UNIVERSITY OF DERBY

PROPOSING A FRAMEWORK FOR ORGANISATIONAL SUSTAINABLE DEVELOPMENT: INTEGRATING QUALITY MANAGEMENT, SUPPLY CHAIN MANAGEMENT AND SUSTAINABILITY

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LIST OF ABBREVIATIONS

BEM: Business Excellence Models
CE: Circular Economy
CR: Corporate responsibility
CS: Corporate sustainability
CSR: Corporate social responsibility
EBDM: Evidence based decision making
EFQM: European Foundation for Quality Management
Envir.: Environmental
EOP: Engagement of people
GRI: Global Reporting Initiative
GSCM: Green supply chain management
HRM: Human Resource Management
KPI: Key performance indicator
LM: Logistics Management
LSS: Lean six sigma
MBNQA: Malcolm Baldridge National Quality Award
OM: Operations management
Ops: Operations
PhD: Doctor of philosophy
QA: Quality assurance
QC: Quality control
QI: Quality inspection
QM: Quality management
QMS: Quality management system
QUAL: Qualitative
QUAN: Quantitative
RAG: Red, Amber, Green
RQ: Research question
SC: Supply chain
SCM: Supply chain management
SCQM: Supply chain quality management
SD: Sustainable development
SLR: Systematic literature review
SM: Sustainability management
SMB: Small and medium businesses
SME: Small and medium enterprises
SOM: Sustainable operations management
SQM: Sustainable quality management
SSCM: Sustainable supply chain management
SSCQM: Sustainable supply chain quality management
TBL: Triple bottom line
Tech: Technology
TQM: Total quality management
VOS: Voice of the stakeholders

DECLARATION

The research compiled in this thesis was undertaken in the College of Engineering and Technology at the University of Derby, under the supervision of Dr. Kapila Liyanage. It is declared that all works included in this thesis were conducted by the author, and no part of the thesis has been submitted in any form to any other university or educational institution. Ethical approval has been granted from the College of Engineering and Technology Research Ethics Committee for the data collection phases of the research. It is confirmed that relevant credit has been granted, where references have been made to the previous works of others. Parts of this thesis have been previously published in the form of journal contributions as outlined in the list of appended publications.

Ali Bastas
University of Derby
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APPENDED PUBLICATIONS

The following publication contributions were confirmed as part of this research, as listed in Table 0.1.

Table 0.1: Appended publications and associated citations (as of June 2019)

No	Publication	No. of Citations (Google Scholar)
I	Bastas A and Liyanage, K (2018a). Sustainable Supply Chain Quality Management: A Systematic Review. Journal of Cleaner Production, Elsevier, 181, 726–744. doi.org/10.1016/j.jclepro.2018.01.110.	24
II	Bastas A and Liyanage K (2019). Integrated quality and supply chain management business diagnostics for organisational sustainability improvement, Sustainable Production and Consumption, Elsevier, 17, 11-30. doi.org/10.1016/j.spc.2018.09.001.	2
III	Bastas A and Liyanage K (2018b). ISO9001 and Supply Chain Integration Principles Based Sustainable Development: A Delphi Study, Special Issue of Sustainable Development and Quality Management, Sustainability, MDPI, 10, 4569. doi.org/10.3390/su10124569.	2

ABSTRACT

Increasing worldwide demand for products and services is applying a significant pressure on firms and supply chains operationally and financially, along with negative implications on our planet and the public. New approaches are highly required to be adopted by all members of the society, including the businesses for sustainable development. On the other hand, enabling such integration from an organisational management perspective is not straightforward, due to complexities and conflicts associated with balanced integration of economic, environmental and social agendas. Aimed towards addressing this important research requirement, a tailored conceptual framework is presented, constructed upon the synergistic principles of quality management (QM) and supply chain management (SCM) to facilitate integration of triple bottom line sustainability into business management.

As the first step of the research, a systematic literature review was conducted, evidencing research gaps, and opportunities. A conceptual framework was established, and an implementation procedure to facilitate operationalisation of the framework was developed including a business diagnostic tool contribution, aiding current state maturity assessment as one of the key implementation steps. These developments were verified, validated and improved through the Delphi method, and applied at an organisation in Cyprus as the final validation step, using the action research method.

Positive relationships were established and verified conceptually between the ISO 9001 principles of QM, supply chain integration principle of SCM, and organisational triple bottom line sustainability integration. The relative importance of these principles adopted in the framework were determined based on expert Delphi panel feedback. The action research demonstrated the application of the framework, outlined its contextual implementation factors, and concluded positive effects on the sustainable development of the participating organisation.

Several contributions to knowledge were made, including the refinement of existing QM and SCM concepts for organisational sustainability improvement, and formulation of a practical framework including a novel diagnostic tool to facilitate integration of triple bottom line sustainability through QM and SCM. Particularly, a new management perspective was introduced with implications to many organisational managers that adopt ISO 9001 and supply chain integration principles, setting the way for extending these principles beyond their original QM and SCM agendas towards organisational sustainable development.

ACKNOWLEDGEMENTS

Firstly, I cannot appreciate enough, my Director of Studies, Doctor Kapila Liyanage, who from the very first day of this research, believed in me, tirelessly supported me and deeply inspired me to develop as a doctoral researcher. My thanks and gratitude also goes to the University of Derby Research Office team, for their kind support and assistance throughout the course of this research. Your contributions are highly appreciated.

I would like to sincerely acknowledge the academic and industrial experts that took part in the Delphi study phase of the research for their interest, contributions and valuable time, helping me to develop the research through their insightful feedback. My deep appreciation and gratitude also goes to the director, owners, management team, and other colleagues of the collaborating organisation during the action research study, for your close cooperation, open approach, time, commitment and support. I am unable to name you due to our confidentiality agreement, but your contribution to this research was highly valuable.

My special thanks also go to the Journal of Cleaner Production editorial team for providing me with the valuable opportunity of reviewing for their journal since November 2017. This opportunity not only provided me with the challenge of critically reviewing state of the art research but also highly contributed to my development as a researcher.

I also would like to thank JCB organisation for their support and sponsorship to this research during my employment period, as part of the supplier development team at the world headquarters. I have earned my chartership as a quality professional, my ISO 9001 lead auditor status, six sigma green belt and quality management diploma during my role at JCB, gaining valuable experiences regarding organisational improvement at the international level, which have proven as highly valuable in my research journey so far. Namely, I deeply appreciate the support of Mr. Neil Griffiths, my line manager during my employment and all my team members at JCB supplier development.

Finally, I am highly appreciative to the incommensurable support of my family, Hasan, Melek and Mert Bastas, in particular my father Hasan Bastas, who started his fight with brain cancer a short time before the compilation period of this thesis. Dear papa, your strength, guidance and inspiring approach always meant a lot for me, and although your major medical condition, the meaning of your supportive approach to me during the compilation period of this thesis was indescribable. I am highly thankful to my mother Melek Bastas, for her love,

prayers and irreplaceable support. My deep thanks and gratitude go to my brother Assistant Professor Doctor Mert Bastas for his continued guidance and support, and for acting as a role model, in this early phase of my research career.

CHAPTER 1 - INTRODUCTION

1.1. Introduction

In this chapter, the research background, problem discussion, research questions, aim and objectives, contributions to the body of knowledge, delimitation and the structure of the thesis are presented. The research motivation and problem discussion section provides an introduction into the focal management area of sustainability management, presenting the research motivation, the importance of the research and the problem discussion. An overview of quality management and supply chain management fields is provided, outlining the evolution of the literature for integration of sustainability. The research inquiries are formulated, and the research aim that stems from the established research problem and inquiries is presented along with the set of research objectives outlined towards the achievement of this aim. Finally, the contributions made to the literature and to industrial management practice is summarised, the scope of the research is discussed, and the structure of the thesis is provided.

1.2. Research Motivation and Problem Discussion

An introduction to the emerging research area of sustainability management is presented in this section, along with the research motivation and the problem discussion, forming the foundations of the research.

1.2.1. Sustainability and Management

"Meeting the needs of the present without compromising the ability of future generations to meet their own needs" lies at the heart of sustainability and sustainable development (Keeble, 1988). The pressure applied on firms and supply chains driven by the highly growing nature of worldwide consumption rate, and demand for products and services is offering significant challenges for our environment and public (Rajeev et al., 2017).

Considering our inclining consumption trends, the boundaries of our natural resources and society, radical changes are required to be adopted by all actors of the society including the organisations (Keeble, 1988; Morioka and Carvalho, 2016a). This strategically positions sustainability as an increasingly growing imperative as a market, societal, legislative and stakeholder requirement for firms, imposing alignment of management activities for sustainable development (Garvare and Johansson, 2010; Morioka and Carvalho, 2016a; Siva et al., 2016). In this context, sustainable development (SD) and sustainability management

(SM) are articulated as following (Kuei and Lu, 2012):

> ***SD:*** "*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"*

In the context of firms, the three dimensional nature of sustainability was articulated as the business case (economic or profit), the natural case (environmental or planet), and the societal case (social or public), which was conceptualised by Elkington (2013) as triple bottom line (TBL) (Dyllick and Hockerts, 2002; Engert et al., 2016). This includes management of organisational products, services and processes across their supply chains and life cycles against the multi-dimensional criteria of triple bottom line (Elkington, 2013). However, very limited organisations have achieved to develop management solutions and synergistic policies for integration of sustainability (Machado et al., 2017), and many are in the search of "guidance" on how to integrate and manage sustainability as part of their intricate and complex intra and interorganisational operation networks (Kiron et al., 2015; Schrettle et al., 2014).

1.2.2. Motivation and Problem Discussion

A number of attempts were made through systematic reviews and conceptual constructs for integration of sustainability into strategic management (Engert et al., 2016), for embedding of sustainability in activities of small and medium enterprises (Witjes et al., 2017), for inclusion of sustainability in firm performance management and measurement systems (Morioka and Carvalho, 2016b), and for enhanced decision making balanced through the integrated lens of triple bottom line (Garcia et al., 2016). Furthermore, the potential of current management approaches including the quality management (QM) (Siva et al., 2016), supply chain management (SCM) (Rajeev et al., 2017), lean manufacturing (Martínez León and Calvo-Amodio, 2017), and relatively newer management approaches including circular economy (Geissdoerfer et al., 2017), were explored.

On the other hand, the practical means including tools, techniques, concepts and mechanisms for business managers to integrate, measure, communicate, drive and improve sustainability internally and across the supply chain network still remains as a highly current need for academics and practitioners (Engert et al., 2016; Kiron et al., 2015; Lozano, 2015; Millar et

al., 2012; Morioka and Carvalho, 2016a; Rajeev et al., 2017; Schrettle et al., 2014; Williams et al., 2017). This viewpoint stems from a number of challenges associated with the managerial integration of sustainability including the following:

- The multi-dimensional agendas introduced by SM are offering not only internal but also external conflicts and complexity for integration, policy and strategy formulation, action deployment and sustainable development (de Brito and Van der Laan, 2010; Engert et al., 2016; Kiron et al., 2015; Kuei and Lu, 2012; Machado et al., 2017; Morioka and Carvalho, 2016b; Schrettle et al., 2014; Seuring and Müller, 2008; Williams et al., 2017). Current frameworks and methods are falling short in systematically and strategically directing sustainability integration efforts in organisations (Engert et al., 2016; Hahn, 2013; Keskin et al., 2013; Machado et al., 2017; Williams et al., 2017).

- Existing approaches are lacking industry (manufacturing, service etc.) and organisational scale (SMB, SME or Large) specific guidance (Rajeev et al., 2017; Reefke and Sundaram, 2016), involving long-term changes that are not straightforward to implement with significant capital investment implications.

- Although the guidelines and standards introduced by Global Reporting Initiative (GRI) and performance assessment frameworks such as Chardine-Baumann and Botta-Genoulaz (2014), a considerable level of difficulty and ambiguity is associated with the definition and elaboration of sustainability in the organisational context. This includes the challenges associated with drawing out what it means for businesses, how it is represented in organisational management, what its key indicators are for each TBL dimension, how it is measured and which managerial processes or mechanisms can be used to aid its integration, acting as a major road block for organisations looking for integration and implementation of sustainability practices (Hart and Milstein, 2003; Morioka and Carvalho, 2016b).

These challenges point towards a key industrial need for new and holistic management approaches that will act as a catalyser for the intricate but important matter of integrating sustainability into organisational and supply chain processes (Beske and Seuring, 2014; de Brito and Van der Laan, 2010; Engert et al., 2016; Lozano, 2015; Rajeev et al., 2017; Reefke and Sundaram, 2016; Williams et al., 2017; Winter and Knemeyer, 2013). This fundamental management research problem is resonated by a number of authors in the literature, including

Engert et al. (2016) that put forward the following statement:

> *"Future research should move from focusing on whether or not companies need to integrate corporate sustainability into their management structures; to how this could be done in practice."*

Nevertheless, conventional management principles and approaches regarded as "best practice", that are already in place and well recognised by managers for driving change, performance measurement, stakeholder satisfaction and improvement, carry a significant potential in speeding up the management transformation into integrated and holistic approaches for sustainability (Kuei and Lu, 2012). Among these conventional management principles, QM and SCM were selected as the focal avenues that have been utilised conceptually to facilitate integration of triple bottom line sustainability into organisations and supply chains due to established integration research streams outlining the clear advantages and synergies offered by these approaches for sustainable development of organisations (Rajeev et al., 2017; Reefke and Sundaram, 2016; Siva et al., 2016), their deep roots in management history facilitating implementation of any QM and SCM associated framework (especially when compared to relatively newer approaches such as circular economy and lean which are less recognised by the practitioner base), and the expertise and previous industrial background of the researcher in these areas.

The integrated perspective of "sustainable operations management" is significantly growing since early 2000s, in the search of holistic and synergistic concepts for total incorporation of environmental, societal and economic issues, QM and SCM being utilised as remarkable reference points in our journey towards sustainable operations, organisations and supply chains (Engert et al., 2016; Kleindorfer et al., 2005; Lozano, 2015; Rajeev et al., 2017; Seuring et al., 2008; Siva et al., 2016). Recent systematic review contributions on the integration of QM and sustainability (Siva et al., 2016), the integration of SCM and sustainability (Rajeev et al., 2017; Reefke and Sundaram, 2016), and the collective integration of QM, SCM and sustainability (Bastas and Liyanage, 2018a), not only outline the supporting role of QM and SCM for integration of sustainability but also highlight the need for further adaptation and pioneering of extant QM and SCM approaches for sustainable development. Through established stakeholder focus, deep functional and operational scope within and outside the boundaries of firms, and inherence in almost every organisation globally, QM and SCM approaches are in pole position for facilitation and catalysis of embedding sustainability into organisations and supply chains (Rajeev et al., 2017; Siva et

al., 2016).

QM and SCM highly influence activities internal and external to firms at both softer (e.g. culture, relationships, engagement of people) and harder levels (e.g. capabilities, systems, coordination and processes), therefore are strategically positioned for driving change towards sustainable management. This view point is shared by several authors in the existing body of knowledge, highlighting the role of deeply rooted QM and SCM philosophies for embedding of sustainability into management systems and processes for reporting, measurement, communication and improvement (Engert et al., 2016; Isaksson, 2006; Kuei and Lu, 2012; Mehra et al., 2001; Rajeev et al., 2017; Reefke and Sundaram, 2016; Zink, 2007). QM and SCM, when implemented in conjunction with each other, reinforce intra and interorganisational cooperation for change and improvement, which offers significant potential for supporting management evolution into incorporation of triple bottom line sustainability in firms (Vanichchinchai and Igel, 2009).

This research originates from this remarkable and highly current management research problem, aiming to explore further the fruitful potential of QM and SCM approaches with a view to provide conceptual and empirical contributions to accelerate our organisational transition into integrated and holistic sustainability management practices.

1.3. Quality Management and Supply Chain Management Overview

An overview of the quality management and supply chain management areas, that are central to the research from the development of a management integration perspective, is presented in this section.

1.3.1. Quality Management

Satisfying or excelling stakeholder and customer needs is central to quality management (QM), including coordination, management and alignment of organisational products, services and processes (Evans and Lindsay, 2010; Fernandes et al., 2017). As a strategic management approach, QM facilitates parameters key to sustainability of firms such as continuous improvement, performance measurement and customer satisfaction improvement through widely established principles, tools, techniques and practices (Evans and Lindsay, 2010; Fernandes et al., 2017; Nguyen et al., 2018; Talib et al., 2011). Customers are getting increasingly concerned about not only the sustainability of products they purchase but also about the sustainability of the supplying organisation. Through identification of customer sustainability requirements (e.g. recyclable materials, emissions, organisational health and

safety etc.), and adopting performance measurement practices such as implementation of business objectives and tracking of performance regarding the relevant sustainability parameters, QM sets a path for organisational sustainable development using the customer satisfaction and performance measurement approaches. A wide scope of activities internal and external to organisations, throughout the life cycle of products and services are included as part of the QM domain, such as externally provided goods, operations, logistics and after sales (Evans and Lindsay, 2010; Fernandes et al., 2017).

With the involvement of participants from 163 world countries, International Organisation for Standardisation (ISO) was established in 1987, catalysing deployment of key quality management principles such as standardisation, measurement and improvement on a global scale (ISO, 2015a; Nguyen et al., 2018). ISO 9001 was introduced as a basis of business management systems, outlining the building blocks of business performance measurement, stakeholder management and a positive approach to organisational sustainable development (Carmignani, 2009; Engert et al., 2016; Heras-Saizarbitoria and Boiral, 2013; ISO, 2015a; Nguyen et al., 2018).

QM approaches such as total quality management (TQM) and Lean Six Sigma (LSS) are also positively associated with sustainable development, adopting key principles of engagement of people, business culture change, enhanced process repeatability, reduced waste and realisation of products / services that are fit for stakeholder requirements (Cherrafi et al., 2017; Govindan et al., 2014; Kuei and Lu, 2012; Zhang and Awasthi, 2014). Quality awards in various geographical regions such as the European Foundation for Quality Management (EFQM) excellence award and Malcolm Baldridge National Quality Award (MBNQA) not only provided noteworthy developments in operational and supply chain performance management practices but also possess the potential to accelerate our journey towards more sustainable operations and supply chains (Asif et al., 2011; Kuei and Lu, 2012; Nguyen et al., 2018).

1.3.2. Supply Chain Management

As an outcome of the current globalisation, growing competition and tougher market conditions, more and more activities, processes and services are being outsourced, resulting in more complex supply chain networks and interorganisational interactions (Ansari and Qureshi, 2015; Rajeev et al., 2017; Reefke and Sundaram, 2016). Cross-enterprise integration and coordination across the supply chain network is at the core of supply chain management (SCM) (Chen and Paulraj, 2004). Supply chain includes the channel of materials,

information, goods and services, associating the features of supply, transformation and demand (Chen and Paulraj, 2004).

SCM revolves around planning, execution and control of material, information, logistics and relationships internal and external to firms, seeking to meet customer and stakeholder requirements (Chen and Paulraj, 2004; Lambert and Enz, 2017). SCM involves intra and interorganisational activities that range throughout the product and service life cycles, from raw material transformation through manufacturing and market use, to end of life stages (Seuring et al., 2008). Hence, SCM is a fundamental parameter for business continuity, performance and improvement of firms along with significant impact on how they are perceived by their stakeholders and sustainability (Rajeev et al., 2017; 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 network, while taking goals from all three dimensions of sustainable development (i.e. economic, environmental and social) into account, which are derived from customer and stakeholder requirements".

1.4. Research Questions

Based on the management research problem presented in Section 1.2, the following research questions (RQs) are formulated and framed in Figure 1.1 as the foundations of this research, which are of exploratory nature, assessing the phenomenon of business sustainability integration in the new, collective light of QM and SCM (Saunders et al., 2015):

> **RQ1:** What are the relationships between the quality, supply chain and sustainability management methodologies?
>
> **RQ2:** What are the key integration issues of quality, supply chain and sustainability management methodologies including synergies, complications and further avenues for integration?
>
> **RQ3:** How can the QM and SCM approaches facilitate and/or accelerate integration of triple bottom line into organisational and supply chain mechanisms?

RQ4: What are the QM and SCM principles that can be coherently framed for sustainable development of organisations and supply chains?

RQ5: How can such a framework be operationalised by industrial practitioners and decision makers?

RQ6: Would such a framework provide a practically verified and validated solution to industrial and academic subject matter expertise for organisational and supply chain integration of sustainability?

RQ7: What are the key contextual factors for application of such a framework, including the enablers and barriers for implementation?

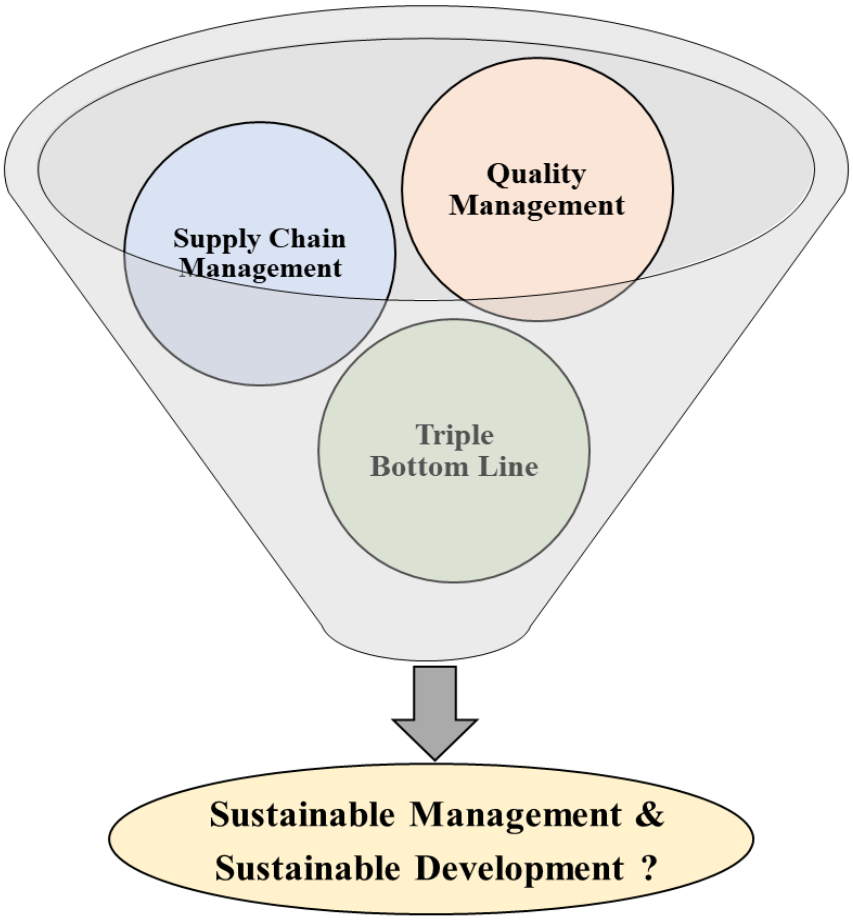

Figure 1.1: Research problem framework addressed by the thesis

1.5. Research Aim and Objectives

Stemming from the societal and industrial needs, and limitations evident in the literature, the aim of this research was set out as:

> ***Aim:*** *"To design and develop a management framework through integration of quality management, supply chain management and sustainability management methodologies with a view to facilitate sustainability integration, and improvement of organisations."*

To enable accomplishment of this aim, and to shed light on the research questions outlined in Section 1.4, the following research objectives were formulated:

1. Undertake systematic review of related QM and SCM integration literature and extant frameworks, critically evaluating relationships, synergies, complications and research gaps in the context of sustainable development of organisations and supply chains.

2. Formulate a conceptual framework, incorporating synergistic and compatible links (propositions) between QM, SCM and SM for organisational sustainability integration and improvement.

3. Synthesise an implementation procedure, integrating QM, SCM and SM methodologies with a view to guide industrial decision making and deployment.

4. Develop a diagnostic tool to facilitate the current state analysis and quantitative maturity assessment step of the implementation procedure.

5. Verify the conceptual framework and validate the implementation procedure and diagnostic tool developed with subject matter expertise from academia and industry.

6. Implement the research outcomes (the novel developments) in their intended context (organisational management), with a view to finalise validation, demonstrate application and outline key implementation factors.

1.6. Contributions to Body of Knowledge

This research contributes to the body of knowledge and to organisational and supply chain management practice through:

1. A systematic literature review, adopting an authentic research approach through the unique, collective lens of QM, SCM and sustainability integration, summarising the state-of-the-art literature in this area. The integration research streams in the QM, SCM and sustainability domain have been growing in isolation to each other, in the absence of a collective approach that simultaneously investigated all three areas with a view to leverage synergies offered by the QM and SCM integration for sustainable development of organisations and supply chains.

2. A new conceptual construct and research line, framed under sustainable supply chain quality management (SSCQM), built upon the holistic view and associated synergies of QM, SCM and sustainability integration.

3. The synthesis of quality management and supply chain management principles and triple bottom line sustainability under an organisational improvement framework tailored towards sustainable management and development.

4. The formulation of a practical implementation procedure and a novel sustainability integration diagnostic tool to facilitate implementation of this framework, offering a solution towards catalysing organisational transformation into sustainable development.

5. The verification, validation and application studies, presenting new empirical insights into the fields of QM, SCM and SM (based on expert panel input and implementation of research outcomes in a small to medium scale business (SMB)).

1.7. Delimitation

Sustainable development and management can be approached from the people, organisational and governmental viewpoints. This thesis adopts an organisational lens to sustainable development due to the significant research requirement perceived in this area and due to the selected management avenues for integration (QM and SCM) being originated from the

organisational context.

On the basis that true sustainable development is heavily dependent on a balanced approach on triple bottom line, the thesis focusses on all three dimensions of sustainability; economic, environmental and social. The arguments established in the literature support the viewpoint that QM and SCM carry the potential to positively influence integration and improvement of all dimensions of sustainability, underpinning such a research concentration decision on the key areas of QM and SCM for development of a management framework for organisational sustainable development.

1.8. Thesis Structure

This thesis consists of seven distinct but complementary chapters, aligned with the aim and objectives of the research. A brief description of each chapter is provided as following:

Chapter 1 – Introduction: outlines an overview of the thesis, setting the scene for the study including the description of the background, key management areas, research problem, the rationale, the scope and the purpose.

Chapter 2 – Literature Review: defines the concepts fundamental to the research and their connections, including the introduction of sustainability, QM and SCM philosophies, practices and integration perspectives along with a brief overview of other management approaches currently being adopted for integration of sustainability. Further, this chapter includes the systematic and critical review of the QM, SCM and sustainability literature, analysing inter-relationships and complications for integration, identifying key research trends, evidencing gaps and establishing research opportunities. The findings are presented in quantitative (descriptive analysis) and qualitative (thematic synthesis) components. A timeline contribution for integration of QM, SCM and sustainability is provided.

Chapter 3 – Research Design: includes a detailed evaluation and discussion on the research philosophy, methodology and data collection methods employed. The epistemological research worldviews, designs and methods are reviewed, arguments regarding the methodological decisions made are presented (pragmatic, mixed-method and triangulation approaches), and a review of the research methods adopted (systematic literature review, Delphi study, action research study) is provided in alignment with the aim and objectives of the research.

Chapter 4 – Conceptual Framework: includes the tabulated analysis of the extant management models and frameworks integrating QM, SCM and sustainability, developing further the gaps and requirements of the literature. The conceptual framework, constructed upon the viewpoints of a wide base of authors, holistic perspective developed, and research opportunities established is discussed. Stemming from the conceptual basis formulated between QM, SCM and sustainability, an implementation procedure is presented to act as a step-by-step road map for industrial implementation. The business diagnostic tool contribution designed to aid the fundamental step of the implementation procedure (current state analysis) is introduced.

Chapter 5 – Verification and Validation: presents the Delphi study carried out for verification and validation of the novel developments (conceptual framework, implementation procedure and the diagnostic tool). The methodology adopted for the study is introduced, the specialist panel consisting of subject matter expert academics and practitioners that took part in the study is presented, quantitative (consensus analysis) and qualitative (thematic synthesis) findings of the study are illustrated, and improvement actions implemented in the implementation procedure and the tool developed are discussed.

Chapter 6 – Application of the framework: demonstrates the application of the developed framework through an action research study. The implementation of the implementation procedure and sustainability integration diagnostic tool is presented at an SMB organisation in Cyprus, noting the positive influences realised and contextual factors observed for operationalisation including the enablers and barriers. The observations, practical insights and learnings captured during the implementation of the framework are discussed.

Chapter 7 – Summary and Conclusions: presents an overview of the research, its key findings, review of achievements against objectives, contributions and final remarks. The limitations of the research are critically reviewed, and future research directions are provided.

The thesis chapters are mapped against the formulated research questions as illustrated in Figure 1.2.

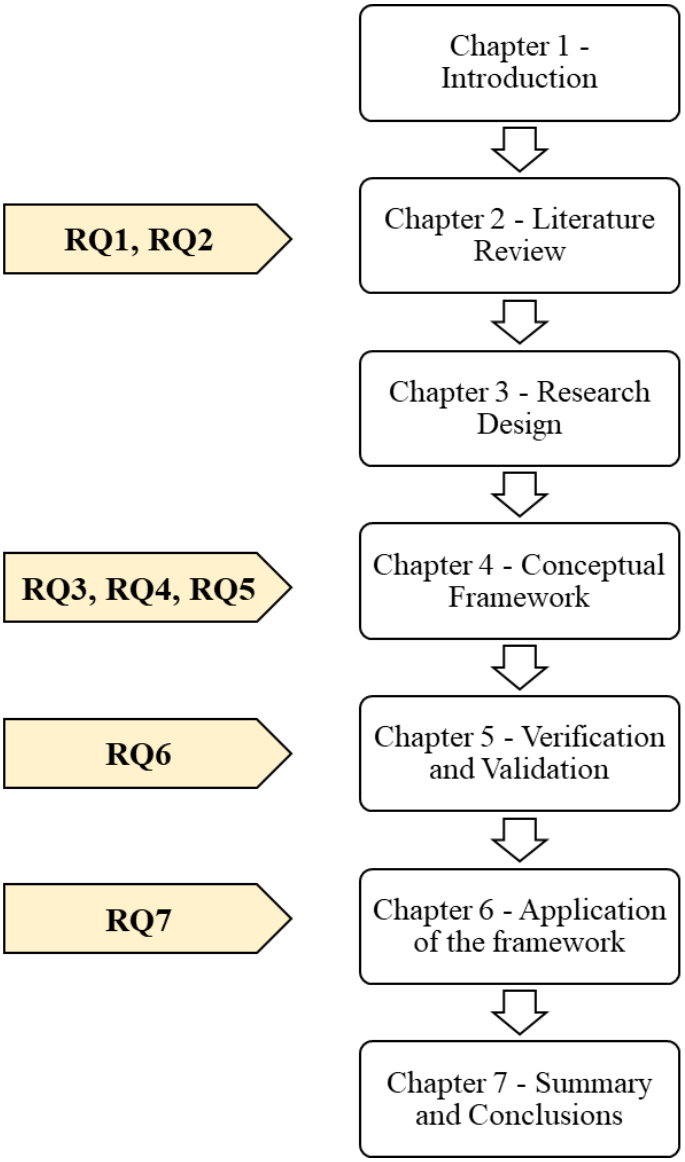

Figure 1.2: Research questions and thesis sections

CHAPTER 2 – LITERATURE REVIEW

2.1. Introduction

Creswell (2013) highlighted the role of literature reviews in doctoral research as following: "literature review enables determination of whether the topic is worth studying, and it provides insight into ways in which the researcher can limit the scope to a needed area of inquiry". Stemming from this viewpoint, this chapter provides the review of the body of knowledge on the evolution and definitions of the sustainability, QM and SCM philosophies, paradigms and integration perspectives in Section 2.2 along with an overview of other management approaches currently being adopted for embedding of sustainability.

Further, this research argues the integration of sustainability through QM and SCM thus, the rationale underpinning this research decision and standpoint is presented in Section 2.3. The methods deployed in the systematic and critical review of the QM, SCM and sustainability literature are detailed in Section 2.4. The findings of this in-depth investigation are presented in quantitative (descriptive analysis) and qualitative (thematic synthesis) components in Section 2.5, including the analysis of synergies and complications for integration, identification of key trends, evidencing of gaps and establishment of opportunities in tandem with the development of a new research avenue of sustainable supply chain quality management. Finally, a timeline contribution for integration of QM, SCM and sustainability is presented in Section 2.6, enhancing the integrated perspective of sustainable supply chain quality management.

2.2. Literature Review of Key Concepts

2.2.1. Sustainability

2.2.1.1. Evolution and Definitions

Sustainability and sustainable development phenomena are undergoing exponential growth in the last two decades, not only permeating the agendas of governmental bodies and businesses, but also disseminating as a focal research avenue globally (Bettencourt and Kaur, 2011). Although the origin of the "sustainable" phenomenon can be rooted back to the "future of mankind" considerations that emerged around the fundamental issues of population growth, resource depletion and environmental pressures in the 1950s (Kidd, 1992), the formal inception stems from the crucial policies of World Conservation Strategy introduced by the International Union for Conservation of Nature (IUCN) (McCormick, 1986), and Our Common Future report by World Commission on Environment and Development (WCED),

which is also known as the Brundtland Report (Keeble, 1988).

The Brundtland Report formulated one of the most recognised and frequently cited definition of sustainable development (SD) as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). In 1994, Elkington further developed this definition into an integrated concept of triple bottom line (TBL), with a view to frame the environmental issues as well as the long term, ethical, societal and economic meanings put forward by the Brundtland Report (Elkington, 2013). This articulation set out the three dimensional nature of sustainability comprising of the business case (economic or profit), the natural case (environmental or planet), and the societal case (social or public), together forming the fundamental concept of triple bottom line sustainability as demonstrated in Figure 2.1 (Dyllick and Hockerts, 2002; Engert et al., 2016). As part of the TBL view, Elkington put forward the imperative association between the organisational goals, and the society and environment that encompass the organisations (Elkington, 2013).

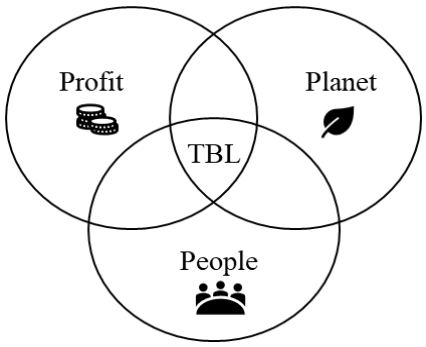

Figure 2.1: Concept of triple bottom line sustainability (Elkington, 2013)

Such broader conceptualisation was resonated by Diesendorf (1999) that articulated SD as "economic and social development that protect and enhance the natural environment and social equity", defining the environmental and social agendas as "primary", and SD as a process or a journey rather than an outcome or a destination (Dunphy et al., 2000). Sterling (2010) echoed a similar view point, defining sustainable development as "a reconciliation of the economy and the environment on a new path of development that will enable the long-term development of humankind" (Klarin, 2018). In addition to sustainable development, sustainability started to be utilised in many phrases in various contexts and disciplines including: "sustainable societies, sustainable communities, environmental sustainability, sustainable growth, corporate sustainability and strategic sustainability" (Vos, 2007).

According to Kidd (1992), “the roots of sustainability are deeply embedded in fundamentally different concepts, each of which has reasonable claims to validity that the search for a single definition seems futile, and the existence of multiple meanings is tolerable, if each analyst describes clearly what he/she means by sustainability”. In spite of the lack of scholar consensus on its definition and the challenges associated with articulating its meaning in different contexts (Vos, 2007), articulation by various scholars of its dimensions (economic, environmental and social) and their integration (socio-economic, socio-environmental, econo-environmental and triple bottom line) were reviewed and provided in Table 2.1.

Table 2.1: Sustainability dimensions and associated definitions
(Adapted from Martínez León and Calvo-Amodio (2017))

Sustainability Dimension	**Definition**	**Reference**
Economic	"Being able to attain long term profitability in volatile and complex market places"	(Fricker, 1998)
Environmental	"Opposite of environmental degradation from the stresses of human population, affluence and technology on ecological and global limits"	(Ageron et al., 2012)
Social	"Roadmap with ethical and moral principles to guide our actions"	(Rothenberg et al., 2001)
Econo-environmental	"Compromise between the natural environment and the pursuit of economic growth"	(Azevedo et al., 2012)
	"Safeguarding natural resources against exploitation, in the name of productivity and competitiveness"	(Ageron et al., 2012)
Socio-economic	"Meeting business and stakeholder needs without compromising the future generations' ability to meet their needs"	(Martinez-Jurado and Moyano-Fuentes, 2014)
Socio-environmental	"Development that improves human life quality while supporting ecosystems"	(Bell and Morse, 2008)
Triple Bottom Line (TBL)	"Satisfying present without compromising the ability of meeting future needs"	(Alsagheer, 2011)
	"Business strategies/activities that meet the needs of organisations and their stakeholders today while protecting, sustaining, and enhancing human and natural resources that will be required in the future"	(Azevedo et al., 2012)

2.2.1.2. Sustainability Integration and Role of Organisations

Our society is facing a number of major environmental and socio-economic issues, placing the future of both our planet and our society at risk. These major environmental and societal concerns were described by Diesendorf (1999), which are factors still highly relevant today for sustainability as presented in Table 2.2. These factors are at the global scale, suggesting sustainable development as an absolute necessity for both developing and developed nations.

Table 2.2: Environmental and socio-economic sustainability concerns
(Adapted from Diesendorf (1999))

Sustainability Dimension	Area of Concern
Environmental	Changes, possibly irreversible, to the composition of the atmosphere and to Earth's climate
	Destruction of stratospheric ozone and increased damage to living organisms from ultraviolet light in sunshine
	Degradation of topsoil and increases in desertification
	Loss of biological diversity
	Damage to photosynthesis and nutrient cycles
	Widespread pollution of air, rivers and ocean
	Depletion of artesian water storages
Socio-economic	The gap between the rich and the poor has been increasing, both between countries and within many countries
	Human rights violations are still endemic in many countries
	A large proportion of the world's population has inadequate diet, nutrition and access to drinking water
	A large proportion of the world's children live in poverty
	Preventable and treatable diseases are prevalent in developing countries
	A large proportion of the world's population is still illiterate
	There are still many refugees, resulting from war, political persecution, environmental destruction and economic hardship

Considering our inclining consumption trends and our environmental and societal boundaries, sustainable development will not be possible without radical and revolutionary changes

adopted by all actors of the society (Keeble, 1988; Morioka and de Carvalho, 2016). In response to the global challenges faced by our society including the concerns revolving around the poverty, inequality, climate, environmental degradation, prosperity, and peace and justice, United Nations (UN) introduced the 17 Sustainable Development Goals in 2015 as demonstrated in Table 2.3 (UN, 2015). These goals were formulated to act as "the blueprint to achieve a better and more sustainable future for all", setting out a 2030 vision and providing countermeasures and a plan of action at the macro level to the current global sustainability issues (UN, 2015).

Table 2.3: UN's Sustainable Development Goals (UN, 2015)

No	Goal	Description
1	No Poverty	Economic growth must be inclusive to provide sustainable jobs and promote equality.
2	Zero Hunger	The food and agriculture sector offers key solutions for development, and is central for hunger and poverty eradication
3	Good Health and Wellbeing	Ensuring healthy lives and promoting the well-being for all at all ages is essential to sustainable development
4	Quality Education	Obtaining a quality education is the foundation to improving people's lives and sustainable development
5	Gender Equality	Gender equality is not only a fundamental human right, but a necessary foundation for a peaceful, prosperous and sustainable world.
6	Clean Water and Sanitation	Clean, accessible water for all is an essential part of the world we want to live in
7	Affordable and Clean Energy	Energy is central to nearly every major challenge and opportunity
8	Decent Work and Economic Growth	Sustainable economic growth will require societies to create the conditions that allow people to have quality jobs
9	Industry, Innovation and Infrastructure	Investments in infrastructure are crucial to achieving sustainable development.
10	Reduced Inequalities	To reduce inequalities, policies should be universal in principle, paying attention to the needs of disadvantaged and marginalized populations
11	Sustainable Cities and Communities	There needs to be a future in which cities provide opportunities for all, with access to basic services, energy, housing, transportation and more
12	Responsible Production and Consumption	Promoting resource and energy efficiency, sustainable infrastructure, and providing access to basic services, green and decent jobs and a better quality of life for all
13	Climate Action	Climate change is a global challenge that affects everyone,

		everywhere
14	Life Below Water	Careful management of this essential global resource is a key feature of a sustainable future
15	Life on Land	Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss
16	Peace, Justice and Strong Institutions	Access to justice for all, and building effective, accountable institutions at all levels
17	Partnership for the Goals	Revitalize the global partnership for sustainable development

The terms "organisation, enterprise, firm, business and corporation" are used interchangeably throughout this thesis, referring to "an association of individuals, created by law or under authority of law, having a continuous existence irrespective of that of its members, and powers and liabilities distinct from those of its members" (Diesendorf, 2000; Hart, 2011). Organisations are a component of the economy and the economy is a component of the society therefore, organisations remarkably influence sustainability through interactions with the economy, natural environment, workforces and the society. Diesendorf (1999) put forward that this strong relationship between the enterprises and sustainability is through "their choices of raw materials and suppliers, land use, geographic locations, manufacturing processes including creation of wastes and pollution, organisational structures, financial arrangements, management systems, employment and work practices, customer services, community activities, uses of information and lobbying", placing organisations as "key players in the sustainability scene".

Stemming from this important position in the sustainability stage, enterprises are endeavouring sustainability integration initiatives as a customer, market, societal, legislative and stakeholder requirement, including alignment of management activities with TBL sustainability goals and sustainable development (Garvare and Johansson, 2010; Kleindorfer et al., 2005; Morioka and Carvalho, 2016a; Siva et al., 2016). According to Kuei and Lu (2012) organisational sustainability management (SM) involves: *"*accelerating the adoption of best management principles, models, and practices throughout the operation system, and enabling the environment to achieve sustainable development*".*

On the other hand, highly growing nature of worldwide consumption rate and demand for products and services is offering significant challenges for adoption of balanced practices from the organisational and supply chain perspective of triple bottom line sustainability (Rajeev et al., 2017). Organisational change and transformation is key to achievement of sustainable development at the enterprise level and despite varying approaches to

sustainability can be observed at the functional levels, "the holistic web of power, direction and influence" vertically across the senior management through the middle management into the individuals is key to making this change happen (Millar et al., 2012; Smith and Sharicz, 2011). "Communications, adoption of reporting practices and prioritising issues" are instrumental to sustainability management integration, policy deployment and transformation of businesses (Millar et al., 2012), which rely on reporting frameworks, indicators and measurement mechanisms for effective operationalisation.

2.2.1.3. Reporting and Indicators

Despite the wide dissemination of the terminologies such as corporate responsibility (CR), corporate sustainability (CS) and corporate social responsibility (CSR), an academic agreement on the definition of sustainability reporting and a standard way to measure organisational sustainability has not yet been reached (Montiel and Delgado-Ceballos, 2014). Bergman et al. (2017) proposed the following articulation that provides a broad framework for the concept of corporate sustainability (CS):

> ***CS:*** *"A systematic business approach and strategy that takes into consideration the long-term social and environmental impact of all economically motivated behaviours of a firm, in the interest of consumers, employees, and owners or shareholders"*

Siew (2015) grouped extant corporate sustainability reporting tools into the three key categories of "frameworks, standards, and ratings and indices" as shown in Table 2.4. It can be observed that several frameworks have been developed to date to support organisations in their sustainability disclosure journey, along with standards for consistent accomplishment of the same through formal documentation and described reporting requirements or characteristics. Ratings and indices were also noted to be in place that provide a platform for third party assessments of organisational sustainability.

Table 2.4: Corporate sustainability reporting tools overview
(Adapted from Siew (2015))

Category	Dimension	Tool	Remarks
Framework	All	Global Reporting Initiative (GRI)	Provides an extensive framework for measuring and reporting triple bottom line sustainability through a comprehensive set of metrics and management guidelines

	N/a	SIGMA project	Describes a four-phase cycle (leadership and vision; planning; delivery; monitor, review and report) broken down into three to five levels each to manage and embed sustainability within a corporation
	N/a	DPSIR framework	A chain of causal links beginning with a set of driving forces (e.g. economic sectors) which translates into pressures (e.g. wastes) to states (e.g. physical) and impacts (e.g. ecosystems) eventually leading up to political responses (e.g. prioritisation and target setting)
	All	The Global Compact	Promotes ten facilitating principles across the key areas of human rights, labour, environment and anti-corruption
	Envir.	Carbon Disclosure Project (CDP)	One of the largest databases on disclosure of greenhouse gas emissions, water use and climate change strategies on a global scale
	Social & Economic	World Business Council for SD	Measures what a corporation does in terms of its activities across the four key areas of governance and sustainability, assets, people and financial flows
	Envir.	Greenhouse Gas Protocol (GGP)	Provides a step-by-step guide for corporations to quantify and report on their emissions
Standard	N/a	AA1000	Organisational corporate accountability standard
	Social	SA8000	Organisational management system standard for international human rights norms and national labour laws
	Envir.	ISO 14001	Organisational environmental management system standard
	N/a	ISO 9001	Organisational quality management system, performance improvement and customer satisfaction standard
	Social	AS/NZS 4801	Organisational occupational health and safety standard in the Australia and New Zealand region
	Envir.	EMAS	Organisational environmental performance assessment and reporting standard
	Social	ISO 45001 (was OHSAS 18001)	Organisational occupational health and safety standard
Ratings & Indices	Envir. & Social	KLD	Assesses environmental, social and governance performance of organisations
	Envir. & Social	EIRIS	Assesses environmental, social and governance performance of organisations
	Envir. & Social	Asian Sustainability Rating	Assesses environmental, social and governance performance of organisations in the Asia region
	All	Dow Jones Sustainability Index	Monitors stock performance of the world's leading corporations in terms of social, economic and environmental sustainability

	Envir. & Social	MSCI ESG indices	Assesses environmental, social and governance performance of firms for investment decision support
	All	FTSE4Good index	Assesses organisations against the key criteria of working towards environmental sustainability, upholding and supporting universal human rights, ensuring good supply chain labour standards, countering bribery and mitigating climate change for investment decision support
	Envir. & Social	Bloomberg ESG disclosure scores	Organisational scoring system based on environmental, social and governance disclosure, utilising GRI framework
	Envir.	Trucost	Creates organisational environmental profile

Among the extant tools, the Global Reporting Initiative (GRI) framework was observed to be holistic with regards to inclusion and specification of detailed set of indicators and metrics for all triple bottom line dimensions against unidimensional tools such as CDP and GGP. Although the benefits and road maps offered by frameworks such as the DPSIR and the Global Compact frameworks for embedding of sustainability reporting, the GRI framework was noted to not only include guidelines for application and deployment in the industry, but also describe indicators for a wide range of triple bottom line issues (33 indicators in total as per GRI (2018)) as a coherent sustainability management tool.

1997 marks the establishment of GRI as an independent, non-profit organisation, which is also in close cooperation with the United Nations Environment Programme (UNEP), providing a global reference point for reporting performance with reference to all dimensions of triple bottom line (English and Schooley, 2014; Siew, 2015). English and Schooley (2014) articulated GRI's mission as "making sustainability reporting standard practice by providing guidance and support to organisations, setting forth principles and indicators that can be used to measure and report on organisational sustainability performance".

According to the GRI guidelines, a typical GRI report should contain the following: "vision and strategy; corporation profile; governance structure and management systems; GRI content index; performance criteria (economic, social and environmental)" (GRI, 2018; Siew, 2015). Table 2.5 presents the GRI indicators for organisational sustainability measurement and reporting, specifying six level 1 indicators for the economic, eight level 1 indicators for the environmental and nineteen level 1 indicators for the social dimension. Within these, lower level metrics are also provided (e.g. direct market presence for the level 1 indicator of economic performance), guiding organisational sustainability measurement efforts.

Table 2.5: GRI Indicators for Organisational Sustainability (GRI, 2018)

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Source: https://www.globalreporting.org/standards/gri-standards-download-center/

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Source: https://www.globalreporting.org/standards/gri-standards-download-center/

The GRI sustainability reporting framework is widely adopted by sustainability scholars and practitioners due to incorporation of a wide scope of stakeholder sustainability issues (Alonso-Almeida et al., 2014; Vigneau et al., 2015). Furthermore, the GRI reporting is now compulsory in certain regions along with a trend of it being converted from a voluntary practice into a mandatory act (Alonso-Almeida et al., 2014), 80% of the global fortune 250 firms and approximately 70% of the N100 firms (largest companies by revenue in each of 34 countries surveyed) adopting it for sustainability reporting, according to the 2011 KPMG survey (English and Schooley, 2014). It is argued that the adoption of "GRI way" to sustainability measurement and reporting is superior to other reporting frameworks, and the number of organisations following this avenue to sustainability reporting will keep growing due to the following (Chester and Woofter, 2005; Siew, 2015):

- "Corporation adopting GRI guidelines can significantly reduce the time and effort spent responding to disclosures on social and environmental information"
- "GRI users score higher than non-users in a benchmark of overall quality of sustainability reports"
- "GRI users have on average lower share price volatility and better operating profit margins driven by lower cost of equity and more accurate analysts' forecast as a direct result of more transparency"

2.2.1.4. Sustainability and Operations Management

Organisational operations and operational decisions directly influence the production and distribution technologies of businesses and their system design hence, sustainability issues such as the productivity and usage levels of materials, energy and intensity of waste release are highly impacted by operations management (OM) practices of firms (Drake and Spinler, 2013). Given the remarkable environmental issues of natural resource depletion and climate change and the significant social requirements of the employees and communities that are increasingly surrounding firms, a response is being driven from organisations and operations research to adapt and address the imperative topic of corporate sustainability (Walker et al., 2014).

Stemming from this essential organisational need, Kleindorfer et al. (2005) were one of the very first to introduce the integrated lens of sustainability and operations management, expanding the OM field to include "planet" and "people" agendas, with a view to foster the expected organisational shift (Drake and Spinler, 2013). Walker et al. (2014) provided the

definition for the integrated approach of sustainable operations management (SOM) as following:

> ***SOM:*** *"The pursuit of social, economic and environmental objectives – the triple bottom line – within operations of a specific firm and operational linkages that extend beyond the firm to include the supply chain and communities"*

Kleindorfer et al. (2005) elaborated the current and the future internal and external operations management strategies in line with this fashioned perspective as demonstrated in Table 2.6. For implementation and facilitation of these strategies, quality management (QM) with its intraorganisational (internal) improvement focus and supply chain management (SCM) with its interorganisational (external) integration and collaboration focus can be argued as strategically positioned.

Table 2.6: Current and future operations management strategies from the lens of sustainability
(Adapted from Kleindorfer et al. (2005))

Level	Time	SOM Strategy	Remarks
Internal	Current	"To improve internal operations with continuous process improvements related to sustainability (e.g. employee involvement, waste reduction, energy conservation, and emissions control)"	QM is in pole position to support both current and future sustainability integration strategies
	Future	"Investing in capabilities to recover pollution-causing chemicals during manufacturing, to develop substitutes for non-renewable inputs, and to redesign products to reduce their material content and their energy consumption during manufacturing and use"	
External	Current	"To improve extended supply chains by analysing upstream supply chains to make trade-offs in the choice of materials and processes and pursuing closed-loop supply chains for remanufacturing and safe disposal.	SCM is in pole position to support both current and future sustainability integration strategies
	Future	"Developing core capabilities in products, processes, and supply chains for long-term sustainability and pursuing strategies to facilitate it"	

The evolution and dissemination of the SOM research was conceptualised under the three key areas of (Kleindorfer et al., 2005):

- *Green product and process development* that includes the considerations surrounding "uncertainty, lead times, and investment; first mover advantage; sustainable product design; the impact of sustainable design on supply chains"
- *Lean and green operations* that comprises of "corporate image and profitability; synergies between lean and green; regulatory compliance; liability and negligence; employee health and safety; improved tools and management systems for better product and process design"
- *Remanufacturing and closed-loop supply chains* that contains "the genesis and the architecture of closed-loop supply chains and development of multi-disciplinary perspectives for closed-loop supply chains"

Gunasekaran et al. (2014) further classified the SOM literature as the following:

- *System design* that includes "product and process design; location planning and analysis; capacity planning"
- *System operations* that consist of "procurement; production and logistics"

Management approaches such as quality management, supply chain management and lean were noted to be instrumental for the sustainable operations management research and associated industrial transition along with the emerging concept of circular economy, providing structure and guidance for organisational integration of the intricate but important issue of triple bottom line sustainability.

2.2.1.5. Enablers and Barriers for Adoption

There are several drivers to adoption of sustainability in the organisational context, acting as motivating and catalysing factors for sustainability integration and development. The external enablers for organisational sustainability adoption comprise of the key categories of "regulatory, support, external pressures and market" whereas, the internal enablers include the key areas of "organisation, staff, information, innovation and economic" as tabulated in Table 2.7 (Neri et al., 2018).

Table 2.7: Enablers to Integration of Sustainability in Organisations
(Adapted from Neri et al. (2018))

Origin	Category	Enabler
External	Regulatory	Compliance with regulation
		Regulatory sanctions and taxes

	Support	External funding
		Public subsidies
		Cooperation and network with other companies
		Support from industrial associations
		Support from consultants
		Support from government
	External Pressures	Customers' pressures
		Communities' pressures
		Partners' pressures
		Shareholders' pressures
		Competitors' actions
		Public opinion
	Market	Increase of market share and sales growth
		New market opportunities
		Increases in resource prices
		Creating competitive advantage
		Resources scarcity
Internal	Organisation	Improving firm brand and image
		Improvement of sustainability related performance
		Anticipation of regulatory changes
		Organisational values and culture
		Past experiences in sustainability and knowledge of business case
		Including sustainability at strategic level
		Adoption of certifications / management systems
		Voluntary agreements
	Staff	Management commitment
		Employee commitment
		Training and education
	Information	Dialogue and encouragement
		Trustworthiness, clarity and availability of information
	Innovation	Product innovation
		Technology innovation
		Quality
		Greater efficiency in processes
	Economic	Cost savings
		Increasing incomes

On the other hand, Trianni et al. (2017) outlined a number of barriers to integration of

sustainability in organisations with reference to the key categories of "organisation, management behaviour, workers behaviour, information, technology / service and economic" as listed in Table 2.8. These parameters can be noted as key issues to be taken into account against the operationalisation and implementation of any new management model or concept, seeking to facilitate and accelerate adoption of sustainability agendas in the organisational context.

Table 2.8: Barriers to Integration of Sustainability in Organisations (Trianni et al., 2017)

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Source: Trianni, A., Cagno, E. and Neri, A. (2017), "Modelling barriers to the adoption of industrial sustainability measures", Journal of Cleaner Production, Elsevier, Vol. 168, pp. 1482–1504.

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Source: Trianni, A., Cagno, E. and Neri, A. (2017), "Modelling barriers to the adoption of industrial sustainability measures", Journal of Cleaner Production, Elsevier, Vol. 168, pp. 1482–1504.

2.2.2. Quality Management

From a historical perspective, "quality" represented the supply of goods or services that satisfy the needs of the receiving person, which is a concept that can be traced back to medieval craftsmen operating during the 13th century (Fisher and Nair, 2009; Juran, 1995). Juran, who introduced many meaningful contributions to the quality management field including the influential quality management trilogy of "planning, control and improvement", described "quality" as "fitness for use" (Bisgaard, 2008; Juran, 1995). According to Juran, "fitness for use" consisted of two key subsets, "features" and "freedom from deficiencies", the former representing the design aspects of the required product, process and service (i.e. design quality or what we intend to deliver) and the latter equating to the manufacturing and delivery aspects of the same (i.e. delivery quality, conformance or what we actually deliver) (Bisgaard, 2008; Juran, 1995).

This key concept "evolved over the past century from an early embryonic set of ideas to a comprehensive framework for managing all aspects of quality in an organisation, private or

public, for profit or not, manufacturing or service" (Bisgaard, 2008). This evolution, the inception of which can be dated back to the industrial revolution and development of mass production practices, included a significant shift of focus from the traditional, craftsmen view of inspecting products into a widened perspective of managing the critical processes and finally into management of the overall system and supply chain (Fisher and Nair, 2009; Weckenmann et al., 2015). The Chartered Quality Institute (CQI), that is the chartered body for quality professionals at the leading role for quality profession articulates the contemporary definition for quality and quality management (QM) as following (CQI, 2018):

> ***Quality:*** *"Making organisations perform for their stakeholders – from improving products, services, systems and processes, to making sure that the whole organisation is fit and effective"*
>
> ***QM:*** *"Constantly pursuing excellence: making sure that what your organisation does is fit for purpose, and not only stays that way, but keeps improving"*

Paradigms are models that are essential to definition and articulation of key issues and developments within disciplines (Ferguson, 1980; Kuhn, 1996), and the evolution of the quality management field can be studied under the five key paradigms of "Quality Inspection (QI)", "Quality Control (QC)", "Quality Assurance (QA)", "Quality Management (QM)", "Total Quality Management (TQM)" and the emerging paradigm of "Sustainability Management" (Siva et al., 2016; Weckenmann et al., 2015). Driven by the increasing competition, growing customer expectations and tougher market conditions, quality management field gained importance along with the increase in academic and industrial awareness (Fisher and Nair, 2009; Olszewska, 2017; Weckenmann et al., 2015).

As part of the transformation and adaptation journey, proactive and preventive practices, tools and techniques were developed across a wide range of inter and intraorganisational processes and systems, from the initial, reactive product and defect detection oriented view. With the dynamic changes in the business environment, quality management practices were adapted accordingly, enabling businesses in every scale and industrial sector to meet their objectives, and providing a platform for problem-solving and continual improvement for survival and growth. This evolution and development of the quality management discipline is schematically represented in Figure 2.2.

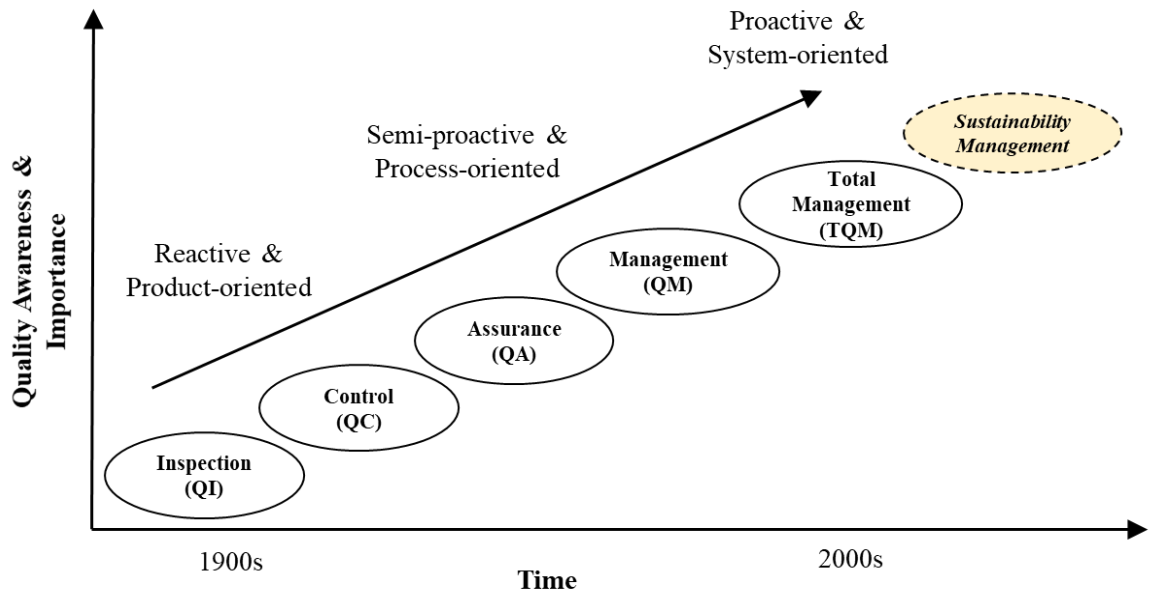


Figure 2.2: The evolution of quality management paradigms
(Adapted from Weckenmann et al. (2015))

The quality inspection paradigm stemmed from the principle of avoiding customer complaints and/or associated actions against the trading person or entity through detection of defects and filtering of goods identified with known faults. This was supported through metrology and testing processes, usually resulting in reactive practices and associated resource implications due to failures, component replacements, inspection equipment, dedicated inspection areas and inspection personnel requirements (Weckenmann et al., 2015).

Due to economic pressures and increasing stakeholder expectations, the QM field expanded its scope into processes and to efficient delivery of fit-for-purpose products. The quality control paradigm was born from the observation that addressing the source of errors proved more effective than reacting to errors, methods such as Deming's Plan-Do-Check-Act cycle, Ishikawa and statistical process control facilitating adoption of this approach, with a view to support problem solving, control and amend the processes and products for quality (Fisher and Nair, 2009; Weckenmann et al., 2015).

The quality control paradigm still encompassed a reactive approach and with the increasing number of activities starting to be outsourced, the prevention philosophy gained emphasis within the QM discipline, bringing together the quality assurance paradigm and proactive tools such as failure mode and effects analysis (FMEA) and event tree analysis (ETA) (Weckenmann et al., 2015). As part of this journey, the "quality" view started to be expanded to various product and service life-cycle phases, including the design and development

phases that were noted to not only have a remarkable impact on product quality but also on management of processes within quality, delivery and cost targets, as per the market expectations. Such growth in terms of scope and applicability, and the increasing supply chain complexity within and across organisations pointed towards not only management of processes but also their interrelations and high risk activities key to delivery of customer related objectives. This formed the basis of quality management paradigm, adopting the system-oriented approach for management of supplier, customer and internal processes.

Addressing the essential requirements of international standardisation, communication, trust, interchangeability imposed by the growing number of outsourced activities and more complex supply chains, ISO 9001 standard was introduced, specifying the fundamentals of quality management system (QMS) and quality performance improvement (Weckenmann et al., 2015). ISO 9001 standard enhanced standardisation, established common technical language and fostered quality management principle deployment internationally, which was introduced by the International Organisation for Standardisation (ISO), that was established in 1987 with participants from 163 countries (ISO, 2015a; Nguyen et al., 2018). This new standard acted as a quality reassurance statement in business to business relationships, "many organisations confirming certification in order to enter particular markets, tender for government contracts and supply large enterprises" (Brown, 2013).

The structure of ISO 9001 quality management system standard is presented in Figure 2.3, demonstrating its sections (denoted in parentheses) and its wide organisational and stakeholder scope (planning, leadership, performance evaluation etc.) to enable the implementing organisation to deliver fit for purpose products and services to achieve stakeholder satisfaction.

Such a contribution extended quality management from a product and process based activity, into an organisational management system philosophy, involving a wide range of intra and interorganisational 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). Deming's Plan-Do-Check-Act cycle also kept its significance in this system-based approach, forming the backbone of the quality management system standard for guiding organisational change management, performance measurement and improvement.

Figure 2.3: ISO9001:2015 Quality Management System Structure
Source: ISO (2015)

The importance of quality management started to be recognised not only by the manufacturing sector, but also by medical, education and public administration sectors due to its facilitating role in delivering high quality results and improvement, irrespective of market conditions, business sector and competition. Ultimately, total quality management (TQM) and business excellence models (e.g. European Foundation for Quality Management (EFQM) and Malcolm Baldridge National Quality Award (MBNQA) in USA) were born as the contemporary paradigm, elaborating quality management discipline beyond the machine-based view and economic agendas through encompassing of social issues including involvement of organisational members, leadership and organisational improvement culture (Brown, 2013; Weckenmann et al., 2015).

All in all, an on-going development was observed in the quality management discipline over the past hundred year period, the field remarkably evolving to enable the organisations to solve problems, survive in the dynamic business climates, facilitate stakeholder risk management, empower team members and achieve continual improvement towards their goals (Brown, 2013). Considering the widening scope of QM and the exponentially growing environmental and social responsibility requirements imposed on organisations, QM remains as a key avenue to guide organisations into higher performance levels, not only economically, but also environmentally and socially (Weckenmann et al., 2015). This viewpoint is resonated by Siva et al. (2016) through their in-depth systematic literature review

contribution, highlighting the high potential and the facilitating role of QM (and its tools) for sustainable development of organisations, framed under the emerging management integration research avenue of sustainable quality management (SQM).

2.2.3. Supply Chain Management

First traces of logistics and supply chain management root back to the military domain, revolving around ensuring the right supplies were provided to the right place at the right time, directly linked to survival during war conditions (Ballou, 2007; Southern, 2011). Coming to 1950s, firms started to conduct key logistics activities essential to delivery of customer requirements such as "transportation, warehousing and purchasing", however at this time, these activities were being carried out in isolation by various departments (marketing, finance, production), in the absence of a joint and optimised organisational view (Ballou, 2007).

In response to the inefficiencies, costs and negative customer satisfaction associated with the "fragmented" view, "physical distribution" was developed as an early paradigm, constructed towards "the coordination of more than one activity associated with physically supplying product to the marketplace" (Ballou, 2007; Southern, 2011). As a fruit of this new concept, the total cost approach was introduced, collectively taking up the key processes of transportation, inventory control, warehousing, and facility location. However, physical distribution and total cost approaches were still very much externally oriented, concentrating on supply operations taking place outside the boundaries of the firms yet, internal operations and processes were not captured.

Coming to 1980s, the "physical distribution" paradigm started to shift into a wider framework named as "business logistics", encompassing activities both external (transportation) and internal (inventory and materials management) to firms (Southern, 2011). This also marks the inception of logistics in terms of a separate function within organisations, as a management area increasingly growing in importance. The significance and strategic position of logistics was reinforced by the key global trend of outsourcing and logistics costs constituting up to 32% of organisational sales (Ballou, 2007). In 1990s, third-party logistics organisations such as DHL started developing, technological advancements such as data interchangeability influencing business operations and distribution networks, and negotiation culture increasingly being adopted between firms and carriers, placing logistics as an integral part of business management (Southern, 2011).

On the other hand, the toughening market conditions, the drive among many organisations for lower cost, higher quality sources and the emerging globalisation trend brought together international supply chain networks, exponentially growing in terms of scale and complexity (Lummus and Vokurka, 1999). This global transformation in business operations introduced the key concepts of "coordination, collaboration and relationship building" between the supply network members.

In addition to the activity and process administrative focus of logistics, interfunctional coordination (harmony among the relevant departments of an organisation) and interorganisational coordination (harmony among entities operating as part of a supply network) practices were formulated as part of the contemporary lens of supply chain management (SCM) in the early 21st century (Ballou, 2007). The current definitions of supply chain management and its key constituent, logistics management (LM) are articulated by the world leading establishment for supply chain professionals and scholars, Council of Supply Chain Management Professionals as following (CSCMP, 2018):

> ***SCM:*** *"Encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities; including coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers; integrating supply and demand management within and across companies"*
>
> ***LM:*** *"Part of SCM that plans, implements, and controls the efficient, effective forward and reverse flow, and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements"*

In parallel to the birth of SCM, the concept of supply chain was introduced, defined as "the processes from the initial raw materials to the ultimate consumption of the finished product linking across supplier and user companies" (Lummus and Vokurka, 1999). At the heart of this new management paradigm lies "integration", where all processes fundamental to creation, sourcing, production and delivery of demand are viewed as one system. The members of the network exchange information in a collaborative manner and work together to improve inefficiencies and develop competitiveness of the overall system. Supply chain management and the key concept of supply chain integration is schematically represented in Figure 2.4. With this widened contemporary scope that includes acquisition (procurement),

conversion (production) as well as the distribution (logistics), the significance of SCM for business management was enhanced, SCM constituting up to 80% of the cost of sales of an organisation (Ballou, 2007).

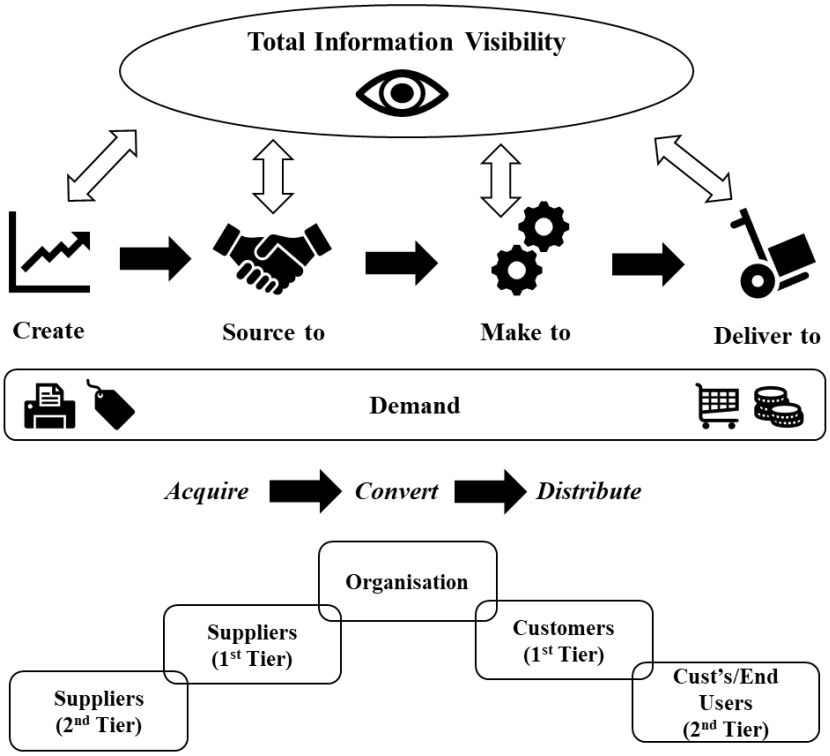


Figure 2.4: Supply chain management and integration
(Adapted from Lummus and Vokurka (1999) and Ballou (2007))

Lambert et al. (1998) established the eight key organisational processes of SCM revolving around the acquire-convert-distribute cycle as following:

- Customer relationship management
- Customer service management
- Demand management
- Order fulfilment
- Manufacturing flow management
- Supplier relationship management
- Product development and commercialisation
- Returns management

Although the key SCM principles of coordination, collaboration, relationship management and integration among the supply chain partners are fundamental to fulfilment of these

processes and to overall performance of the supply chain (Botta-Genoulaz et al., 2013), only a low percentage of organisations would historically embrace and follow these principles in real practice (Fawcett and Magnan, 2002).

Post implementation of Kyoto-Protocol in 2005, academics and practitioners started increasingly integrating sustainability and triple bottom line (TBL) model introduced by Elkington (2013) into organisational management processes including SCM, Seuring and Müller (2008) proposing one of the first conceptual frameworks to incorporate TBL into supply chains (Rajeev et al., 2017). The laws, standards and regulations implemented in developed countries drove many organisations to adopt environmental and social agendas (Ansari and Qureshi, 2015), some businesses outsourcing their elements with high sustainability impact to developing regions where such legislation were not yet in place (Liu et al., 2007; Rajeev et al., 2017). Such actions resulted in the sustainability impacts shifting location however the overall sustainability performance of the supply chain remained the same.

Given the importance of the holistic supply chain view for sustainability and the remarkable intra and interorganisational scope of SCM, concerning a wide base of internal and external stakeholders, SCM is well positioned as an influential management method for integration and improvement of sustainability (Reefke and Sundaram, 2016), under the increasingly growing integration research line of sustainable supply chain management (SSCM). The evolution of logistics and supply chain management discipline is mapped in Figure 2.5.

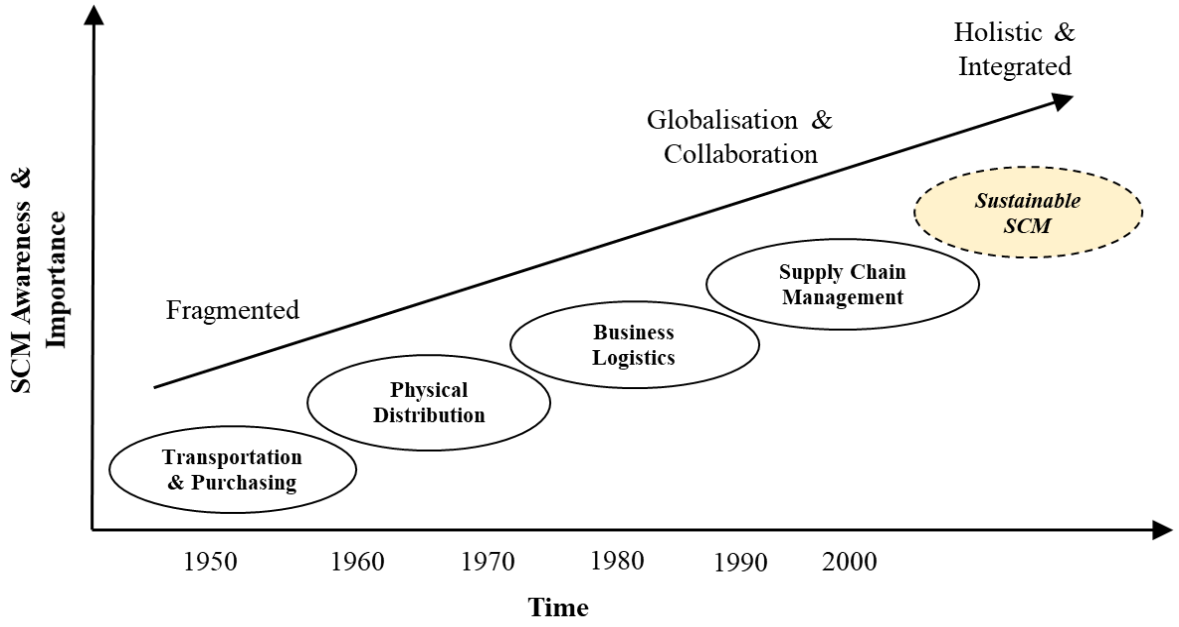


Figure 2.5: The evolution of logistics and supply chain management

2.2.4. Other Management Approaches Adopted for Integration of Sustainability

In this section, key management philosophies and business models apart from QM and SCM, adopted in the literature for organisational integration and improvement of sustainability are reviewed, including the lean and circular economy philosophies.

2.2.4.1. Lean and Six Sigma

The concept "lean" emerged in late 1980s, heavily associated with Toyota Production System, revolutionising the production system management discipline in the pursue of eliminating or minimising waste, and maximising value (Martínez León and Calvo-Amodio, 2017). The lean approach aims to provide products and services that satisfy or exceed customer expectations at the minimum associated cost and time through continuous waste reduction (Cherrafi et al., 2016). In this context, waste stands for "anything other than the minimum amount of equipment, materials, parts, space and time which are absolutely essential to add value to the product or service" (Russell and Taylor, 2016).

Waste is usually taken up under seven categories: "transport, inventory, motion, waiting, overprocessing, overproduction, and defects", which are classed as non-value added activities where resources are consumed however, the customers of the organisation do not benefit from such activities being carried out. Recently, an eighth waste category has been included in the lean framework as "under-utilised skills", recognising the importance of social considerations and engagement of team members in organisations (Tasdemir and Gazo, 2018).

Although there are diverging views on the precise definition of the term lean and its content (Cherrafi et al., 2016; Martínez León and Calvo-Amodio, 2017), Shah and Ward (2003) articulated it as following:

> ***Lean:*** *"A multi-dimensional approach that encompasses a wide variety of management practices that can work synergistically to create a system that delivers high-quality products at the pace of customers' demand with little to no waste"*

In late 1990s and early 2000s, a key QM approach, six sigma, started to be incorporated in the lean philosophy for promotion of organisational improvement, resulting in the integrated framework of lean six sigma (LSS). Six sigma methodology was articulated by Schroeder et al. (2008) as following:

> ***Six Sigma:*** *"An organised, parallel-meso structure to reduce variation in*

organisational processes by using improvement specialists, a structured method, and performance metrics with the aim of achieving strategic objectives"

Six sigma approach is based on systematic elimination of root causes that result in process, product and service variabilities with a view to improve process performance and achieve higher levels of quality performance through a stage based structure for implementation, known as DMAIC (Define, Measure, Analyse, Improve, Control) (Zu et al., 2008). The DMAIC structure of six sigma was also identified as highly relevant for facilitation of organisational sustainability integration, management and improvement (Garza-Reyes, 2015a). To overcome limitations of lean and six sigma approaches, the hybrid concept of LSS was developed that seeks not only process speed and cost improvements but also process quality improvements through waste minimisation and aligning organisational processes to customer requirements (Cherrafi et al., 2016). From this perspective LSS "brings a structured approach and data driven analysis to eliminate or reduce the sources of variation and waste" (Erdil et al., 2018).

Lean and green (environmental sustainability) integration is argued as natural and logical due to originating from the common and compatible goal of waste elimination (Erdil et al., 2018; Garza-Reyes, 2015b). Positive relationships between lean, six sigma and triple bottom line sustainability were established (Cherrafi et al., 2016; de Freitas et al., 2017; Martínez León and Calvo-Amodio, 2017). The benefits offered by lean principles and tools such as value-stream mapping, single minute exchange of die, 5S, kaizen, total productive maintenance, poka-yoke (error-proofing) and kanban for integration and improvement of sustainability in organisations were established (Cherrafi et al., 2016; Martínez León and Calvo-Amodio, 2017; Tasdemir and Gazo, 2018; Vinodh et al., 2011). According to Cherrafi et al. (2016), these benefits are due to several synergies between lean and sustainability approaches as tabulated in Table 2.9:

Table 2.9: Synergies between Lean, Six Sigma and Sustainability approaches
(Adapted from Cherrafi et al. (2016))

Synergy	Rationale
Waste elimination and efficient use of resources	LSS and sustainability both focus on reducing waste and inefficiency.
Continual improvement and implementation strategies	LSS and sustainability are both based on an approach of continual improvement.
Management commitment	LSS and sustainability both require an organisational culture that emphasises

and employee involvement	management commitment and employee involvement in problem solving.
Measurement metrics	LSS and sustainability both emphasise the importance of using metrics to inform decisions.
Supply chain relationships	LSS and sustainability are both based on close collaboration, and the sharing of information and best practices across the chain to improve enterprisewide performance.
Satisfying customer needs	LSS and sustainability both focus on improving customer satisfaction.
Tools and practices	LSS and sustainability both use common tools and root cause analysis. Many LSS tools are easily adapted and extended for sustainability.

Several models and conceptual frameworks were constructed to facilitate implementation of integrated lean, six sigma and sustainability to drive sustainable development of organisations (Cherrafi et al., 2016, 2017; Erdil et al., 2018; Martínez León and Calvo-Amodio, 2017; Souza and Alves, 2018). Cherrafi et al. (2016)'s framework and its components integrating LSS and triple-bottom line sustainability are demonstrated in Figure 2.6.

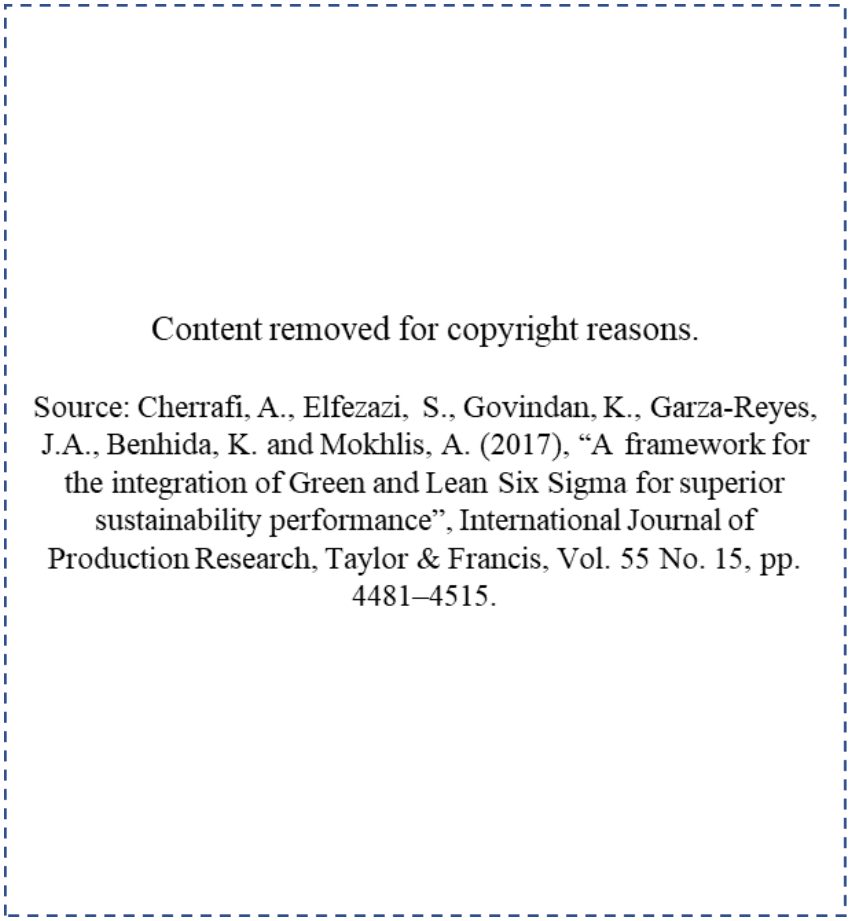


Figure 2.6: Integrated Framework of LSS and TBL Sustainability

Source: Cherrafi et al. (2016)

On the other hand, a number of barriers are associated with the adoption and deployment of lean practices in organisations, including the significant cultural changes it requires and the necessity in embracing it as a philosophy rather than a strategy or a set of tactics to realise the results and benefits of lean initiatives (Bhasin and Burcher, 2006). A similar view point was shared by Cherrafi et al. (2016) that discussed "lack of human resources involvement" and "lack of management awareness" as two key barriers to implementation of lean practices for business performance and sustainability improvement.

2.2.4.2. Circular Economy

The term circular economy (CE) is rooted back to early 1990s, where relationships between economic and environmental issues started receiving remarkable attention at industrial, governmental and academic levels (Andersen, 2007). The significant increase in global demand, parallel economic development and unsustainable natural resource consumption led to negative impacts on the ecology and reproductive capacity of the biosphere, one of the response strategies for organisations and governments evolving in the form of CE modelling for sustainability (Lieder and Rashid, 2016; Merli et al., 2018). Although academic consensus has not yet been reached on its definition (Merli et al., 2018), Ellen Macarthur Foundation (2013), that is a key non-governmental establishment for CE approach's development, promotion and dissemination, articulated it as following:

> ***CE:*** *"An industrial system that is restorative or regenerative by intention and design. It replaces the end-of-life concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models"*

It is clear that the conventional linear approach of "take-make-dispose" requires high levels of resources and energy that are no longer accessible and readily available thus, business transition into CE models is imperative (Ellen Macarthur Foundation, 2013). "Reusability of products and raw materials" is central to circular economy philosophy for minimisation of waste, where products are retained in the loops as long as possible and waste is "designed out" as much as possible (Ellen Macarthur Foundation, 2013; Govindan and Hasanagic, 2018).

Geissdoerfer et al. (2017) framed CE in the organisational sustainability context in terms of "closing, narrowing, slowing, intensifying, and dematerialising resource loops", where inputs

and outputs (waste, emissions, effluents etc.) are aimed to be brought down to minimum levels for sustainable development. This concept encompasses recycling (closing), enhancements in efficiency (narrowing) and prolonged use phases (slowing) as well as intensified use phases (intensifying) and replacement of product utility through service and software solutions (dematerialising). The conditions of "economic, environmental and social goals, proactive stakeholder management and long term perspective within short term actions" are identified at the heart of operationalisation and realisation of a CE based business model (Geissdoerfer et al., 2017). The "restorative industrial system design" of circular economy, involving key industrial stakeholders for higher resource productivity and sustainable development is presented in Figure 2.7.

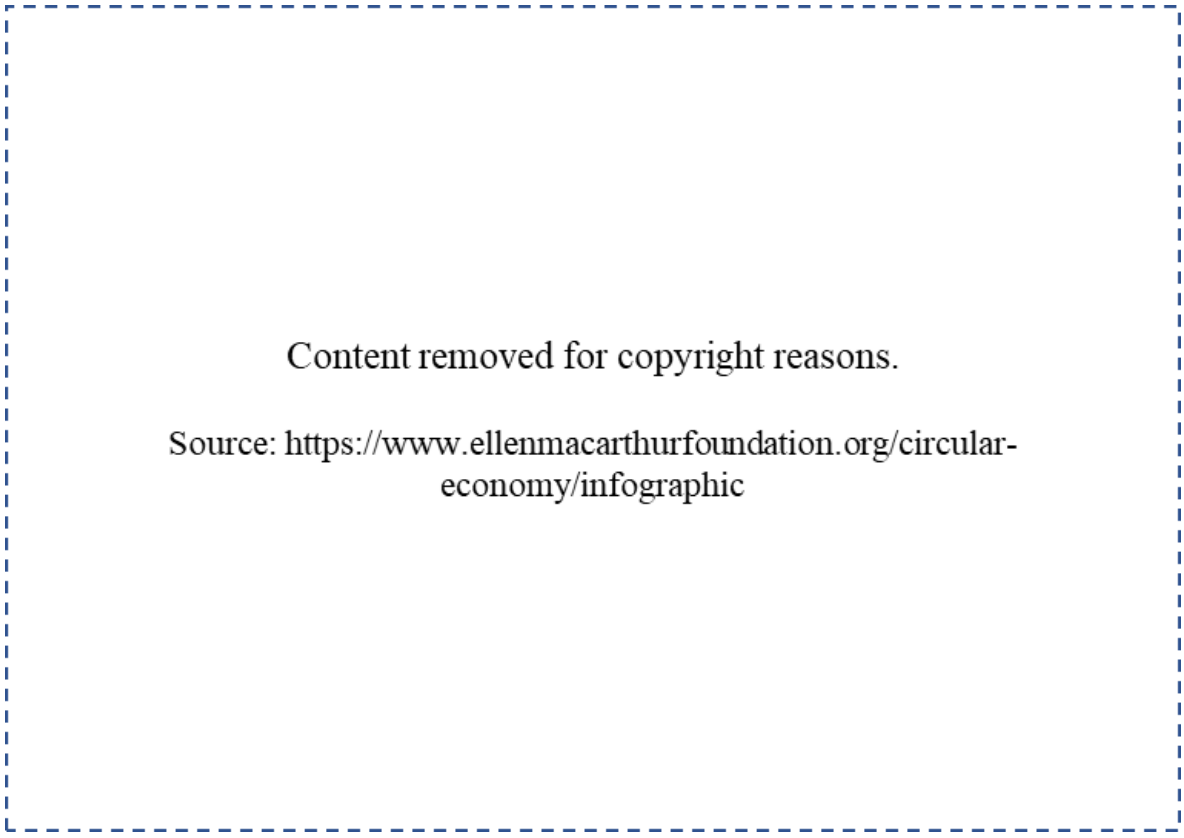


Figure 2.7: Industrial Structure of Circular Economy
Source: Ellen Macarthur Foundation (2013)

For implementation and operationalisation, Lieder and Rashid (2016) put forward a concurrent approach, including top-down elements concerning governmental bodies (such as legislation, policies, social awareness and support infrastructure) and bottom-up elements involving businesses (such as collaborative models, supply chains, product designs and information technologies adopting CE). It is argued that the public establishments will be

more inclined towards an approach towards reduction of environmental and societal business impacts whereas, due to market pressures, organisations will be naturally closer to seeking economic benefits, conceptualised under a collective and convergent multi-stakeholder approach for CE (Lieder and Rashid, 2016).

Urbinati et al. (2018) emphasised the importance of managerial practices revolving around the two key categories of client relationships (customer value proposition and interface) and supply chain (value network) for organisational deployment of CE. Contrariwise, there are several internal and external organisational barriers to adoption of circular economy including a wide range of governmental, market, cultural and technological issues (Govindan and Hasanagic, 2018; Kirchherr et al., 2018; Masi et al., 2018).

2.3. QM and SCM as Research Avenues for Integration of Sustainability

Although the various benefits offered to organisations and value chains, there are several established barriers to adoption and effective implementation of QM (Cătălin, 2014; Rokke and Yadav, 2012; Talib and Rahman, 2015), SCM (Fawcett et al., 2008; Sajjad et al., 2015), LSS (Cherrafi et al., 2016; Shamsi and Alam, 2018; Yadav et al., 2018) and CE (Govindan and Hasanagic, 2018; Kirchherr et al., 2018; Masi et al., 2018) philosophies. These barriers were reviewed for each approach and collectively summarised in Table 2.10 with a view to provide a comprehensive picture regarding the key management approaches currently being adopted for integration of sustainability.

Table 2.10: Barriers to QM, SCM, LSS and CE approaches

Barrier	**QM**	**SCM**	**LSS**	**CE**
Lack of senior management engagement, commitment and support	X	X	X	X
Resistance to change	X	X	X	X
Cross-functional conflicts	X	X	X	X
Lack of training and skills	X	X	X	X
Poor planning	X	X	X	X
Lack of trust, information sharing and cooperation between SC members		X	X	X
Inflexible organisational systems, capabilities and processes		X	X	X
Information technology limitations		X	X	X
Lack of a performance measurement system		X	X	X
Lack of management awareness			X	X
Lack of an effective model or sequential approach to guide industrial implementation			X	X

High implementation costs	X	X
Negative customer perception towards reused components		X
Lack of public awareness		X
Weak supporting economic incentives and legislation		X

It was observed from the barriers comparative analysis in Table 2.10 that even though there are barriers that are common across the QM, SCM, LSS and CE approaches, there are further barriers to adoption of LSS and CE philosophies such as "lack of management awareness, lack of an effective business model for application and high implementation costs" and barriers specific to CE including "negative customer perception towards reused components and lack of public awareness". Moreover, the following implications were noted regarding the adoption of LSS and CE philosophies when weighed against the QM and SCM philosophies for a research path towards embedding of sustainability in the organisational and supply chain context:

- LSS and CE are highly new approaches (gaining popularity in the early 21st century) with relatively lower levels of management awareness at the global scale, in relation to QM and SCM practices (fundamentals of which are rooted back to the first half of the 20th century). This is a significant barrier in the short and medium term for dissemination and realisation of any new management framework constructed on the basis of LSS and CE.

- LSS and CE are heavily associated with manufacturing practices and associated sectors due to waste minimisation and resource orientations. Although the QM and SCM philosophies also originated from and were highly influenced by a similar background (manufacturing and its subsidiaries), these approaches are now widely adopted in and are applicable to a wide range of other sectors including the service (Cho et al., 2012; Hasan and Kerr, 2003), construction (Arditi and Gunaydin, 1997; Vrijhoef and Koskela, 2000), education (Lau, 2007; Mergen et al., 2000), healthcare (Berwick et al., 1991; Lagrosen et al., 2007; de Vries and Huijsman, 2011) and hospitality (Camisón, 1996; Zhang et al., 2009) sectors.

- LSS and CE are closely linked to and heavily dominated by the environmental dimension of sustainability due to the inherent "waste elimination" principle located at the heart of both approaches. However, this can become a roadblock or limitation for development of a holistic management framework that aims to support integration

of all triple bottom line sustainability dimensions, which requires a balanced and collective view with reference to financial, environmental and social agendas.

On the other hand, QM and SCM approaches can be argued to be located in pole position for the achievement of the aim and objectives of this research (i.e. facilitation and catalysis of organisational sustainability integration, and improvement) due to the following justifications:

- QM and SCM are well recognised by managers for driving change, performance measurement, stakeholder satisfaction and improvement (Kuei and Lu, 2012). Through established stakeholder focus, deep functional and operational scope, and inherence in almost every organisation globally, QM and SCM approaches can support implementation of sustainability practices in organisations (Rajeev et al., 2017; Siva et al., 2016).

- QM and SCM highly influence activities within and outside the boundaries of firms at both softer (e.g. culture, relationships, engagement of people) and harder levels (e.g. capabilities, systems, coordination and processes), which can be tailored towards sustainable development (Engert et al., 2016; Isaksson, 2006; Kuei and Lu, 2012; Mehra et al., 2001; Rajeev et al., 2017; Reefke and Sundaram, 2016; Zink, 2007).

- QM and SCM, when implemented in conjunction with each other, reinforce intra and interorganisational cooperation for change and improvement, which offers significant potential for supporting management evolution into incorporation of triple bottom line (Vanichchinchai and Igel, 2009).

Stemming from these arguments and the fruitful avenues paved by the QM and SCM approaches, this research focusses on the QM and SCM philosophies in the pursue of developing a solution for businesses and supply chains to integrate and improve sustainability, utilising the deeply rooted principles, processes and potential of these key industrial paradigms.

2.4. Systematic Literature Review – Methodology

2.4.1. Aim and Scope

Based on the promising research opportunities identified on the integration of the influential management philosophies of QM and SCM with the sustainability imperative, a systematic literature review (SLR) study was conducted with a view to support development of a conceptual construct for integration and improvement of organisational sustainability in line with the aim and objectives of the research. The following research questions were targeted to be addressed by the systematic literature review:

> **RQ1:** What are the relationships between the quality, supply chain and sustainability management methodologies?
>
> **RQ2:** What are the key integration issues of quality, supply chain and sustainability management methodologies including synergies, complications and further avenues for integration?

A number of recent reviews were noted to be carried out on the integration of SCM with sustainability (Rajeev et al., 2017; Reefke and Sundaram, 2016), QM with sustainability (Siva et al., 2016) and QM with SCM (Sharma et al., 2012; Talib et al., 2011), establishing knowledge bases on research themes, integration issues and synergies along with emphasis on further integration potential for firm performance and sustainability improvements. On the other hand, there are no, or highly limited reviews undertaken to date from the lens of all three (QM, SCM and sustainability), connecting links and exploring further synergies towards supporting development of holistic management frameworks.

The research aim and scope set out in this SLR stem from the principle of developing new insights and a collective perspective that has not yet been established in integration research streams that grew in isolation to each other. Such an in-depth analysis of the integration knowledge bases was further anticipated to provide a solid foundation for the conceptual development phase of the research through evidencing and framing of gaps and opportunities in the extant literature.

Figure 2.8 schematically represents the aim, scope and highly limited literature review perspective adopted in the systematic literature review study.

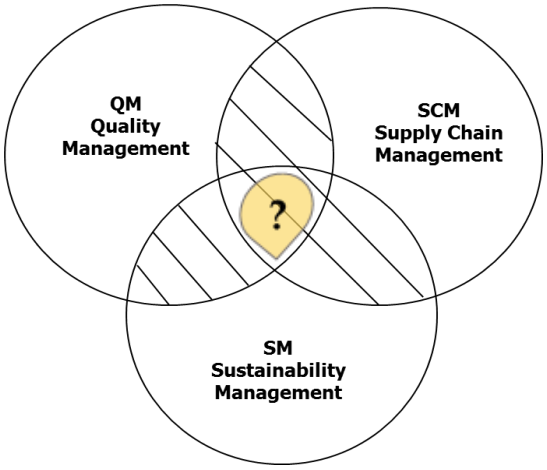


Figure 2.8: The aim and scope of the systematic literature review

2.4.2. Materials and Methods

2.4.2.1. Systematic Versus Traditional Literature Review

The literature review process facilitates management of diverse intelligence pools, such as academic inquiries set out in this study towards collectively investigating interdependencies between quality, supply chain and sustainability management (Tranfield et al., 2003). Traditionally, the narrative nature of the management research reviews brought together certain limitations including bias and lack of critical evaluation (Tranfield et al., 2003).

Systematic reviews support establishment of solid knowledge bases, providing methodological rigour for particular research questions through transparent and extensive literature scanning, critical assessment and mapping out of the "knowns" and "unknowns" on the areas under investigation (Briner and Denyer, 2012). Insights acquired as a result of such reviews serve the purpose of stimulating future thinking and theory constructions in the strategic management areas under investigation (Webster and Watson, 2002).

Epistemologically, systematic literature review along with descriptive and thematic analyses methodology has been deployed in recent studies with similar management integration focus such as lean management, supply chain management and sustainability (Martinez-Jurado and Moyano-Fuentes, 2014), lean and green (Garza-Reyes, 2015b), lean, six sigma and sustainability (Cherrafi et al., 2016).

Stemming from the evidence in the management review literature, systematic review process has been adopted to ensure a focused, transparent and reproducible evaluation on the research inquiries with high levels of reliability due to mitigated risk of bias introduction (Briner and

Denyer, 2012; Kitchenham, 2004; Tranfield et al., 2003).

2.4.2.2. Systematic Literature Review Process and Phases

Stages fundamental for a rigourous and complete systematic literature review (SLR) were applied as follows (Briner and Denyer, 2012; Kitchenham, 2004; Tranfield et al., 2003):

- Research inquiries (RQ1 and RQ2) were formulated in phase 1, in line with the aim and objectives of the research;
- Relevant literature materials were located in key databases and identified in phase 2;
- Retrieved studies were sorted, assessed and confirmed for inclusion in the review, as per set criteria and research objectives in phase 3;
- Relevant data and information were extracted from the materials, along with descriptive and thematic analyses of the findings in phase 4;
- The findings were reported, disseminating key themes, literature gaps, research requirements and an emerging integration research avenue exploration in phase 5.

Journal and conference publications within the scope of the review were located and extracted through the utilisation of aggregator databases including EBSCO (ebscohost.com), ISI Web of Science (wokinfo.com), Scopus (scopus.com) and in publisher databases including Elsevier (sciencedirect.com), Emerald Insight (emeraldinsight.com), Taylor & Francis (tandfonline.com), Springer (springlink.com), IEEE (ieeexplore.ieee.org). Although adoption of such multiple levels of database granularity (aggregator and publisher level) resulted in an overlap to a certain extent between the two levels of databases, this provided a validation of the aggregate searches conducted to ensure capturing of all relevant material in the literature. The review was limited to peer reviewed journal publications and conference proceedings with a view to ensure inclusion of the most reliable materials and publications with remarkable managerial impact in the research fields under investigation (Saunders et al., 2015). Only papers published in English language were considered for inclusion.

The Kyoto Protocol implementation in 2005 was noted as a remarkable milestone in global sustainability practices and sustainability research, most sustainability integration research in relation to the research agenda of this review stemming post this global initiative (Rajeev et al., 2017). Robinson and Malhotra (2005), in their highly cited research paper, outlined the importance of supply chain and quality management integration and described 2005 and beyond as the inception of supply chain quality management (SCQM) field. Based on these

key milestones on the quality, supply chain and sustainability management areas and to ensure capturing of state of the art literature, search period in this review was set from 2005 to June 2017. To validate this stance, the literature between the 1990 - 2004 periods was searched for sanity however, this search did not identify any significant materials relevant to the research questions of this review.

All research streams studying the relationships, synergies, complications from an integration perspective among the three management models under investigation (QM, SCM and SM) were considered. Taking into consideration the highlighted need in the literature for the incorporation of triple bottom line into management practices and decision making, sustainability literature on all three sustainability dimensions (e.g. economic, environmental and social) were included (Beske and Seuring, 2014; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013). Quality management literature included captured both softer aspects of QM such as total quality management principles (e.g. management commitment and support, customer focus etc.) (Talib et al., 2011), and harder aspects such as quality management systems (e.g. ISO9001, Baldridge etc.) (Shalij et al., 2009).

On the other hand, the articles considered to be irrelevant and outside the scope of this study were excluded, such as papers related to "water or air quality management and sustainability" where the sustainability, quality and supply chain terms were quoted outside the business management and integration contexts. Studies with reference to integration of sustainability, quality and supply chain management with other business models such as lean manufacturing were also excluded from this study to ensure focus and rigour on the specific relationships between the QM, SCM and SM models and frameworks under investigation.

Considering the current knowledge bases offered by the extant review articles on SSCM (Rajeev et al., 2017), SQM (Siva et al., 2016) and SCQM (Sharma et al., 2012; Talib et al., 2011), higher level search strings were set to extract an overview of the latest themes and integration issues fundamental to these research lines. Nevertheless, the search protocol adopted identified research materials covering a wide range of sustainability, QM and SCM integration issues not limited to but including green supply chain management, quality management based eco-design, planning of sustainable supply chains, enablers of SSCM, performance measurement of SSCM and design of quality management system based supply chains. Therefore, search strings outlined below were adopted for development of SQM, SSCM and SCQM research lines, with a view to guide the research journey towards a more holistic integration perspective:

Search 1 *- SQM: "Sustainability" AND "Quality Management";*

Search 2 *- SSCM: "Sustainability" AND "Supply Chain Management"*

Search 3 *- SCQM: "Quality Management" AND "Supply Chain Management"*

With a view to complement extant review studies in the literature and to develop a collective perspective of sustainable supply chain quality management (SSCQM) in line with the research objectives of this study, an in-depth search was undertaken towards revealing this relatively unexplored territory as per the search protocol below:

Search 4 *- SSCQM: "Sustainability" AND "Quality Management" AND "Supply Chain Management" including keywords fundamental to each research line.*

Considering that such a collective review approach is highly limited in the current literature, the decision was taken to expand the SSCQM search, incorporating QM, SCM and sustainability as well as their subsets and related keywords. Sustainability and SCM keywords utilised in the SSCQM search protocol included “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” (Rajeev et al., 2017). The keywords adopted for QM included “Six Sigma”, “quality management systems”, “total quality management”, “ISO 9001”, “EFQM”, “Baldridge Model”.

For synthesis and analysis of qualitative review information, several methods are available in the literature (Barnett-Page and Thomas, 2009), such as meta-ethnography (Britten et al., 2002), meta-analysis (Koretz and Lipman, 2017), grounded theory (Wolfswinkel et al., 2013), content analysis (Finfgeld-Connett, 2014), and thematic synthesis (Thomas and Harden, 2008). As it provides a structured method for interpretation of thematic information and it facilitates development of a holistic view on the literature materials under review, the decision was made to adopt thematic synthesis method in this study (Barnett-Page and Thomas, 2009). Thematic synthesis method was also successfully applied in similar studies, facilitating extraction of key thematic information during the systematic review of management integration literature (Garza-Reyes, 2015b).

A database in MS Excel was formed to sort, codify and categorise articles included in this review, clustering the studies under SQM, SCQM, SSCM and SSCQM categories for descriptive analysis and thematic synthesis. To gather descriptive data, key descriptive information including publication date (year), country of the main author, application area

and business sector (manufacturing, energy, theoretical etc.), research methodology applied (case study, mixed etc.), sustainability dimensions addressed (social, economic, environmental) and publication journal (journal of cleaner production etc.) were extracted from the publications and recorded on the database developed. The SLR phases adopted are outlined in Table 2.11.

Table 2.11: Systematic literature review phases applied

Phase 1 *Question Formulation*	**Research Questions** RQ1: What are the relationships between the quality, supply chain and sustainability management methodologies? RQ2: What are the key integration issues of quality, supply chain and sustainability management methodologies including synergies, complications and further avenues for integration?
Phases 2 & 3 *Locating, Selecting and Evaluating Articles*	**Literature Databases** Key aggregator (e.g. EBSCO) and publisher (e.g. Elsevier) databases (peer reviewed only) **Search Period** 2005 to June 2017 (state of the art / post Kyoto Protocol (Rajeev et al., 2017)) **Inclusion Criteria** Sustainability, QM and SCM integration research that establish relationships, synergies and complications for integration in the organisational context. **Exclusion Criteria** QM, SCM and sustainability terms outside the business management and integration perspective. Integration of sustainability, QM and SCM with other models e.g. Lean. **Search Strings** SQM: “QM” + “Sustainability” SSCM: “QM” + “SCM” + “Sustainability” SCQM: “SCM” + “Sustainability” SSCQM: “QM” + “SCM” + “Sustainability” and all related keywords.
Phase 4 *Analysis*	**Methods for analysis** Descriptive analysis and thematic synthesis.
Phase 5 *Reporting*	**Reporting of findings** Findings reported in descriptive and analytic (thematic synthesis) components.

For thematic analyses, the main findings such as key relationships proposed (for conceptual studies) and/or confirmed (for empirical studies), and key discussion areas were noted for

each article included in the review under each category (SQM, SCQM, SSCM and SSCQM). The key elements of the topics were identified, resulting in the initial classifications and coding. Further coding and associated classifications were generated from the higher level classifications, finally resulting in the concept maps for SCQM and SSCM, illustrating concentrations and common themes in relation to particular research lines (Barnett-Page and Thomas, 2009; Thomas and Harden, 2008). Due to the relatively lower number of articles identified, detailed discussions were provided with reference to each paper under the SQM and SSCQM categories.

2.5. Systematic Literature Review – Findings

Following the outlined SLR protocol, the articles identified were filtered, sorted and confirmed for inclusion in the review through an iterative selection process as presented in Figure 2.9. As part of this process, duplicates were removed, eligibility confirmed from abstracts and the full text of outstanding articles reviewed in the light of the research questions for final decision on inclusion for descriptive and thematic analyses, in relation to the integration areas under investigation (Moher et al., 2009).

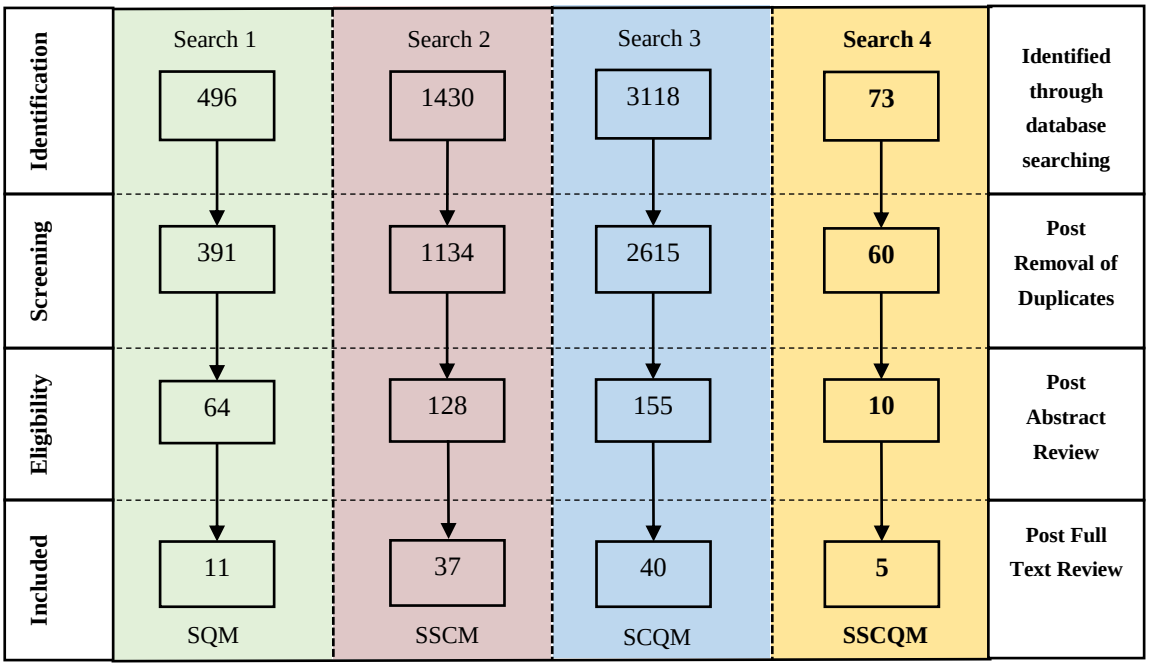


Figure 2.9: Overview of paper identification, selection and inclusion process

The 93 articles selected and confirmed as relevant as per the SLR protocol for the research lines are visually represented in Venn diagram form in Figure 2.10, in line with the research aim and scope outlined in Section 2.4.1. The 83% of the literature identified were

down to SCQM (43%) and SSCM (40%) literature, highlighting the integration focus in these emerging research streams. On the other hand, only 12% of the articles identified were under SQM category, pointing out limited research in this area with potentially unexplored integration synergies. The full list of articles included in the systematic literature review is provided in Appendix One.

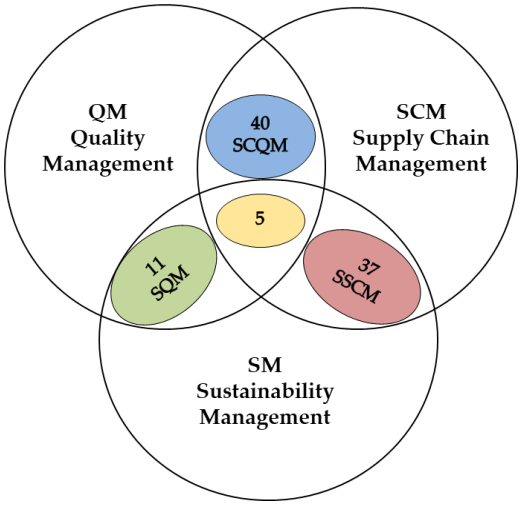


Figure 2.10: Representation of number of articles identified in QM, SCM and SM integration literature

2.5.1. Descriptive Analysis

In this section, the descriptive statistics of the articles included in the systematic literature review are presented, including the distribution of the articles against the key parameters of publication year, geographical location of the corresponding author, application area, research methodology adopted, TBL dimension studied and publication journal.

An analysis of the distribution of papers against the years was undertaken, studying the trend of research streams from 2005 to 2017 (first half), and the results presented in Figure 2.11. It was seen that the 74% of the materials were published since 2010 with the years 2015 (12%) and 2016 (14%) having the highest number of publications, which highlights the emerging and growing nature of the research fields. Moreover, 6 articles were already identified in the first half of year 2017 (6%), that further predicts another year of growth for the research streams, in particular for the sustainability research streams.

Considering the growing external pressures on organisations from legislative bodies, customers and demands of our society for sustainability, the research streams studying incorporation of sustainability into fundamental business practices is expected to increase further. This projection is also in line with the findings of other authors that studied

integration of sustainability with other management systems such as Garza-Reyes (2015) and Cherrafi et al. (2016).

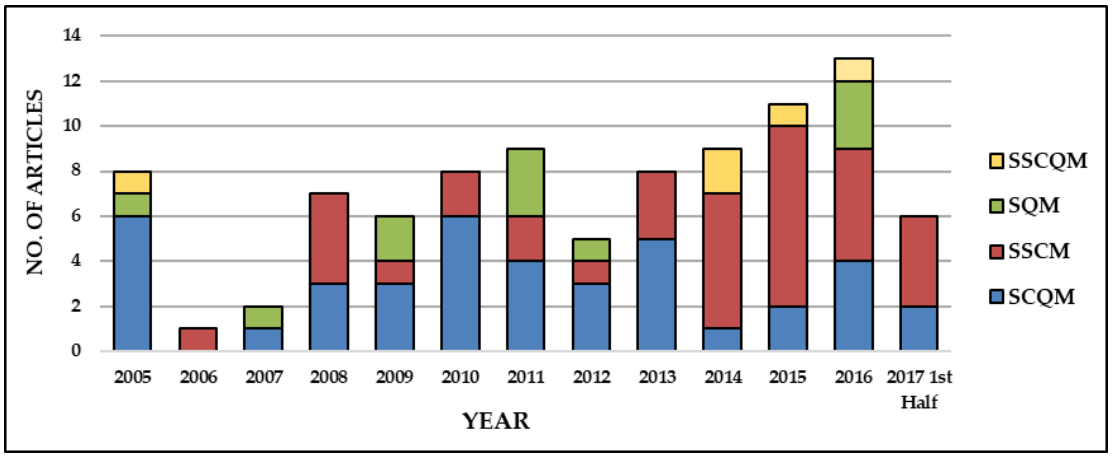


Figure 2.11: Number of publications per year

The geographical locations where the publications were produced are demonstrated in Figure 2.12. This information was produced based on the location information of the main authors of the publications reviewed. The analysis revealed that a significant portion of the research streams under review was conducted in USA with 15% of all publications included in the SLR identified in this geographical area. On the other hand, the majority of the work (64%) carried out in this region studied the integration of SCM and QM methodologies (SCQM). India and China were also popular regions for SCQM research with 18% and 15% of SCQM studies carried out in these regions including a range of empirical and theoretical modelling papers.

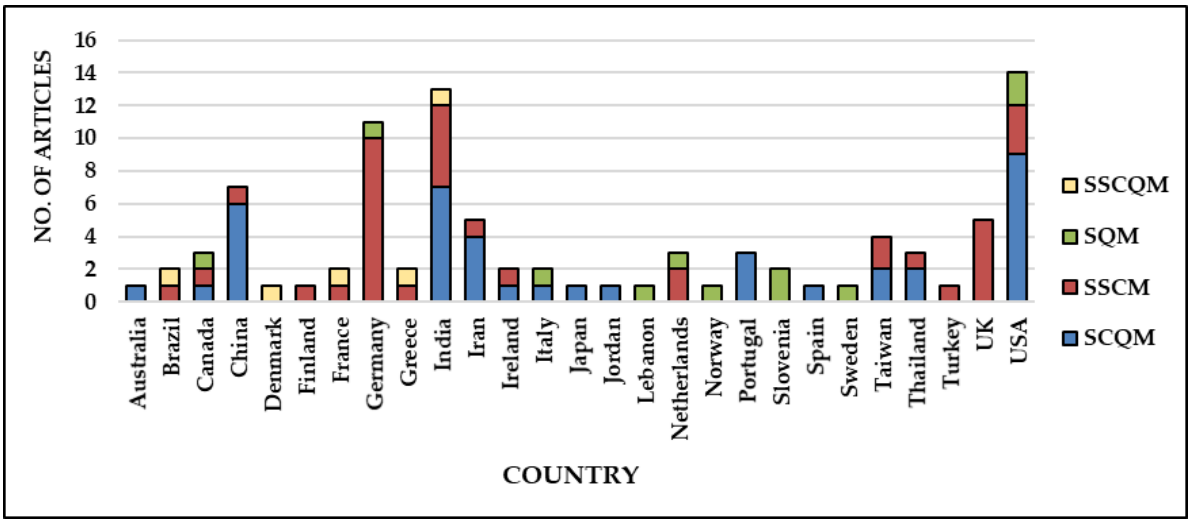


Figure 2.12. Number of publications per geographical area

With reference to sustainability research, it was noted that 57% of the research was conducted in the European Union (EU) countries, with Germany equating to the 21% of all sustainability research identified. This finding reflects the remarkable role played by the developed, EU countries in driving sustainable development and incorporation of sustainability into organisational management practices. Although 11% of the sustainability research was observed to take place in India, it was arguably important to note that more researchers in developing countries are required to be encouraged and involved to take part in future research in integration of SM, QM and SCM, which is expected to benefit our society and address context specific aspects of sustainability for organisations in all regions.

As shown in Figure 2.13, a remarkable portion (45%) of the research streams included in the review were seen to be "theoretical" studies. The articles classified under this category include literature reviews and conceptual studies, where the information presented, and relationships identified were not empirically evaluated with data gathered from industrial contexts. This finding agrees with the suggestions of SQM (further empirical studies are required on the effect of quality management systems and practices on sustainability performance (Kuei and Lu, 2012; Siva et al., 2016)), SSCM (more focus on industry specific, empirical studies is required (Rajeev et al., 2017)), and SCQM (conceptual frameworks integrating QM and SCM are required to be validated through empirical investigations in different industries (Fernandes et al., 2017; Quang et al., 2016)) literature, resonating the clear need for further empirical research on these areas.

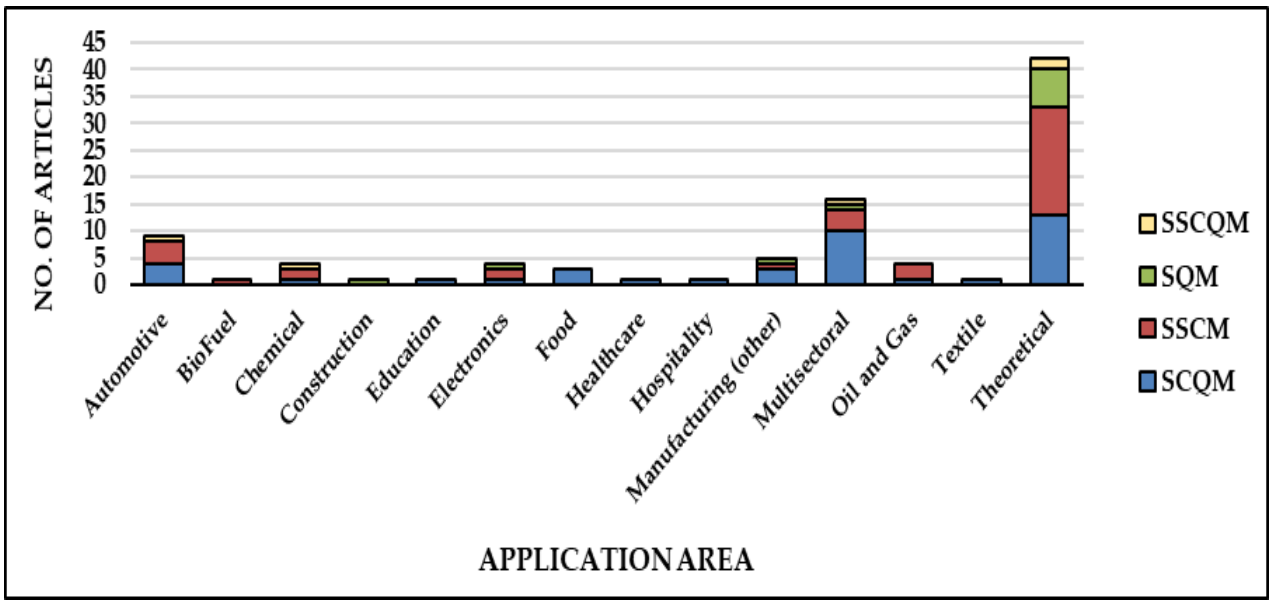


Figure 2.13: Number of publications per application area

On the other hand, the empirical studies reviewed utilised data mainly from multiple business sectors (17%), and from the automotive sector (10%). All in all, it was observed that the manufacturing industries are at the forefront of QM, SCM and sustainability integration research, most of the empirical studies focusing on the organisational development in the manufacturing orientated sectors (e.g. automotive, chemical, electronics etc.). This reflects the inherent pressures on the manufacturing industries for higher performing, cleaner and more responsible products, services, processes and supply chains (Bhanot et al., 2015; Cherrafi et al., 2016; Garza-Reyes, 2015b).

Figure 2.14 presents the distribution of publications with reference to the research methodology applied. Conceptual contributions were noted as significant with 27% of papers applying this method and proposing innovative frameworks for integration of QM, SCM and SM including integrated tools, techniques and practices (SSCM in particular). Literature review (including SLR) was further seen to be a common research method adopted, 23% of papers adopting this methodology to facilitate continued research and theory building on integration. Despite, case studies of qualitative nature were noted as the most popular empirical assessment method (23%), the quantitative surveys were also widely used (22%).

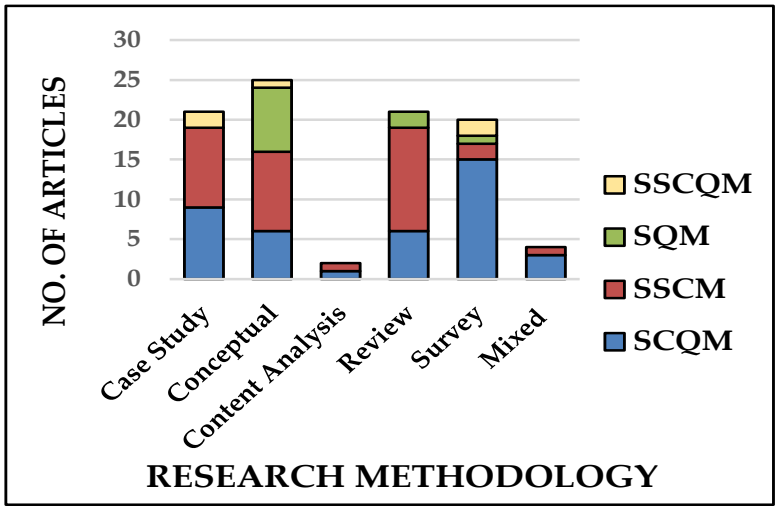


Figure 2.14: Number of publications per research methodology applied

Furthermore, studies that utilised mixed methods (qualitative and quantitative) only equated to a low percentage (5%), even though the significant benefits offered by such research methodology for management research studies (Tranfield et al., 2003). Leech and Onwuegbuzie (2009) highlighted that more balanced assessments with enhanced research data results certainty and validity can be achieved through triangulation of qualitative and

quantitative methods. Based on this perspective, it is argued that empirical research studies that adopt both qualitative and quantitative methods are likely to provide further insights and enhanced confidence levels for the integration research lines.

Figure 2.15 demonstrates the distribution of the publications versus the sustainability dimensions addressed in the publications. Only 43% of the studies adopted the "holistic" view to sustainability, taking into consideration all three pillars (TBL), which resonates with the current consensus in the literature that the collective view on triple bottom line (total integration of financial, environmental and social thinking into internal operations and supply chains) still highly remains as a fundamental challenge for future sustainability research and the industry (Beske and Seuring, 2014; de Brito and Van der Laan, 2010; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013).

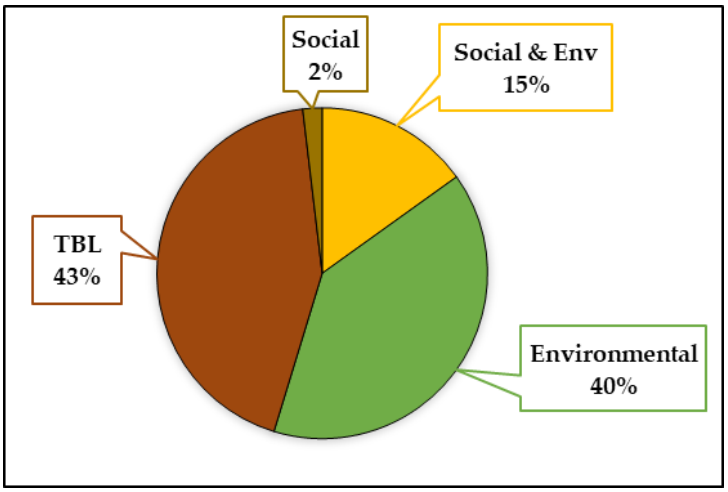


Figure 2.15: Distribution of sustainability research streams against three pillars of sustainability

A significant portion (15%) of sustainability research adopted an integrated approach, addressing both environmental and social sustainability dimensions, assuming that the economic sustainability is the most developed pillar of sustainability due to historical profitability reasons in industry with limited research focus noted on the economic dimension (Gold and Schleper, 2017). On the other hand, environmental sustainability dimension, green supply chain management (GSCM) literature in particular, was observed to be the focal research line among the uni-dimensional sustainability articles. The 40% of articles identified in this SLR were noted to study various aspects of incorporating environmental sustainability into QM and SCM considerations. This finding is also in line with the findings of Siva et al. (2016) that conducted a literature review specifically on QM and sustainable development.

The distribution of the articles against the publishing journals are presented in Figure 2.16, where the diversity of the literature search conducted is demonstrated, including a high number of journals from a wide range of databases. The journals that only published 1 article were included in "Others" category, that represents the 49% of all articles, evidencing the high level of attention and popularity received by the research streams across many different journals and publisher databases.

Journal of cleaner production (Elsevier) was observed to be a key publishing avenue for the sustainability integration streams, constituting to the 25% of the sustainability integration papers. International journal of production economics (Elsevier) was also noted as a popular publishing channel, 6% of all articles being published in this journal although, the majority of these were down to the QM and SCM integration (SCQM) research.

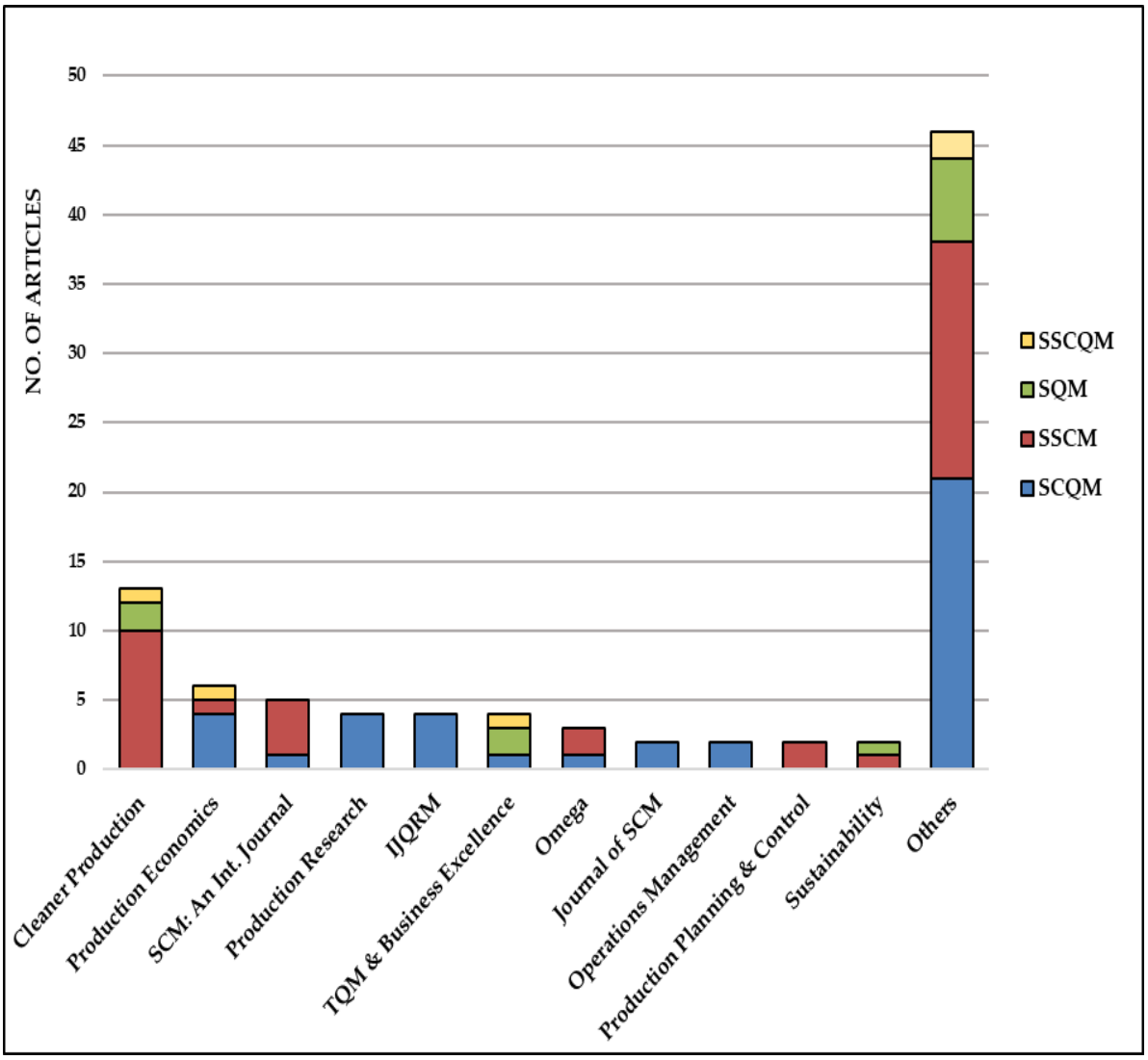


Figure 2.16: Distribution of research streams against the publishing journals

2.5.2. Thematic Synthesis and Key Research Themes

The thematic synthesis and analysis results for the QM and SCM integration research (SCQM - Section 2.5.2.1), SCM and sustainability integration research (SSCM - Section 2.5.2.2), QM and sustainability integration research (SQM - Section 2.5.2.3) and the collective integration research (SSCQM – Section 2.5.2.4) are presented in this section.

2.5.2.1. Supply Chain Quality Management

The focal research streams and themes identified, surrounding the SCM and QM integration research, are presented in Figure 2.17, along with weightings of recurrence (percentage of papers addressing the identified themes). In general, the literature is in agreement on synergies and benefits of integration of supply chain and quality management methodologies with 80% of SCQM literature highlighting various benefits that would be obtained from integrated and coherent approaches.

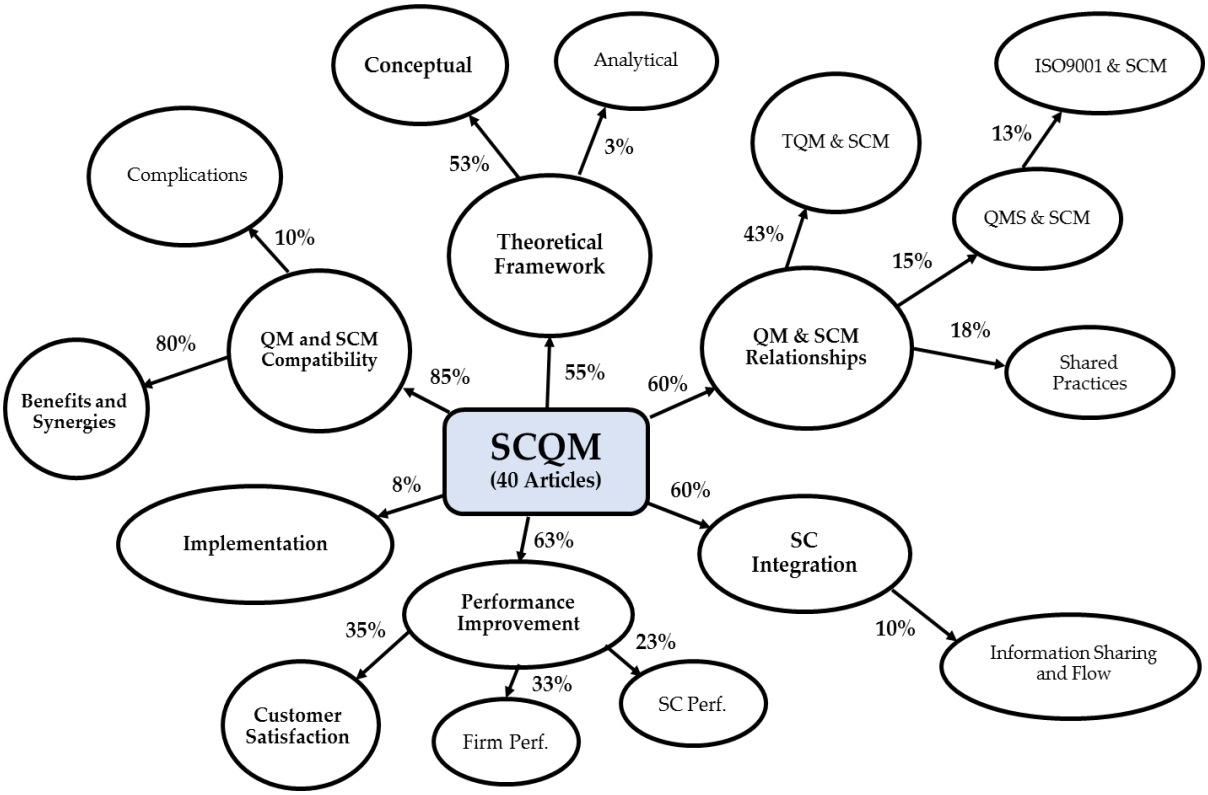


Figure 2.17: Concept map of SCM and QM integration (SCQM) literature

In particular, the literature highlighted four main advantages received from integration as: enhanced supply chain integration (discussed in 60% of SCQM articles), improved customer satisfaction (discussed in 35% of SCQM articles), enhanced firm performance (33% of SCQM articles) and improved supply chain performance (23% of SCQM articles). This

finding is demonstrated in Table 2.12 against the associated SCQM literature.

Table 2.12: Benefits of integrating quality and supply chain management (SCQM)

Benefit	Authors
Supply chain integration (increased supply chain collaboration)	(Carmignani, 2009; Casadesús and de Castro, 2005; Chadha and Gagandeep, 2013; Chen et al., 2014; Flynn and Flynn, 2005; Fynes et al., 2005; Gu et al., 2017; Jiang et al., 2010; Kannan and Tan, 2005; Kaynak and Hartley, 2008; Kuei et al., 2011; Lou et al., 2009; Mahdiraji et al., 2012; Mellat-Parast, 2013; Quang et al., 2016; Robinson and Malhotra, 2005; Shalij et al., 2009; Sharma et al., 2012; Talib et al., 2011; Terziovski and Hermel, 2011; Vanichchinchai and Igel, 2009; Wang et al., 2010; Zhong et al., 2016)
Improved customer satisfaction	(Casadesús and de Castro, 2005; Chadha and Gagandeep, 2013; Fynes et al., 2005; Gu et al., 2017; Jiang et al., 2010; Kannan and Tan, 2005; Lin et al., 2013; Mahdiraji et al., 2012; Mellat-Parast, 2013; Quang et al., 2016; Robinson and Malhotra, 2005; Talib et al., 2010, 2011; Vanichchinchai and Igel, 2009; Zeng et al., 2013)
Improved firm performance	(Azar et al., 2010; Azizi et al., 2016; Foster and Ogden, 2008; Lin et al., 2013; Mahdiraji et al., 2012; Mellat-Parast, 2013; Quang et al., 2016; Sarrico and Rosa, 2016; Shalij et al., 2009; Sharma and Modgil, 2015; Talib et al., 2010, 2011; Zhong et al., 2016)
Improved supply chain performance	(Flynn and Flynn, 2005; Jraisat and Sawalha, 2013; Lin et al., 2005; Mahdiraji et al., 2012; Mellat-Parast, 2013; Sarrico and Rosa, 2016; Terziovski and Hermel, 2011; Vanichchinchai and Igel, 2010; Zhong et al., 2016)

It was noted that the integration of quality management that seeks internal (executives and employees within boundaries of organisations) participation and supply chain management that seeks external (suppliers and customers) partnerships results in a synergistic, collaboration and coordination environment among all chain links with a holistic supply chain view (Vanichchinchai and Igel, 2009). As the ultimate goal of both QM and SCM is "customer satisfaction", the integration enhances the influence of both, resulting in enhanced organisational customer satisfaction levels (Mahdiraji et al., 2012).

Through implementation of practices shared among QM and SCM such as continuous improvement and leadership, organisational performance is improved (Azar et al., 2010; Fernandes et al., 2017; Kaynak and Hartley, 2008). Supply chain performance is highly enhanced through QM principles and continuous improvement concepts deployment across the supply chain network (Terziovski and Hermel, 2011). Stemming from the facilitation of

collaboration across the supply chain network through SCQM approaches, several authors further highlight information sharing and flow across the supply chain as an integral factor for supply chain performance (Jiang et al., 2010; Quang et al., 2016; Sarrico and Rosa, 2016).

On the other hand, a few complications for integration were established. Siddiqui et al. (2012), in an empirical study conducted on oil and gas supply chain, did not observe any significant relationships between QM and SCM practices. Talib et al. (2010) argued that although certain benefits, the integration of QM and SCM results in complexity in both the business processes and the firm structure. Vanichchinchai and Igel (2009) discussed that potential conflicts may arise for integration as the main focus of QM is internal participation from in-house team members whereas SCM seeks interorganisational engagement and partnerships. Vanichchinchai and Igel (2009) further highlight that conflicting primary goals of QM (specification based performance - quality) and SCM (time based performance - delivery) can act as a complication for integration and collective implementation.

Quality management literature in the context of supply chain management was grouped into two research streams: total quality management (TQM) practices - SCM relationships (43% of SCQM literature) and quality management systems (mainly ISO 9001) - SCM relationships (15% of SCQM literature). Vanichchinchai and Igel (2009) and Talib et al. (2010) put forward a strong correlation between TQM and SCM practices. Shared TQM and SCM practices were outlined as "leadership, customer focus and supplier quality management" (Azar et al., 2010; Kaynak and Hartley, 2008). Carmignani (2009) and Shalij et al. (2009) identified mediating relationships between ISO9001 and SCM, proposing expansion of internal quality management systems (QMS) across the entire supply network through a cooperating framework, exploiting the limitations of the current system for supply chain performance improvements. Casadesús and de Castro (2005) and Chadha and Gagandeep (2013) supported ISO9001 based SCQM systems, pointing out synergistic incorporation of QMS and SCM through a supply network fully engaged in continuous improvement.

2.5.2.2. Sustainable Supply Chain Management

Figure 2.18 schematically represents the key recurring themes for supply chain management and sustainability integration (SSCM) literature reviewed along with associated weightings. One of the main themes in the SSCM literature was noted as supply chain integration, which is established as a key factor for implementation, execution, effectiveness and improvement of sustainable supply chain management. The supply chain integration brings together

collaboration, coordination, information sharing, trust and enhanced relationships in every segment of the supply chain network including multi-tier suppliers, focal organisations and customers. Integration and collaboration can be defined as the first building block of the SSCM philosophy (Beske and Seuring, 2014; Liebetruth, 2017; Rajeev et al., 2017).

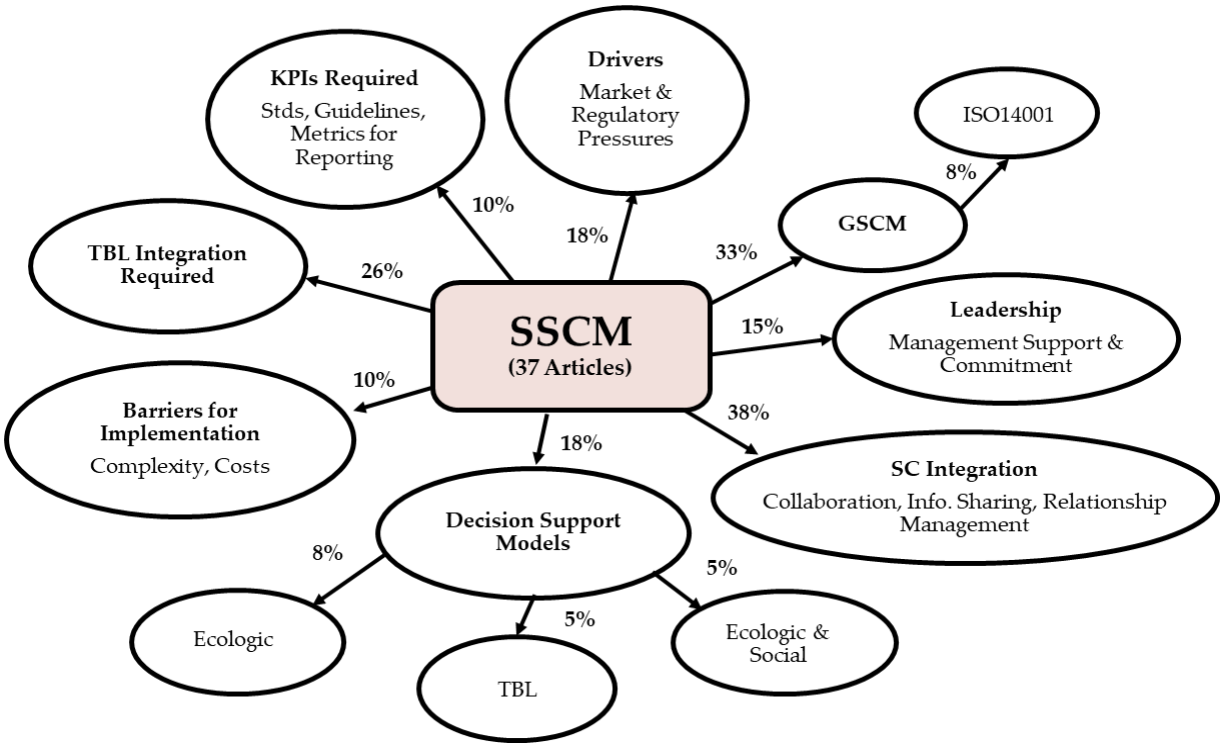


Figure 2.18: Concept map of the supply chain and sustainability integration (SSCM) literature

The literature pointed out "leadership" as another critical success factor of SSCM (Agi and Nishant, 2016; Ansari and Qureshi, 2015; Luthra et al., 2015, 2016; Reefke and Sundaram, 2016; Somsuk and Laosirihongthong, 2016). The commitment and support from the senior management of organisations in each supply chain link is essential for the efficiency and effectiveness of SSCM. The leadership across the supply chain provides the vision and the engagement for incorporation of triple bottom line into supply chain decision making, reinforcing collaboration, and monitoring sustainability performance against objectives. Leaders also play a key role in driving sustainability performance improvement. Thus, leadership, senior management commitment and support for SSCM activities can be defined as the second building block of SSCM implementation and deployment.

External stakeholder requirements and pressures were seen as the main driver and motivator for implementation of SSCM and environmental supply chain management (GSCM)

practices (Lin, 2013; Luthra et al., 2016; Seuring and Müller, 2008; Somsuk and Laosirihongthong, 2016; Türkay et al., 2016; Xia and Li-Ping Tang, 2011; Zhu et al., 2006). Legislative bodies such as the governmental regulators were identified as a highly influential factor for GSCM deployment (Luthra et al., 2016). Türkay et al. (2016) further concluded that legislation is imperative for integration of social and environmental considerations into SCM. Seuring and Müller (2008) described market and legislative pressures as key drivers for SSCM, Lin (2013), Somsuk and Laosirihongthong (2016) and Zhu et al. (2006) resonating with the same for GSCM.

The integration of environmental sustainability into supply chains received significant attention in the literature with 33%. The implementation of ISO 14001 environmental management system and use of certified suppliers were identified as influential factors for GSCM implementation and effectiveness (Agi and Nishant, 2016; Ansari and Qureshi, 2015). Govindan et al. (2014) supported this view however, put forward the argument that ISO 14001 implementation, although being an influential factor for environmental sustainability, does not have a significant impact on overall supply chain sustainability performance due to its lack of influence on economic and social dimensions.

In general, a consensus has been reached in SSCM literature over a period of time that the incorporation of all three pillars of sustainability (TBL) into SCM is highly required (Ansari and Qureshi, 2015; Ashby et al., 2012; Awudu and Zhang, 2012; Beske and Seuring, 2014; Gold and Schleper, 2017; Reefke and Sundaram, 2016; Türkay et al., 2016; Winter and Knemeyer, 2013). Considering the traditional focus of organisations on the economic dimension (Gold and Schleper, 2017), and the extant research concentration on the environmental issues (GSCM), the integration of triple bottom line and multi-dimensional approaches into the supply chain thinking will provide more balanced, holistic and effective SSCM implementation, mitigating the industrial risk of favouring certain dimensions over the others.

Several decision making support models were designed by the literature to facilitate measurement and integration of sustainability into supply chain management activities although, only two papers considered all three pillars of sustainability (Chardine-Baumann and Botta-Genoulaz, 2014; Schaltegger and Burritt, 2014). Moreover, several authors emphasised the importance of key performance indicators (KPIs) for supply chain sustainability performance in the implementation of SSCM practices, highlighting the current absence of guidelines, metrics and standards for measurement, monitoring, reporting and

improvement of supply chain triple bottom line performance (Ansari and Qureshi, 2015; Rajeev et al., 2017; Schaltegger and Burritt, 2014; Wan Ahmad et al., 2016). Wan Ahmad et al. (2016) articulated that such measurable indicators would enable organisations to assess their progress and impact of their strategies, establish priorities, facilitating continual improvement, and contributing to effectiveness of SSCM activities.

On the other hand, several complications and barriers for integrating triple bottom line considerations into supply chain management were discussed (Ansari and Qureshi, 2015; de Brito and Van der Laan, 2010; Seuring and Müller, 2008; Silvestre, 2015). Seuring and Müller (2008) argued that SSCM implementation and deployment face significant resistance in organisations due to additional cost implications, inherent complexity and interorganisational communication difficulties. De Brito and Van der Laan (2010) articulated further on the complexity challenges associated with SSCM approaches, arguing that the multi-dimensional (financial, environmental and social) view introduced by SSCM brings together multiple objectives and agendas with the potential risk of inter and intraorganisational conflicts.

2.5.2.3. Sustainable Quality Management

Fundamental quality management concepts including Deming's cyclic Plan-Do-Check-Act (PDCA) management tool, quality function deployment, continuous improvement, customer focus and stakeholder management were identified to be synergistic with sustainability management (Alemam and Li, 2016; Kuei and Lu, 2012; Rusinko, 2005; Siva et al., 2016; Zink, 2007). PDCA cycle, with its iterative improvement framework, was adapted for sustainability (TBL) practice implementation and change management facilitation by Kuei and Lu (2012), Asif et al. (2011), and Rusinko (2005).

Siva et al. (2016) and Zink (2007) highlighted that QM, with its inherent focus on stakeholder (customers, regulatory bodies and other interested parties to whom the business is dependent for existence) management, supports sustainable development. This is achieved through managing the needs and expectations of stakeholders that are influential for the continuity of the organisation, that results in increased sustainability management capabilities and performance. Siva et al. (2016) further established the support of quality management for sustainability through integrated management systems and environmental management systems. Quality management system is argued to support integration of other management systems (environmental, OH&S), enabling minimisation of redundancies and efficiency enhancements. Quality management principles, tools and practices including continuous

improvement and relationship management are argued to be shared, and in synergy with environmental management principles, thus supporting environmental sustainability in organisations (Siva et al., 2016).

Maletič et al. (2011) outlined the four primary characteristics of SQM as "green development and environmental aspects, top management commitment, employee support, corporate social responsibility and local community engagement". Srdić and Šelih (2011) developed an integrated quality and environmental sustainability performance management framework for sustainable development of construction projects, consisting of three key elements: "building level (quality and sustainability assessment), process/project level (established QMS and EMS), and product level (conformance through environmental product declaration)". Aquilani et al. (2016) integrated TQM and TBL, redefining critical success factors at their interface with a view to foster organisational sustainability through QM processes and value co-creation.

Alemam and Li (2016) integrated quality function deployment (QFD) tool with functional design analysis through relational matrices for environmental sustainability improvements. The integration of the QFD tool facilitated the embedding of eco-design principles into the new product development process, enabling design of more environmentally sustainable products. Utne (2009) also assessed eco-QFD concept for environmental sustainability improvement of fisheries, concluding that the structure introduced by such an integrated system facilitates stakeholder requirement analysis with potential improvements in sustainability decision making. 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.

On the other hand, Asif et al. (2011) reviewed EFQM and Baldridge (MBNQA) models from the lens of TBL, identifying that both models do not adequately address the dynamic nature of the multi-dimensional, sustainability bottom line requirements. Stemming from this observation, it was concluded that the sustainability indicators and reporting needs are required to be embedded within both QM models (Asif et al., 2011). An integrated management framework was proposed using EFQM and Baldridge models to incorporate TBL aspects and indicators into business processes, derived from stakeholder requirements with a view to drive continual sustainable development through the integrated PDCA cycle (Asif et al., 2011).

2.5.2.4. Sustainable Supply Chain Quality Management

Five studies were identified to associate relationships and synergies between QM, SCM and sustainability, justifying categorisation under SSCQM, justifying particular focus in this review (Agi and Nishant, 2016; Dubey et al., 2015; Fassoula, 2005; Govindan et al., 2014; Jabbour et al., 2014). The distribution of these studies in relation to TBL are illustrated in Figure 2.19. Agi and Nishant (2016), Dubey et al. (2015) and Jabbour et al. (2014) investigated relationships between GSCM, QM and environmental sustainability.

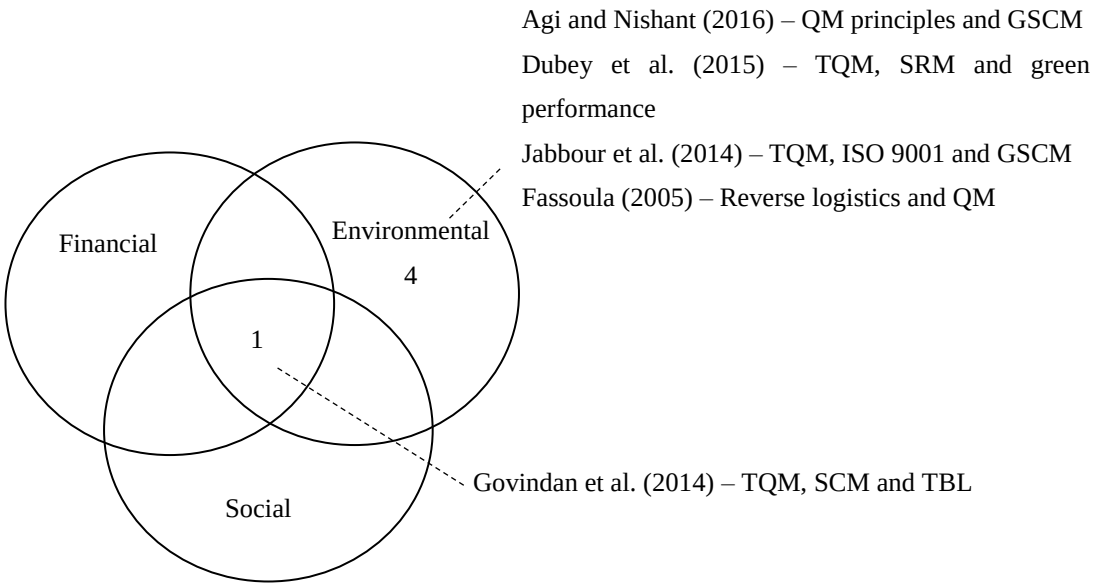


Figure 2.19. Distribution of 5 SSCQM Papers against triple bottom line

Jabbour et al. (2014) modelled QM as "ISO 9001 implementation; TQM implementation; and certification of suppliers based on quality criteria" and measured the organisational green performance as "the emission of waste; compliance with environmental legislation; firm's environmental reputation; and firm's overall environmental performance". The empirical survey evidence captured from Brazilian companies concluded that QM establishes the foundations for environmental management and its maturity in businesses, which subsequently facilitates green supply chain management practices and environmental performance.

Agi and Nishant (2016) identified "relationship between supply chain members, management commitment and application of QM principles" as influential factors for GSCM implementation and environmental sustainability, based on the opinions of the SCM experts in the Middle East region. Dubey et al. (2015), in their empirical study on Indian rubber

goods manufacturing industry, further evidenced that "supplier relationship management (SRM) and TQM, influenced by leadership practices and moderated by the institutional pressures (e.g. normative and customer pressures)", positively impact environmental performance and facilitate development of greener supply chain networks. Fassoula (2005) constructed a business diagnostic tool on the basis of a positive relationship between the SCM practice "reverse logistics management" (management of materials, inventory, products and information from the point of use, to their origin, for value recapturing) and quality management, integration increasing the effect of both for improvements in environmental sustainability and organisational competitiveness.

Nevertheless, although providing valuable insights to the environmental sustainability knowledge base, these studies entail the limitation of not including the social and economic dimensions of sustainability, lacking the full triple bottom line view which is required for true sustainable development (Agi and Nishant, 2016; Dubey et al., 2015; Fassoula, 2005; Jabbour et al., 2014).

On the other hand, Govindan et al. (2014), during their case study on Portuguese automotive sector, concluded positive associations between TQM, SCM practices and supply chain triple bottom line sustainability performance, which can be noted as the first paper to link QM, SCM and TBL through incorporation of the full supply chain view. However, the empirical evidence in this study is only limited to the perceptions of participants representing a specific business sector (automotive), in a specific geographical region (Portugal).

All in all, the knowledge base on the emerging SSCQM field was concluded as highly limited, although its high potential. It was reflected that many future research opportunities are bound to spring for exploration of this fruitful area, investigating relationships between various QM approaches (ISO 9001, EFQM, MBNQA), SCM approaches and triple bottom line, shedding light on the current limited empirical coverage on business sectors and geographical regions.

2.6. QM, SCM and Sustainability Integration Timeline

A number of research contributions were noted under a timeline framework towards connecting the trends and forming a future map of the integration research streams. Starting with the SCQM research, Kuei et al. (2011) designed and validated a global SCQM framework through an empirical case study, strongly suggesting future research to incorporate sustainability dimensions in the subsequent SCQM modelling studies. Fernandes

et al. (2017), in their state-of-the-art research study, proposed a conceptual supply chain quality management framework, combining QM and SCM principles for organisational performance improvement. As part of Fernandes et al. (2017)'s SCQM model, sustainability was also identified as a key supply chain factor however, the relationships between the QM, SCM, SCQM practices and sustainability indicators were not defined or elaborated, setting the scene for future research opportunities seeking to embed sustainability. The potential effects of such an SCQM framework on organisational triple bottom line (environmental, economic and social sustainability) performance were not considered. Fernandes et al. (2017)'s SCQM framework can be considered as the first SCQM framework to incorporate sustainability even though, the links with three pillars of sustainability and the expected influence of SCQM on triple bottom line were established as "missing". SSCM research was also observed to follow a similar path towards full integration, authors such as Govindan et al. (2014) and Agi and Nishant (2016) including QM principles as well as SCM practices and sustainability in their conceptual frameworks, empirically suggesting positive relationships.

Taking into account the historical evolution and the extant integration trends among quality, supply chain and sustainability management approaches along with the future research directions indicated in key literature above, the emergence of a new research field, framed under the novel concept of sustainable supply chain quality management (SSCQM) is foreseen as outlined below in Figure 2.20. This new field is expected to expand on the evident strengths, synergies and relationships established between quality, supply chain and sustainability management practices, contributing towards the journey of true organisational sustainable development, and cooperative enhancements across the full supply chain network.

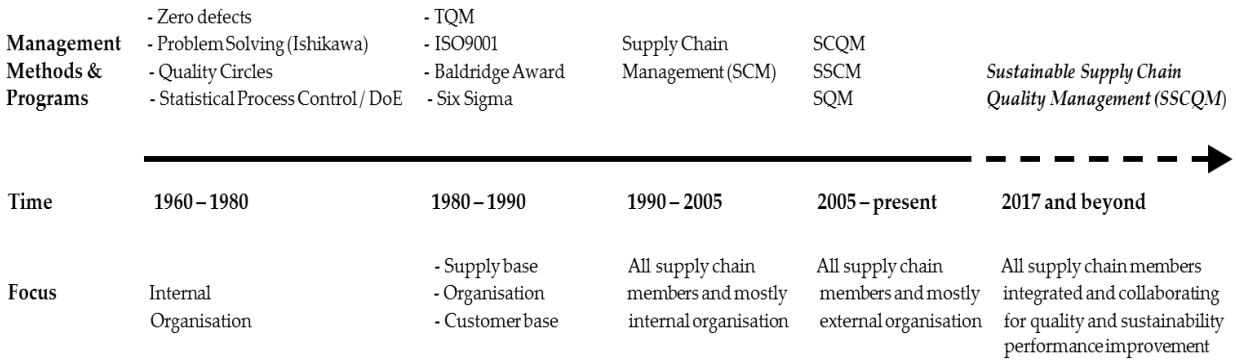


Figure 2.20: Evolution of SCM, QM, SM integration and the inception of a new research area: SSCQM

(Adapted from Robinson and Malhotra (2005))

2.7. Summary and Conclusions

This chapter presented a detailed review carried out into the important phenomenon of sustainability, including the detailed review of its literature definitions, evolution, global significance, indicators, enablers, barriers and integration trends with organisational operations management field. The review was mainly undertaken from the perspective of organisations, in line with the research aim and objectives. Although an agreed scholar definition for sustainability was not established, a clear conclusion entailed embracing of radical changes by all actors of the society in an immediate manner, as a response to the environmental demands of our planet and social demands of our society, organisations and organisational management being located in pole position in this transformation journey.

The evolutions and articulations of quality management (QM) and supply chain management (SCM) disciplines were reviewed, concluding their rich history and remarkable influence on the performance of organisations and supply chains. The two key emerging philosophies of lean six sigma (LSS) and circular economy (CE) were studied from the lens of sustainability, noting a number of benefits provided by both, for organisations. The comparative analysis into the evolution and implementation barriers of QM, SCM, LSS and CE favoured a research pathway through QM and SCM, due to these philosophies being more deeply rooted and widely recognised globally, their intra and interorganisational scope, and synergies associated with their collective integration.

Subsequent to establishment of the advantages offered by quality management (QM) and supply chain management (SCM) approaches for integration of sustainability over the emerging concepts of LSS and CE, a systematic review of the QM, SCM and sustainability integration literature was undertaken with a view to explore unrevealed potential for integration. The systematic literature review was undertaken towards addressing the first research question (relationships between QM, SCM and sustainability management methodologies) and the second research question (key integration issues of QM, SCM and sustainability management methodologies including synergies, complications and further avenues for integration) of the thesis. As a result, 93 papers were identified as relevant to this review between 2005 and the first half of 2017. The descriptive statistics of the literature were provided along with the key themes covering the integration research streams, presented in the concept map format.

Significant benefits of integrating quality and supply chain management were established

including performance improvements and integration increasing the effect of both methodologies. Integration of sustainability into quality and supply chain management was seen to be a highly emerging area with balanced (financial, environmental and social) approaches still very much required to enable more sustainable organisations and supply chains for our society. In the light of this comprehensive review, a new, emerging research area was revealed: sustainable supply chain quality management (SSCQM). Furthermore, key deductions noted from the systematic literature review carried out from the collective lens of QM, SCM and sustainability integration included the following:

- QM and SCM integration offers significant potential for organisations including focal business and overall supply chain performance improvements.

- Collective integration of triple bottom line considerations into SCM and other business processes is a remarkable gap that needs to be addressed by all future sustainability management research streams.

- The relationships between QM and three pillars of sustainability in the context of supply chain is a fruitful area to be explored. This avenue carries the potential for an ultimate, sustainability management framework that is continuously improved through QM principles and deployed across the supply chain through SCM principles.

The in-depth critical review of the body of knowledge in QM, SCM and sustainability integration not only enabled identification of opportunities and gaps in the extant literature but also led to development of a collective integration perspective, paving the path for the conceptual development phase of the research, in line with the aim and objectives of the research i.e. formulation of a management solution for organisational integration, and improvement of sustainability through QM and SCM.

CHAPTER 3 – RESEARCH DESIGN

3.1. Introduction

This chapter discusses the steps taken towards answering the research questions (RQ1 – RQ7), reviewing the available philosophies, methods and paths in the literature with a view to achieve the aim and objectives of the research. For this reason, a review of research approaches is presented, setting out the philosophical worldview as well as the design and methods adopted. Following the identification of the worldview embraced in the research, an overview of the research strategy and design utilised is provided. Details on the research strategy utilised for the conceptual and empirical phases of the research are justified along with a critical review and selection of available research methods for the same.

3.2. Research Philosophy and Approaches

The development of knowledge, and the nature of that knowledge, in a particular area of investigation are highly related with the terms "research philosophy and approach" (Saunders et al., 2015). On this note, Johnson and Clark (2006) emphasised the importance of awareness in management research regarding the selection of research approaches and philosophical standpoints, such awareness and understanding highly influencing how the research is undertaken, what path is taken and how the phenomena being studied are comprehended. Creswell (2013) framed research approaches into the three key interrelated elements of "worldviews, designs and methods" that encompass both philosophical supposition aspects, and the methodical and procedural aspects as shown in Figure 3.1.

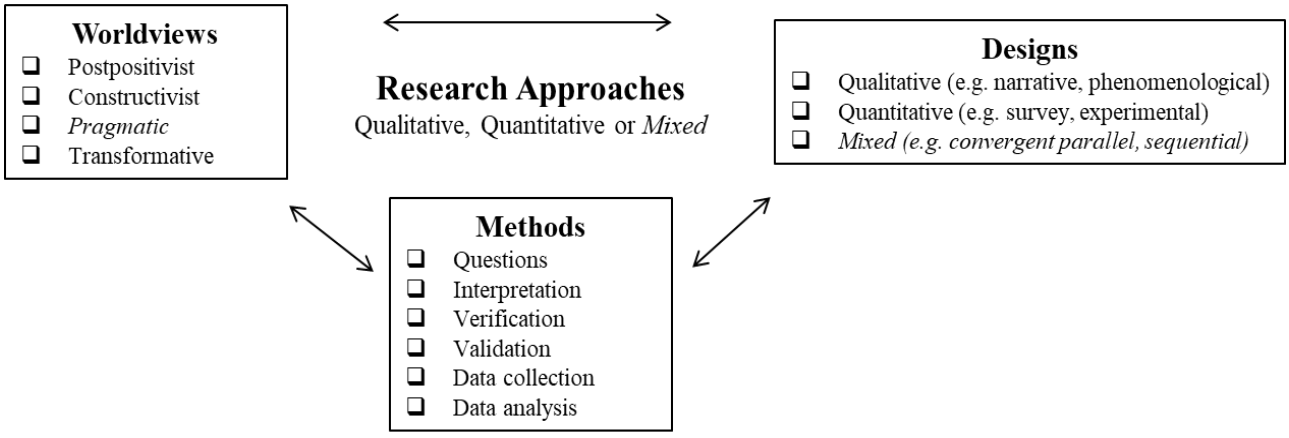


Figure 3.1: Research Approaches Overview – Worldviews, Methods and Designs (Adapted from Creswell (2013))

3.2.1. Worldview

Worldview is articulated by Guba (1990) as "a basic set of beliefs that guide action" despite, various other terminologies have been adopted by other scholars for the same including paradigm (Ferguson, 1980; Kuhn, 1996; Mertens, 2010), epistemology and ontology (Crotty, 1998). According to Slife and Williams (1995), researchers do not usually disclose their philosophical standpoints or choose to leave them "hidden". On the other hand, worldviews have a direct impact on research practices, underpinning key research decisions regarding the type of design adopted and methods deployed for achievement of research objectives thus, they need to be established (Creswell, 2013). Saunders et al. (2015) resonated with this viewpoint, establishing research strategies, designs and methods as "secondary" to the establishment of worldviews, associated belief systems and philosophical assumptions.

The four key worldviews mainly discussed in the literature and their key features are described as following (Creswell, 2013):

- Positivism/Postpositivism: "determination, reductionism, empirical observation and measurement, theory verification"
- Constructivism: "understanding, multiple participant meanings, social and historical construction, theory generation"
- Transformative: "political, power and justice oriented, collaborative, change-oriented"
- Pragmatism: "consequences of actions, problem-centered, pluralistic, real-world practice oriented"

Generally associated with the quantitative research and hence also identified as the "scientific method" or the "empirical science", the postpositivists perceive the world in an objective, cause and effect relationship (deterministic) manner, converging their ideas into a narrow set of hypotheses and associated parameters for testing (reductionistic), for addressing their research questions (Creswell, 2013). To achieve this, positivism typically utilises experimental and survey-based methodologies, collecting empirical measurement data to warrant, revocate, refine and revise their original views (hypotheses) (Easterby-Smith et al., 2012). In this worldview, the observer chooses to remain totally independent from the topic of investigation (Ihuah and Eaton, 2013).

Contrariwise, constructivism is linked to the qualitative research and is usually combined with interpretivism, where researchers construct their subjective articulations of their

surroundings and experiences, with a view to articulate the objects or phenomena under investigation (Creswell, 2013). Constructivism is also known as social constructivism, due to its proximity to social issues, recognising the variable nature of viewpoints, and adopting a divergent approach to investigations that encapsulates complexity and depth rather than converging ideas into a few categories (Creswell, 2013). Constructivists take the supposition that "there is no absolute truth" as the baseline and endeavour to reveal various truths, acknowledging how differing articulations of "truth and reality" are developed (Easterby-Smith et al., 2012). This is achieved through open-ended questioning and interaction, where the participants are observed in their original life settings, and cultural, social and historical meanings about situations are inductively sought or theories generated (Creswell, 2013). In other words, in this worldview, the observer is part of, dependent on and immersed in the topic of investigation and the social group being studied (Ihuah and Eaton, 2013).

However, a group of researchers disagree with the postpositivist approach from the point of view that such philosophical stance "imposed structural laws and theories that did not fit marginalised individuals" whereas, the constructivist approach of recognising subjectivity does not extend far enough to cover these specific groups of people (Creswell, 2013). This worldview is embraced by the transformatives, whose belief system is based on the value that "research inquiry needs to be intertwined with politics and a political change agenda to confront social oppression at whatever levels it occurs" (Mertens, 2010). The key concentration of transformative research is summarised by Mertens (2010) as "the inequities based on gender, race, ethnicity, disability, sexual orientation, and socioeconomic class that result in asymmetric power relationships", with a view to identify, and drive political and social action against these issues (Creswell, 2013).

On the other hand, a remarkable and emerging group of researchers do not feel associated to a single belief system and reality, embracing a problem and real practice oriented path, utilising all the available techniques for articulation, comprehension and solution of situations and problems (Creswell, 2013). Saunders et al. (2015) articulated the pragmatic worldview as: "the recognition that there are many different ways of interpreting the world and undertaking research, that no single point of view can ever give the entire picture, and that there may be multiple realities". Tashakkori and Teddlie (1998) put forward that the interaction level of the researcher with the investigation may vary depending on the research questions being tackled and the point in the research journey. Encouraging the adoption of pragmatic worldview and mixed research designs, it was argued that undertaking research in line with the research questions, interests and what adds value to the investigation, adopting

various methods as appropriate, and utilising the findings towards addressing research inquiries and problems are highly fruitful for achievement of positive research outcomes (Armitage, 2007).

The worldview adopted in the research would be required to fit or at least be compatible with the aim of this research, which is outlined as following:

> ***Aim:*** *"To design and develop a management framework through integration of quality management, supply chain management and sustainability management methodologies with a view to facilitate sustainability integration, and improvement of organisations"*

At the heart of this aim lies a current, complex and practical organisational management problem i.e. integration of triple bottom line sustainability into organisational processes, mechanisms and structures, that necessitates a problem-oriented worldview to enable formulation of a comprehensive solution, and a real-world practice based approach to ensure that this solution is feasible for deployment in a wide range of industrial contexts. From this perspective, the transformative worldview was reflected upon as not applicable due to its specific focus on political issues around marginalised community groups.

Moreover, although certain elements of the postpositivist paradigm such as deductive theory development and verification of relationships between the QM, SCM and sustainability were seen to be highly relevant to the research, this worldview did not offer a full fit for the research as the organisational and sustainability disciplines are very much social and human orientated in their nature. As rightfully put forward by Saunders et al. (2015), "the social world of business and management is far too complex to lend itself to theorising by definite 'laws' in the same way as the physical sciences, leading to rich insights into the complex world of management and sustainability world being lost, if such complexity is reduced entirely to a series of law-like generalisations".

On the other hand, the constructivist approach on its own was reflected upon as highly contextual and limited for formulation of a management solution that could be applied in various regions, cultures and sectors. Resonating with the views of Saunders et al. (2015), Ihuah and Eaton (2013) and Khin and Fui (2012) that highlight its suitability and fruitful nature for management and sustainability research, a pragmatic worldview was embraced in this research.

3.2.2. Design

The identification and adoption of a pragmatic worldview directly influences the research design selection, embracing utilisation of a mixed design, i.e. adoption of both conventional approaches of quantitative (Quan.) and qualitative (Qual.). However, prior to articulation of mixed design and the benefits offered by such design, it is important to define the traditional ways (i.e. Quan. and Qual.) that together contribute towards a mixed design.

The quantitative designs are associated with numeric data and can be grouped into two main categories of experimental (e.g. true-experiments, quasi-experiments, applied behavioural analysis) and non-experimental (e.g. surveys, causal-comparative, correlational) designs, former "seeking to determine if a specific treatment influences an outcome" and surveys, as the most popular non-experimental quantitative design "providing a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population" (Creswell, 2013). Quantitative designs possess the advantage of providing generalisable explanations regarding situations under investigation, backed up by experimental or statistical evidences, but may fall short in explaining why such findings were reached (Easterby-Smith et al., 2012).

The qualitative designs are linked to the non-numeric data, including the narrative research (capturing of information and stories from participants to construct a collaborative narrative), grounded theory (formulation of a generic theory based on the views of participants), case study (detailed analysis of a case, utilising various data collection techniques over a period of time), participatory action research (developing understanding through introducing actions for change and reflecting on its impacts) and the phenomenological research (capturing of experiences and views of participants on a particular phenomenon) (Creswell, 2013). Qualitative designs offer the strength of developing insights into why and how situations occur in the way they have been observed or captured in terms of findings but may suffer from the limitation that the findings are highly specific to the circumstances or contexts of collection and not generalisable to a considerable ratio of the population (Easterby-Smith et al., 2012).

The mixed design adopts both quantitative and qualitative elements with a view to complement each other for a higher depth and breadth of understanding on the particular line of inquiry (Ihuah and Eaton, 2013; Johnson et al., 2007). A similar supporting view was shared by Creswell and Plano Clark (2011) that parallel employment of quantitative and qualitative approaches enhance comprehension of complex research problems, as opposed to

utilisation of a single or mono approach. Tashakkori and Teddlie (1998) place this principle of mixed methods at the core of the pragmatic worldview, arguing its open-minded and powerful essence to lines of inquiry. The mixed-method design offers the key advantages of "triangulation, facilitation, complementarity, generality, aided interpretation, enhanced puzzle solving and studying of different aspects", against utilisation of a mono method (solely qualitative or quantitative) design (Saunders et al., 2015).

The three main categories of mixed designs comprise of the following (Creswell, 2013):

- *Convergent parallel mixed methods:* where the qualitative and quantitative data are integrated to paint a comprehensive picture regarding the research problem.
- *Explanatory sequential mixed methods:* where the quantitative research is undertaken and analysed first and then analysed in further detail through qualitative research.
- *Exploratory sequential mixed methods:* where the qualitative research is conducted first, revealing the views of participants, then the quantitative research is carried out.

Farquhar (2016) described the principle of triangulation, as a common feature of mixed-method designs as "obtaining a fix on the phenomenon under investigation from two known points". Triangulation stems from the bias minimisation or validation point of views, where several and independent inputs are utilised for higher levels of certainty and enhanced levels of depth during investigation of phenomena (Jick, 1979). Triangulation can be adopted through data (similar data collection from different sources), researcher (multiple researchers involved in collection and interpretation of data), theory (multiple theoretical perspectives for interpretation), methodology (varieties of same method or different methods for same objective), and perception (primary data from participants is supported with secondary data) (Bekhet and Zauszniewski, 2012; Farquhar, 2016; Turner et al., 2017).

Despite the observation in Chapter 2 (Figure 2.14) that mixed methods only represent a low percentage of the extant QM, SCM and sustainability integration research streams, it was seen that there are remarkable benefits offered by the mixed-method design for management research studies in general, which was also established as a highly relevant point to be taken into account for this research (Tranfield et al., 2003). Leech and Onwuegbuzie (2009) resonate with this viewpoint, articulating that more balanced explanations and evaluations regarding research inquiries would be achieved along with enhanced research findings certainty and validity through triangulation of qualitative and quantitative methods.

Ultimately, combination of both methods during the data collection phases would enable development of a management solution that is both applicable to a wide range of industrial sectors and organisations (through quantitative methods), and also detailed and comprehensive enough through consideration of social and cultural aspects of sustainability and management (through qualitative methods) (Easterby-Smith et al., 2012).

3.2.3. Methods and Strategy Overview

Saunders et al (2015) outlined the key features of management research as "it being of transdisciplinary nature, it should be able to develop ideas (through conceptual and methodological rigour) as well as relating them to practice and not only offer findings that advance knowledge but also introduce solutions to practical managerial problems". With a view to achieve the aim and objectives of this management research, the following fundamental steps were undertaken (Easterby-Smith et al., 2012; Saunders et al., 2015; Yin, 2003):

- *Literature review:* that established the research topic, articulated the research problem, formulated the research questions, critically reviewed the extant body of knowledge, evidenced gaps and determined key research opportunities (presented in Chapters 1 and 2). This step was conducted as the initial phase of the research, carrying out an in-depth review of the relevant QM, SCM and sustainability literature.
- *Conceptual development:* that concentrated and facilitated the approaching of the unknown, framing and structuring the learnings acquired through a tailored lens against research questions, and identifying the QM and SCM concepts useful to practitioners for organisational sustainability integration (presented in Chapter 4). This step was conducted as the second phase, developing relationships between QM, SCM and TBL sustainability under a conceptual framework, and detailing an implementation procedure along with a maturity diagnostic tool for application.
- *Data collection, analysis and interpretation (empirical):* that verified, validated and refined the conceptual integrity of the developments as the final phase of the research, utilising empirical insights through expert feedback and application studies for a robust explanation of the phenomenon under investigation, checking the practicality, representativeness and applicability of the solution (presented in Chapters 5 and 6).

Based on these steps, this research comprised of the three key phases structured around the questions, aim and objectives of the research as presented in Table 3.1.

Table 3.1: Research Phases, Questions and Objectives

Phase	Research Question	Research Objective
Phase 1 - Literature Review	RQ1: What are the relationships between the quality, supply chain and sustainability management methodologies? RQ2: What are the key integration issues of quality, supply chain and sustainability management methodologies including synergies, complications and further avenues for integration?	Undertake systematic review of related QM and SCM integration literature and extant frameworks, critically evaluating relationships, synergies, complications and research gaps in the context of sustainable development of organisations and supply chains.
Phase 2 - Conceptual	RQ3: How can the QM and SCM approaches facilitate and/or accelerate integration of triple bottom line into organisational and supply chain mechanisms? RQ4: What are the QM and SCM principles that can be coherently framed for sustainable development of organisations and supply chains?	Formulate a conceptual framework incorporating synergistic and compatible links (propositions) between QM, SCM and SM for sustainability integration and improvement.
	RQ5: How can such a framework be operationalised by industrial practitioners and decision makers?	Synthesise an implementation procedure, integrating QM, SCM and SM methodologies with a view to guide industrial decision making and deployment. Develop a diagnostic tool to facilitate the current state analysis and quantitative maturity assessment step of the implementation procedure.
Phase 3 - Empirical	RQ6: Would such a framework provide a practically verified and validated solution to industrial and academic subject matter expertise for organisational and supply chain integration of sustainability?	Verify the conceptual framework and validate the implementation procedure and diagnostic tool developed with subject matter expertise from academia and industry.
	RQ7: What are the key contextual factors for application of such a framework, including the enablers and barriers for implementation?	Implement the research outcomes (the novel developments) in their intended context (organisational management), with a view to finalise validation, demonstrate application and outline key implementation factors.

As presented in chapters 1 and 2, an in-depth review of the literature was conducted, establishing a highly significant management problem for the industry and society, formulating research questions, scoping out the research within the boundaries of QM and SCM literature, and analysing key themes, trends and opportunities in the extant research streams in line with the research questions 1 and 2. Stemming from the pragmatic worldview embraced, a convergent parallel mixed-method design was adopted during the systematic literature review stage, utilising between-method triangulation through quantitative (descriptive statistics) and qualitative (thematic synthesis) components. This enabled establishment of a rich and detailed view regarding the research area under investigation.

The same approach was also carried forward to the empirical phase of the research due to its suitability with the research questions, consistency and establishment of a holistic perspective regarding the research inquiries (Bekhet and Zauszniewski, 2012; Farquhar, 2016; Jick, 1979). According to Paul (1996), between-method triangulation as part of a mixed method design is a particularly fruitful approach for organisational management research through "leveraging the strengths of several methods while mitigating weaknesses".

Following literature review, two main approaches were identified to reasoning towards answering research questions; deductive and inductive (Creswell and Plano Clark, 2011; Saunders et al., 2015; Soiferman, 2010; Yin, 2003). In simple terms, these two standpoints lie on the basis of deriving theory or conceptual development followed by collecting data (deductive) or collecting data followed by deriving the theory or conceptual development from the observations (inductive) (Soiferman, 2010). According to Yin (2003), extant literature can also be utilised for establishment of research questions and objectives as part of the deductive approach.

The deductive way provides the advantage of constructing a theoretical or conceptual framework and associated propositions, facilitating and directing data collection and analysis efforts in line with the questions, objectives and conceptual standpoints of the research (Saunders et al., 2015). Moreover, this approach enables connections between the research and the extant literature, placing the contributions of the research into the existing body of knowledge and guiding the research towards revealing the unknowns through an analytical framework. Additionally, the data collection practices under the guidance and facilitation of the deductive approach is relatively more structured and more formalised, relying less on interpretation and less subjective (Saunders et al., 2015).

On the other hand, formulation of theories and concepts in advance can prematurely limit the issues that may be fundamental to the comprehension and explanation of the phenomenon being studied (Bryman, 2003). Moreover, predetermined developments also possess the risk of being heavily criticised or not embraced by the participants in the phenomenon's natural context and setting (Bryman, 2003). However, considering its clear advantages, its suitability to management research through its structured and formalised nature, and its alignment with the research questions and objectives, a deductive approach was justified to be deployed. Therefore, the literature review was followed by the conceptual development phase, formulating relationships between QM, SCM and sustainability from the literature and framing relationships, concepts, tools and a road map for integration and improvement of organisational sustainability, in line with the research questions and objectives (RQs 3, 4 & 5).

For a theory, concept or a framework to be classed as a "reliable one", its key features need to be demonstrated and supported "in a given number of predictable instances", in other words, it needs to be verified and validated (Weick, 1989). Furthermore, at the heart of every management research lies triggering some form of action for better or outcomes that drive practical consequences in the industry, emphasising the significance of delivering applicable and practical management solutions (Easterby-Smith et al., 2012). Based on this, verification and validation of the solution developed was undertaken in its intended context (organisations), through capturing of subject matter expertise in line with research question 6. It is accepted that conceptual frameworks developed and matured as a result of expert opinions provide more "correct, complete, innovative and flexible" solutions regarding the research lines of inquiry and phenomena under development (Charness and Tuffiash, 2008; Ehrich et al., 2018; Shanks, 1997). As an ultimate step of the research, the finalised solution was implemented in a real industrial setting as per research question 7 for further validation, and to identify key factors to its implementation, demonstrate its application and assess its success in its intended business management domain to drive integration and improvement of sustainability.

All ethical considerations for the empirical phase of the research were taken into account prior to data collection, not to expose the research participants to any harm, embarrassment or any other material disadvantage, including the key ethical aspects of informed consent, confidentiality and confirmation of voluntary participation of the research population, in line with the University Research Ethics procedures (as demonstrated in Appendices Three and Five) (Saunders et al., 2015). Ethical approval was obtained from the College of Engineering

and Technology Research Ethics Committee, prior to the commencement of data collection processes, the copy of which is included in Appendix Two.

Figure 3.2 demonstrates the interconnectivity between the research questions, worldview embraced, the mixed design adopted, deductive approach utilised and the key associated elements of the research.

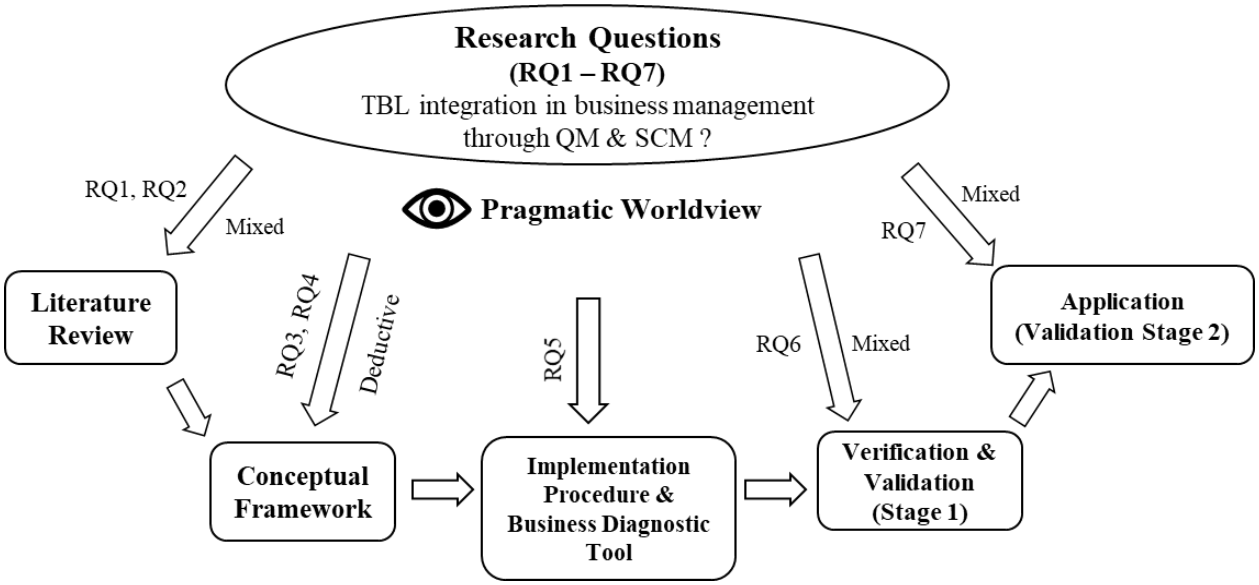


Figure 3.2: Research map including the questions, worldview, design and key elements

3.3. Research Strategy – Conceptual Development

Imenda (2014) highlighted the key role of conceptual frameworks as following: "conceptual frameworks represent an integrated understanding of issues within a given field of study, which enables the researcher to address a specific research problem; guiding the researcher in terms of specific research questions, hypotheses or objectives, leading to a better directed review of literature, effective selection and identification of appropriate research methods, and enhanced interpretation of results". For management research, the role of new conceptual developments is further highlighted, in particular for adoption of tailored perspectives with a view to address current research problems such as sustainable development of firms, enabling us "to see the world as it might be, as opposed to representing the phenomenal world as it is" (Suddaby, 2014; Whetten, 1989).

Conceptual frameworks are typically constructed from the theories that underpin the research, "consisting of concepts interconnected to explain the relationships between them and how the

researcher asserts to answer the research problem defined, aimed at advancing the development of a theory or a concept in a way that would be useful to practitioners in the field" (Adom et al., 2018). Imenda (2014) articulated that conceptual frameworks "bring together a number of related concepts towards broader understanding of phenomenon or achievement of research objectives". The difference between theoretical and conceptual frameworks was outlined as: "a whole theory may serve as one's theoretical framework whereas, a conceptual framework is normally of limited scope, carefully put together in the form of a conceptual model, and immediately applicable to a particular study or phenomenon of interest" (Imenda, 2014).

The research strategy followed for the construction of a conceptual framework included a further literature review that consisted of an in-depth gap analysis of the extant models and frameworks in the literature, establishing opportunities and grounding for a new conceptual construct. As part of the literature review, the QM and SCM principles that are synergistic towards business integration of sustainability were reviewed and framed under a coherent and practical framework, outlining how and which QM and SCM principles would be best suited for sustainable development, in line with the research questions 3 and 4. As a result, propositions were formulated (positive relationships synthesised as outlined in sections 4.3.1.1 to 4.3.1.8), outlining linkages between QM, SCM principles and triple bottom line sustainability, and resulting in an organisational improvement construct from the important lens of sustainable management and development.

Drawn from the conceptual construct, the strategy towards development of the implementation procedure comprised of a literature review from a practical managerial perspective, both critically reviewing the extant frameworks in the literature and devising the steps specific and essential to the implementation of the sustainability synergistic QM and SCM principles for sustainable development of organisations. As part of the implementation procedure development, a road map for industrial implementation and operationalisation was constructed, outlining the steps required for integration and improvement of sustainability in the organisational context, in line with the research question 5. With a view to facilitate one of the key steps in the implementation procedure (current state analysis), a business diagnostic tool was developed, enabling organisational maturity assessments of the QM and SCM principles identified as sustainable development synergistic.

3.4. Research Strategy – Verification and Validation

3.4.1. Verification and Validation

Verification is defined as the "the process of checking, confirming, making sure, and being certain, with a view to ensure reliability and the rigour of a research study" (Morse et al., 2002). The key principle of verification is based on the establishment and correction of errors with a view to align and direct the conceptual development and associated data collection to deliver a "solid product" (Kvale, 1989; Morse et al., 2002). The conceptual framework constructed in this research was based on the positive relationships formulated between QM, SCM and sustainability. In other words, the propositions (i.e. positive linkages put forward between the eight management principles derived from the QM and SCM domain to facilitate organisational sustainability integration and improvement) between QM, SCM and sustainability from the lens of integration and improvement of business sustainability laid the foundations of the implementation procedure and diagnostic tool solution developed in this research. In the light of this perspective, the confirmation and refinement of the conceptual framework developed was referred to as "verification", as it provided the basis and the grounding for the practical implementation procedure and diagnostic tool construction.

From a managerial perspective, the conceptual modelling and validation are highly related processes, validation standing for testing the level of "usefulness, practicality and representativeness" of any management framework development (Landry et al., 1983). As part of the validation process, "the degree of relevance of assumptions and theories underlying the conceptual framework developed against a problem situation for the intended users and use of the framework" is evaluated (Landry et al., 1983). In the case of this research, the implementation procedure and the diagnostic tool developments represented the more practical aspect of the research, detailing the steps required for realisation, application and operationalisation of the conceptual framework formulated against the research aim, the testing of these components incorporated as an important step of the research and referred as "validation". The validation of the implementation procedure and diagnostic tool developments were conducted in two stages through both expert input and application studies as outlined below:

- *Validation Stage 1:* Validation through expert feedback
- *Validation Stage 2:* Validation through application in the organisational integration and improvement context

3.4.2. Verification and Validation Through Expert Feedback

Capturing of participant opinions from knowledgeable specialists in the area of investigation regarding the "reasonableness and accuracy" of the novel development is a frequently used technique for validation (Landry et al., 1983). According to Saunders et al. (2015), collecting expert opinions is one of the principle ways of conducting exploratory research. Meyer and Booker (1991) described expert judgement as "invaluable for assessing products, systems, and situations for which measurements or test results are sparse or non-existent". Expert participant feedback collection offers remarkable advantages over non-expert feedback collection, resulting in enhanced levels of data correctness and completeness, which was selected to be adopted to contribute towards a more rigorous verification and validation (Charness and Tuffiash, 2008; Ehrich et al., 2018; Rowe and Wright, 2013; Shanks, 1997). Figure 3.3 schematically frames the verification and validation strategies adopted for confirmation and development of the conceptual framework, implementation procedure and diagnostic tool synthesised in this research, utilising subject matter expert opinions and feedback.

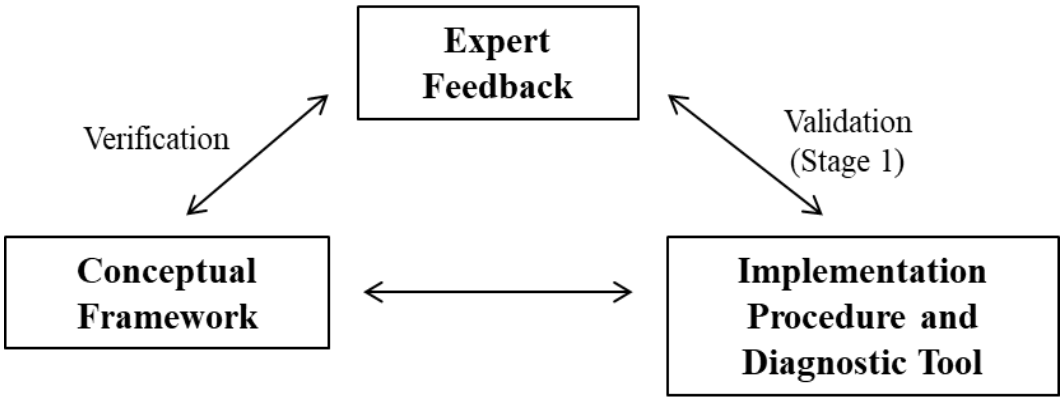


Figure 3.3: Verification and validation strategies adopted through expert feedback

3.4.3. Delphi Method Selection for Expert Verification and Initial Validation

There are a number of quantitative and qualitative strategies that can be utilised for capturing and analysing expert feedback data towards addressing the research question 6, including the Bayesian method (Meyer and Booker, 1987), Delphi method (Clayton, 1997), critical decision method (Hoffman et al., 1998), grounded theory (Pidgeon et al., 1991), case study (Macquet, 2009), and content analysis (Agarwal and Tanniru, 1991). Delphi method was favoured against other methods for verification and validation as it "allows access to the positive attributes of interacting groups (such as knowledge from a variety of sources and

creative synthesis), while pre-empting the negative aspects that often lead to suboptimal group performance (attributable to social, personal, and political conflicts)" (Rowe and Wright, 2013). Moreover, the Delphi method was seen to be flexible and appropriate for adoption of a mixed-method design for capturing of both quantitative and qualitative expert feedback for a more comprehensive data collection and analysis. Additionally, its key features of iterative structure, anonymity and controlled feedback capture were noted to be highly suitable (Rowe and Wright, 2013).

Delphi study is a highly utilised method for construction, verification, pioneering and validation of novel concepts (Fernández-Llamazares et al., 2013; McMillan et al., 2016), adopted in a wide range of subjects including systems management (Brancheau et al., 1996), international business (Griffith et al., 2008), innovation management (Munier and Rondé, 2001), and medical (Chang et al., 2010), especially in the cases of no or highly limited comparable sources being present in the area of novel concept developed (Linstone and Turoff, 1975). A panel of experts are selected as per a set qualification criteria and the experts anonymously express their opinions, feedback and criticism about the novel development through independent surveys, with a view to verify its theoretical and/or conceptual standpoints, validate its practical stances, and improve its practical relevance and significance (Dalkey and Helmer, 1963; Hung et al., 2008; Linstone and Turoff, 1975). The researcher then analyses the feedback, summarises the results and confirms the aspects where consensus has been established. The concept is then updated in the light of the expert feedback and re-shared with the panel of experts, until consensus is reached on all aspects (Dalkey and Helmer, 1963; Hung et al., 2008; Linstone and Turoff, 1975).

Driven by the pragmatic worldview adopted, a convergent parallel mixed-method design was adopted for the Delphi study, utilising between-method triangulation through quantitative (consensus / percent agreement analysis) and qualitative (open-ended questioning and thematic synthesis) elements to not only quantitatively gauge the expert agreement levels on the various aspects of the conceptual framework, implementation procedure and diagnostic tool, but also to qualitatively provide the experts with the opportunity of freely discussing their views and suggestions for improvement.

Validation criteria for Delphi studies include the confirmation of practical relevance aspects of the proposed solution (conceptual framework) such as correctness, completeness, clarity and conciseness (Holsapple and Joshi, 2002), which are aspects key to operationalisation of the conceptual framework as per the research question 6. Correctness of the proposed

conceptual solution in this context refers to compatibility and consistency of its elements with stated theories and methodologies; completeness refers to the validity of its context and its completeness as a management framework to drive continual sustainable development; clarity refers to the objective perception of its contents along with its adequacy for practitioner understanding and; conciseness represents the simplicity and practicality of its contents and structure for practitioners.

3.4.4. Data Collection and Analysis Methods for Delphi Study

With a view to develop a management solution applicable and generalisable to a significant range of industries and geographical regions, experts from a wide base of industrial backgrounds and regions were selected to take part in the Delphi study. This limited the choice of data collection methods for the Delphi study to a certain extent due to time and resource constraints. As part of these limitations, methods such as the case study, focus groups and face to face interviews were discounted as the time and resources available for the study would not allow for visiting of the participants from various regions and industries.

As a result, the online survey method was seen to be the most appropriate and efficient method for the collection of independent expert feedback, allowing the flexibility to accommodate the mixed research design (qualitative and quantitative components) in line with RQ6 and the verification and validation objectives. As a result, the Delphi study was justified to be undertaken via an online survey, constructed in the Google Forms platform, which is a free, user-friendly and a highly recognised online research survey tool, taking into account the key considerations for a robust data collection, minimised bias and errors with reference to the online survey method (Statistics NZ, 2015).

Prior to circulation to the Delphi panel participants and data collection, a pilot test was run on the online survey, where ten native English speaker colleagues completed the survey, which is typically regarded as the minimum number of participants for pilot survey tests (Saunders et al., 2015). It was confirmed that all pilot test respondents completed all the questions as per the guidelines, with no issues, and the online form captured all the quantitative (Likert scale) and qualitative (open-ended questions) data accurately and in full.

In the initial design, a Likert scale consisting of five levels (strongly disagree – 1; disagree – 2; neither agree, nor disagree – 3; agree – 4; strongly agree – 5) was adopted to quantify the level of expert agreement or disagreement on the various conceptual aspects of the development (Allen and Seaman, 2007; Matell and Jacoby, 1971). However, it was observed

in the pilot test that, a number of participants were inclined towards the neutral scores on various aspects (neither agree, nor disagree – 3), which would be an undesirable outcome for consensus building during Delphi verification and validation studies.

Garland (1991) argued that such inclination towards the neutral level can occur due to "respondents' desires to please the researcher or appear helpful or not be seen to give what they perceive to be a socially unacceptable answer", which are also highly applicable to the social phenomenon of sustainable development. For this reason, the mid-point level (neither agree, nor disagree – 3) was removed as a countermeasure, resulting in a Likert scale consisting of four levels as recommended by Garland (1991), who put forward elimination of the neutral response as a solution for studies that are looking to develop a clear picture on a phenomenon.

As an exception, for capturing of expert feedback on the relative importance of QM and SCM principles for integration of sustainability, a higher level of granularity was embedded (9-level Likert scale) to enable capturing of the level of detail required for establishment of relativity among several principles. Such an amendment and adoption of a higher level of granularity in the Likert scale is recognised, as "the optimal number of scale categories is content specific and a function of the conditions of measurement" (Cox, 1980; Garland, 1991).

From a qualitative data capture point of view, open-ended questions were included to enable the experts to freely discuss their opinions, express their concerns and outline their suggestions with reference to various aspects of the conceptual developments. According to Singer and Couper (2007), open-ended questioning technique "has an established and deeply rooted history in surveys, contributes towards more respondent-focused surveys, enhances the accuracy and usefulness of the data collected, and provides the breadth as well as the representativeness of coverage at little additional cost". No problems or concerns were reported regarding the open-ended questions and qualitative feedback data collection during the pilot test.

Subsequent to the pilot test and refinement step, the experts were selected as per a defined criteria, invited through formal letters and a Delphi panel formed, all expert panellists providing their feedback on the predetermined set of verification and validation questions through the online survey (de Vaus, 2001). The Delphi study survey template utilised is provided in Appendix Four.

For analysis of qualitative expert feedback and generation of key themes, a number of methods are available in the literature such as meta-ethnography, meta-analysis, grounded theory, content analysis and thematic synthesis (Barnett-Page and Thomas, 2009; Thomas and Harden, 2008). Due to its structured approach (Castleberry and Nolen, 2018), and its particular suitability and rigour for generation of key themes, the decision was made to adopt thematic synthesis method in the Delphi study, with a view to establish key improvement suggestion areas as per the expert feedback to strengthen the conceptual developments (Barnett-Page and Thomas, 2009).

Verification and validation through reaching expert consensus lies at the heart of Delphi studies, for which various perspectives in the literature can be observed such as the quantification of uncertainty levels regarding a particular aspect, acceptance above a certain percentage of agreement and the extent of expert feedback on a particular aspect (Black et al., 1999; Diamond et al., 2014; Graham et al., 2003; Hsu and Sandford, 2007a; Linstone and Turoff, 1975). A significant ratio of Delphi studies adopted percent agreement approach for establishment of consensus (Diamond et al., 2014), which was judged to be an appropriate and objective way of defining consensus thus, selected for adoption in the Delphi study of this research.

The data collection and analysis process adopted in the Delphi study is portrayed in Figure 3.4.

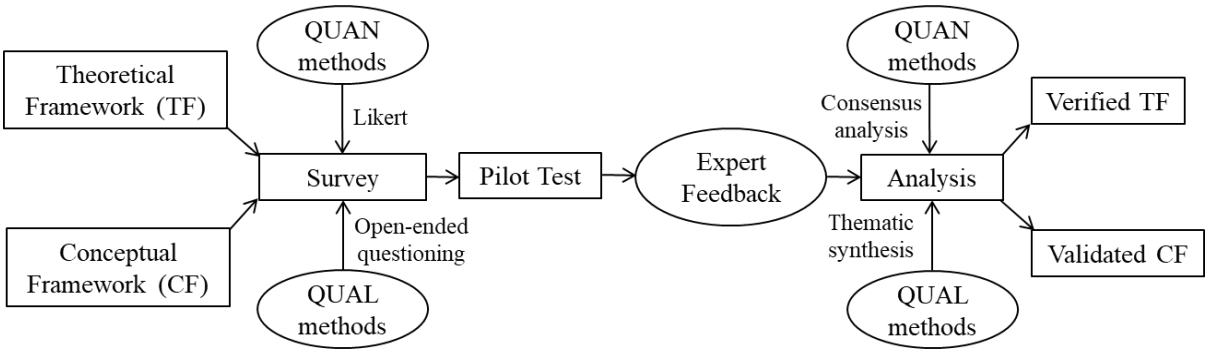


Figure 3.4: Data collection and analysis processes adopted in the Delphi study

3.5. Research Strategy – Application for Final Validation

3.5.1. Implementation of Research Outcomes

Formulating research ideas, solutions and road maps highly related to managerial practice and current managerial issues is identified as central to management research, influencing change, business transformation and improvement in the key areas of stakeholder concern, such as sustainable development (Saunders et al., 2015). This view is resonated by Easterby-Smith et al. (2012), that placed a key emphasis on the triggering of practical managerial actions for better business results, management research facilitating implementation of dynamic stakeholder requirements (e.g. sustainability) through advancing knowledge and providing new theories and concepts. The stakeholders in this context include the legislative bodies, the bank, the local communities, shareholders or business ownership, and employees. Stemming from these standpoints, subsequent to the verification and initial validation stage of the framework synthesised, a final application step was undertaken as the final stage of the validation process (validation stage 2) to implement the research outcomes in their natural setting (organisational context), addressing the research question 7 and endorsing the practical contributions of the research.

This final validation and application step offered the following opportunities, contributing towards formulation of a comprehensive management solution for facilitation of business sustainability integration through QM and SCM principles:

- Sustainability integration in organisations is a complex matter due to multi-dimensional agendas involved and potential conflicts with the existing agendas and management practices in place (Machado et al., 2017; Morioka and Carvalho, 2016a; Schrettle et al., 2014; Williams et al., 2017). The application step enables detailed demonstration of how to apply the verified and validated solution, facilitating its communication to and adoption by its potential industrial implementors.

- The actual effects, influences and outcomes of the solution can be studied in its intended context, including evaluation of its impact on the key management aspects of maturity assessment, current state and risk analyses, decision-making, improvement action formulation and sustainable development of organisations.

- Parameters key to implementation of the solution can be investigated empirically and in depth, including the enablers, barriers and other context-specific business factors, essential to business change management and effective operationalisation.

3.5.2. Action Research for Application and Contextual Investigation

With a view to reach an informed and suitable methodological decision for the application research step, the following requirements were formulated:

The application research method needed to;

- Enable the appropriate conditions for application of the conceptual framework, tackling the organisational transformation challenges with regards to integration of sustainability into business management practices.

- Facilitate a collaborating environment between the researcher and the participating organisation, supporting the researcher to conduct detailed observations and rigorous data collection with reference to application of the solution.

- Be compatible with the application study being mainly carried out in the field (at the implementing organisation), with a practical, change and futuristic focus.

- Foster delivery of practical insights to industrial practitioners for implementing and operationalising the solution developed, outlining the key factors for successful implementation.

Action research and case study were the two main methods that were identified in the light of requirements outlined above in the operations research domain (Dresch et al., 2015). Although the two methods have certain aspects in common (e.g. both concentrate on specific contexts, both develop insights on how things are and how they behave in their natural settings etc.) (Dresch et al., 2015); a key difference is the role and position of the observer during the implementation and data collection stages (Baskerville, 1997). In case studies, the researcher is an observer of the phenomenon under investigation with limited or no participation in the situation being researched (Yin, 2003), whereas in action research, the researcher is in close cooperation with the participants, experiencing the phenomenon under investigation through introducing the actions jointly and observing their effects at first hand (Brydon-Miller et al., 2003).

The participative, change-oriented, problem-driven and collaborative essence of action research was reflected upon as a better fit to the aim and objectives of this research, where the management solution formulated was applied together, in collaboration with the senior leadership of the participating organisation, with a direct positive effect on the level of engagement and depth of data collected. First introduced by Kurt Lewin in the 1940s (Lewin, 1946), action research is articulated by Reason and Bradbury (2001) as following:

> ***Action Research:*** *"a participatory, democratic process concerned with developing practical knowing in the pursuit of worthwhile human purposes, grounded in a participatory worldview which is emerging. It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities"*

In action research, the researcher "observes from within, an objective situation of the real world, with a view to both improve it and to acquire knowledge of it" (Checkland and Holwell, 1998). Through action research, insights into "how a member of a particular group performs an action, how and why such action may change or improve the functioning of a system, and how the process of change or improvement allows the generation of learning" are developed (Coghlan and Brannick, 2001). Kurt Lewin constructed action research on the basis of advancing understanding of systems through attempting to change them (Lewin, 1946). Action research capitalises on the cooperation of participants that bring together diverse knowledge, skills, and expertise, enhancing the exchange of information, learning and knowledge building (MacDonald, 2012).

Moreover, the cyclic and systematic nature of action research approach was anticipated to facilitate the observation process of the solution's application and its effects (Collatto et al., 2018). Action research's problem-solving orientation and practical nature was also seen to be synergistic with the pragmatic worldview embraced in this research, and compatible with the mixed-method design selected, allowing for adoption of both qualitative and quantitative methods during the application of the solution. Change is at the heart of action research, which offered a fit with the aim of this research from the point of view that the research targeted to catalyse organisational change towards sustainable management and development under the facilitation of QM and SCM philosophies.

Action research method's suitability and effectiveness in management and sustainability research was further evidenced where Hind et al. (2013) used this strategy in their investigation with reference to incorporation of sustainability in organisational practices to drive improvements, concluding that action research "is an appropriate process for investigating, initiating and supporting new sustainability management practices in organisations".

Tripp (2006) outlined the key stages of action research as following, which were applied to this research and schematically represented in Figure 3.5:

- *Plan:* includes all planning activities such as the confirmation of resources required for the study, identification of and agreement with the organisation that will take part in the study, and establishment of data collection methods and protocols to be utilised during the study.

- *Act:* comprises of the implementation of the solution developed that stems from the verified conceptual framework and initially validated implementation procedure.

- *Describe:* revolves around the contextual observations and articulations during the application of the framework and the associated implementation procedure. The effects of the actions implemented are established and factors key to operationalisation are noted.

- *Evaluate:* contains the analysis on the outcomes of the implemented framework, revisiting the solution in the light of the observations and learnings captured during the application stage.

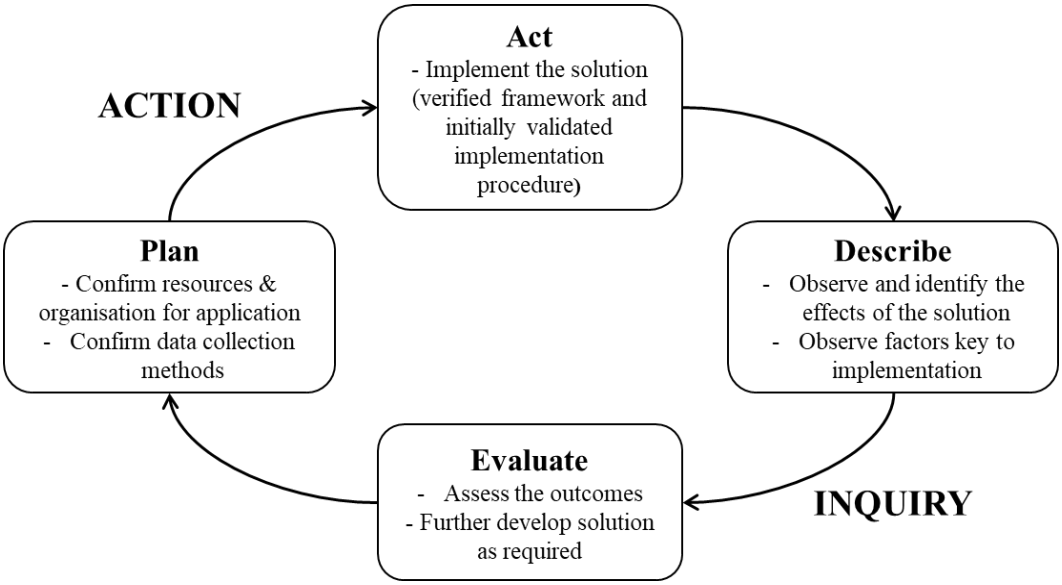


Figure 3.5: Action research strategy and inquiry cycle adopted
(Adapted from: Tripp (2006))

3.5.3. Data Collection and Analysis Methods for Action Research

Given its clear advantages, the mixed-method design was carried over to this final step of the research, triangulating qualitative and quantitative data for a comprehensive assessment with a view to capture practical insights into the application and operationalisation of the management solution developed. This mixed design generated both quantitative and qualitative data for analysis, supporting further development of the research framework and its outputs. The following qualitative and quantitative data collection and analysis methods were deployed against the key research objectives of the action research towards addressing the research question 7:

- Practical evaluation of each implementation step of the conceptual framework (participative observation / discussion; thematic synthesis for analysis; qualitative)

- Assessment of enablers, barriers and other factors to implementation including change management (participative observation / discussion; thematic synthesis for analysis; qualitative)

- Observing the effect of synthesised theories and concepts on sustainable management maturity, sustainability integration and improvement decision making of the organisation (measurement of associated levels before and after the activity; comparative analysis; quantitative)

Participative observation and discussion was selected as an appropriate method for the qualitative data capture, as this approach allows the researcher to freely interact, record observations continuously and have open discussions with the leadership of the implementing organisation with a view to analyse the key issues during the implementation period (Kawulich, 2005; Savage, 2000; Vinten, 1994). For consistency and due to its strength in generation of key themes (Barnett-Page and Thomas, 2009), the thematic synthesis method was adopted for establishment of key information within the qualitative data captured.

On the quantitative side, the levels of sustainable management maturity, sustainability integration and sustainability improvement action formulation capability were measured to gauge a clear picture regarding the sustainable management and development of the participating business. Comparative analysis (before and after analysis) approach was adopted for the analysis of the quantitative data collected to establish the situation before and after the application, with a view to confirm any impact realised post the implementation through action research study (Gravelle et al., 2007).

As the conceptual framework, implementation procedure and diagnostic tool were verified and initially validated through participants from a wide base of industries and regions; the detail of data collected in line with the research objectives, and the level of cooperation were noted as the deciding factors during the selection of single or multiple cases for the action research study. The investigation was justified to take place in a single organisation to enable focus on a single case for an in-depth application and analysis of the issues. According to Yin (2003), single cases of organisations can be utilised to enhance concentration with the advantage of developing a comprehensive picture regarding the phenomenon under investigation.

Undertaking the action research on a single organisation contributed to the establishment of a close, effective and collaborative working relationship with the senior leadership of the participating business (Baxter and Jack, 2008). The senior leadership of the organisation selected shown significant interest in the research, providing the necessary resources, time and commitment for the study. The director of the business committed to take active part in the study, with a view to utilise the developments introduced by the research to integrate and improve sustainability of his business under the facilitation of the researcher. Further details on the organisation that took part in the action research study for final validation stage of the research are provided in Chapter 6.

3.6. Summary and Conclusions

This chapter presented the approach adopted in this research, detailing the steps taken towards addressing the research questions and achieving the research objectives. The key constituents of research approach were outlined as the worldview, design and methods (Creswell, 2013). A pragmatic worldview was embraced, due to its problem-centred, flexible, practical nature and its suitability to management research (Saunders et al., 2015), reflected upon as highly compatible with the aim and objectives of the research.

The conventional research approaches of quantitative and qualitative were reviewed and their pros and cons noted. It was observed that this research would not sit comfortably with a mono-method as the quantitative methods would fall short in terms of addressing the contextual and social aspects of the sustainability and management fields, and the qualitative methods on their own would not be adequate to develop a management solution applicable to a range of industries and regions. With a view to capitalise on the strengths of both methods (and mitigate their weaknesses), a mixed-method design was justified to be adopted. Deductive approach was preferred over inductive, following the research path of generating a conceptual framework prior to data collection phase, enabling the advantages of guidance and facilitation provided to empirical phases, enhanced research structure and formality, and placing the research into the existing body of knowledge.

In line with the research questions and objectives, the research comprised of the three key phases of literature review (RQs 1 and 2), conceptual development (RQs 3, 4 and 5), and empirical data collection and analysis (RQs 6 and 7). To confirm (and refine if required) the conceptual relationships and standpoints formulated, a verification step was designed to be undertaken; and to ensure the representativeness, practicality and usefulness of the implementation procedure and diagnostic tool solution formulated (Landry et al., 1983), a validation step consisting of two stages (i.e. expert feedback and application) was justified.

The Delphi study, utilising a mixed-method design was selected to be deployed, as a flexible, structured, rigorous and iterative approach to collection of expert feedback for verification and initial validation of novel developments (Rowe and Wright, 2013). Finally, action research step was adopted with a view to implement the research outcomes, demonstrate the application of the conceptual solution developed, to investigate its contextual implementation factors (barriers, enablers etc.) in a real business setting and to analyse its effects on the organisational management practices through a participatory approach, deployed as the final

step of data collection for validation.

The overview of the research design, phases and methods adopted is presented in Table 3.2, aligned to the research questions and outcomes.

Table 3.2: Research Design, Questions and Methods Overview

Phase	Research Questions	Study	Research Design & Methods	Outcome	Output
Literature Review	RQ1 & RQ2	Critical review of the literature	Systematic Literature Review Mixed-method design including: Qualitative (thematic synthesis) & Quantitative (descriptive analysis) elements	Key concepts for the research including sustainability, QM, SCM, LSS and CE critically assessed. Fundamental integration issues, interdependencies, synergies, complications identified. Literature gaps evidenced.	SLR paper published in JOCLEPRO Ref: Bastas and Liyanage (2018a) ✓
Conceptual	RQ3 & RQ4	Construction of Conceptual Framework	Literature review Conceptual development Deductive approach adopted	Relationships between QM, SCM and sustainability synthesised. Relevant QM, SCM approaches and principles reviewed conceptually. Conceptual framework constructed.	Conceptual article contribution confirmed in Sustainable Production and Consumption journal Ref: Bastas and Liyanage (2019) ✓
	RQ5	Development of Implementation Procedure and Diagnostic Tool	Literature review from a business implementation point of view	Implementation Procedure for industrial operationalisation formulated along with a business diagnostic tool to aid implementation.	
Empirical	RQ6	Verification & Validation Stage 1	Delphi Study Mixed-method design through online survey including: Qualitative (open-ended inquiries) & Quantitative (Likert) assessments	The conceptual framework verified through subject matter expertise. Implementation procedure and the diagnostic tool contributions initially validated and developed further through expert feedback.	Delphi study article published in Sustainability (MDPI) journal Ref: Bastas and Liyanage (2018b) ✓
	RQ7	Validation Stage 2	Action Research Application of the framework in a real industrial case via mixed-method design including qualitative (participative observations) & quantitative (maturity measurements) assessments	The application and contextual factors of the framework, implementation procedure and the diagnostic tool developments explored and demonstrated through industrial implementation and observation as part of the final validation step.	Action research study article contribution accepted for publication in Sustainable Production and Consumption journal. ✓

CHAPTER 4 – CONCEPTUAL FRAMEWORK

4.1. Introduction

This chapter presents the conceptual development aspects of the research, in line with the research questions 3, 4 and 5. A detailed review of the extant management models and frameworks integrating QM, SCM and sustainability is undertaken, evidencing the gaps further, establishing key opportunities and forming the basis for a robust conceptual construction. Structured around the key ingredients of conceptual development (description, explanation and context), a conceptual framework integrating QM, SCM and sustainability for sustainable development of organisations is formulated, defining how QM and SCM approaches can facilitate sustainability integration and which principles of the same are in pole position for a coherent and synergistic framework as per the RQs 3 and 4. Taking the conceptual construct as its backbone, an implementation procedure for implementation and operationalisation is introduced towards addressing the RQ 5. Finally, a novel, organisational diagnostic tool to facilitate implementation of one the key steps in the implementation procedure (maturity and risk assessment for current state analysis) is presented.

4.2. Review of Extant Models and Gap Analysis for Conceptual Development

4.2.1. Review of Extant Models Integrating QM, SCM and Sustainability

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). Stemming from this perspective, a further step of literature review specifically from the lens of conceptual development towards a management solution formulation was deployed. As part of this directed and more specific literature investigation, the 93 articles included in the systematic literature review were re-assessed for inclusion. The inclusion criteria focused on the key feature of "relevance to conceptual development" phase of the research, all literature materials introducing management frameworks that integrate QM, SCM and triple bottom line sustainability being considered as relevant. As part of this re-assessment process, all 93 articles captured as part of the SLR protocol were evaluated whether they assessed integration from a business integration perspective, including the research on integration principles, practices and mechanisms. As part of this process, more generic works such as literature reviews were excluded, and 42 theoretical, conceptual and empirical studies were identified as relevant. This contributed to evidencing of gaps from a

conceptual point of view, supporting a holistic view for framework development. The process adopted with reference to this literature review is presented in Figure 4.1.

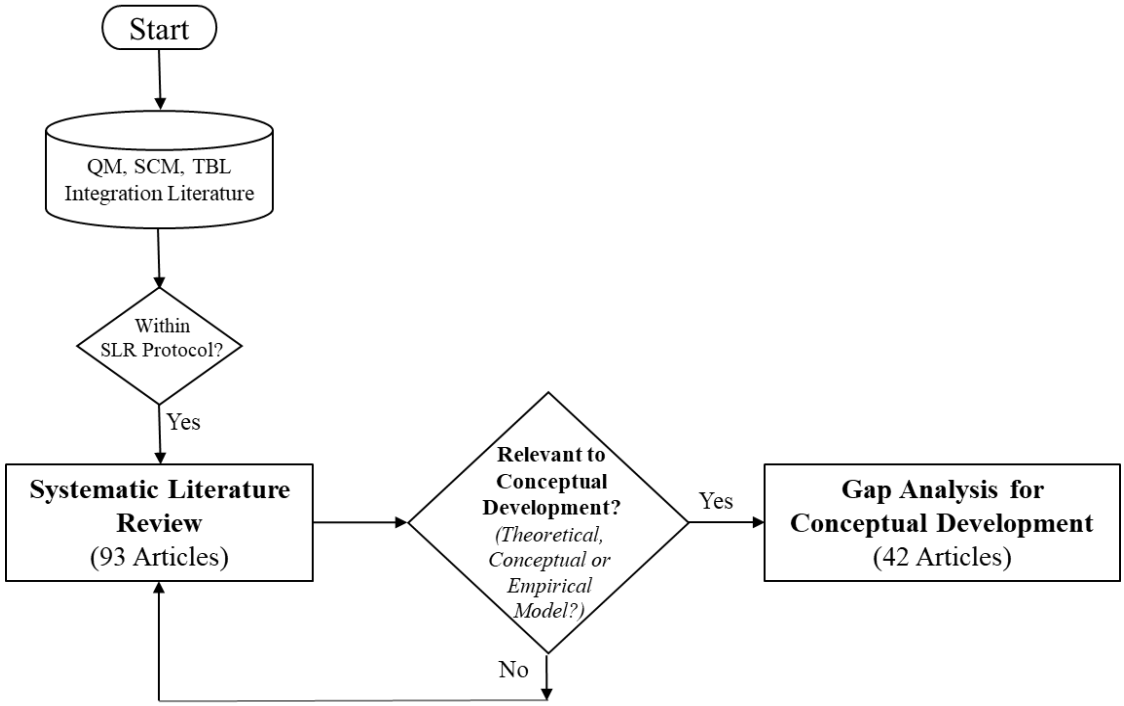


Figure 4.1: Literature review process for extant, integrated management models gap analysis from the lens of conceptual development

As part of this critical literature review step for conceptual development, the extant constructs were assessed in relation to full or partial incorporation of triple bottom line (economic, environmental and social), taking into account the resonance in the sustainability integration literature that fully integrated approaches are imperative for true sustainable development (Ansari and Qureshi, 2015; Gold and Schleper, 2017; Reefke and Sundaram, 2016). The key contributions of the articles were extracted, and the strengths and weaknesses were noted from a lens of collective integration. Only 30% of sustainability integration research identified under the SLR protocol involved QM and QM related issues, pointing towards potential gaps in this domain. Considering this significant shortfall in the QM integration research domain, particular attention was given to this area, elaborating on key approaches (e.g. TQM, ISO 9001, EFQM and MBNQA), with a view to explore potential opportunities, reveal hidden gems and provide further insights. The findings of this critical evaluation are tabulated in Table 4.1, facilitating gap analysis and providing a current state map of the integrated models under the research domain. The opportunity noted for conceptual articulation and development of the emerging research line, sustainable supply chain quality management (SSCQM) was denoted in amber, placing the framework in the extant literature.

Table 4.1. Integrated SCM, QM and sustainability management models overview and gap analysis

Author(s) (Year)	SCM	TQM	ISO 9001	EFQM	MBNQA	Other QM	Sustainability			Remarks
							Econ.	Envir.	Social	
Agi and Nishant (2016)	✓		✓					✓		Confirmed a positive relationship between quality management principles (ISO 9001) and organisational 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 organisational sustainability through QM processes and value co-creation.
Asif et al. (2011)				✓	✓		✓	✓	✓	Proposed an integrated framework using EFQM and Baldridge models to incorporate TBL aspects and indicators into business processes, derived from stakeholder requirements.
Azar et al. (2010)	✓	✓								Suggested that TQM practices are interdependent across supply chains, and SCQM has the potential to improve performance.
Azizi et al. (2016)	✓	✓								SCM and TQM principles considered for an integrated SCQM model construct. Put forward that SCQM positively contributes to competitive advantage of businesses.

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.
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 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. Suggested 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. Suggested a 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 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 leaders at five automotive companies in Portugal.
Grosvold et al. (2014)	✓						✓	✓	✓	Articulated sustainable supply chain performance as the result of SSCM (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 organisations.
Jabbour et al. (2015)	✓							✓		Conducted an empirical study on relationships between GSCM practices and environmental performance indicators. Links with QM not included along with social and economic sustainability dimensions.
Jabbour et al. (2014)	✓	✓	✓					✓		Established relationships between SCM, QM and sustainability performance although, social and financial dimensions were not included. QM (ISO 9001, TQM and supplier quality certification) was identified as the key antecedent of environmental management, GSCM and green performance of organisations.
Jraisat and Sawalha (2013)	✓					✓				Outlined the key role of quality control in improving SC performance. Effects on SC sustainability performance not considered.

Kuei and Lu (2012)		✓					✓	✓	✓	Developed conceptual framework, integrating TQM principles and sustainability management. The framework proposed did not employ SCM practices and supply chain thinking.
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, utilising SCM and EFQM approaches with a view to develop an integrated framework. Links with sustainability/TBL performance not studied.
Lin (2013)	✓							✓		Studied 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 organisational performance. Concluded that key TQM practices can be integrated into supplier participation programs, leading to increased cross-enterprise cooperation, and hence, enhanced organisational 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 were not included, the framework did not consider the integrated TBL sustainability view, and QM practices were not studied.
Mellat-Parast (2013)	✓					✓				Established firm level and supply chain level QM practices and their effects to buyer-supplier satisfaction and performance. Links with sustainability/TBL performance not studied.
Quang et al. (2016)	✓					✓				Formulated a SCQM structural model that set out direct and indirect relationships with firm performance. Links with Sustainability/TBL not identified.
Rusinko (2005)						✓		✓		Developed a framework that expands Deming's PDSA 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.
Schmidt and Schwegler (2008)	✓							✓		Provided a decision-making aid, considering cumulative environmental sustainability indicators across the supply chain network. The framework did 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 ISO 9001 and SCM integration, resulting in creation of a ISO 9001 based supply chain quality management system. The potential advantages that could be obtained from such a system from the sustainability point of view were not 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.
Somsuk and Laosirihongthong (2016)	✓						✓	✓	✓	Impact of GSCM practices and drivers on economic, environmental and social sustainability performance studied. The potential relationships and influence of QM practices not explored.
Srdić and Šelih (2011)			✓					✓		Put forward an integrated quality and environmental sustainability performance management framework for sustainable development of construction projects, incorporating ISO 9001, ISO 14001 and environmental sustainability.
Stindt (2017)	✓							✓	✓	Framework proposed to assess environmental and social sustainability impact of various SCM practices. The assessment is conducted specific to each sustainability dimension as opposed to an integrated and holistic TBL approach. The potential relationships and influence of QM practices not explored/included.
Tsoulfas 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 with 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. Concluded that the internal implementation of QM practices is fundamental to customer satisfaction. Links with sustainability/TBL not identified.
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. Links with sustainability/TBL not identified.
Opportunity: *Sustainable Supply Chain Quality Management (SSCQM)*	✓		✓				✓	✓	✓	*Opportunity noted for a framework that incorporates the organisational synergies offered by the ISO 9001 QM principles, reinforced both internally and externally through the key SSCM principle, supply chain integration, for organisational sustainable development.*

4.2.2. Gap Analysis for Conceptual Development

The 42 management models integrating QM, SCM and sustainability, established as part of the conceptual development literature review were critically evaluated from the point of features key to gap analysis for conceptual development (e.g. distribution of integration approach adopted, distribution of sustainability dimensions considered etc.).

As outlined in Figure 4.2, the 38% of the models (16/42) discussed integration of QM and SCM, establishing the highly growing and synergistic nature of integration between the two approaches, integration supporting managers to overcome weaknesses of both, organisational performance improvements and leading to enhanced collaboration across the supply chain network. 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 utilised 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, linking QM, SCM and TBL, and pointing towards remarkable synergies along with further potential for integration.

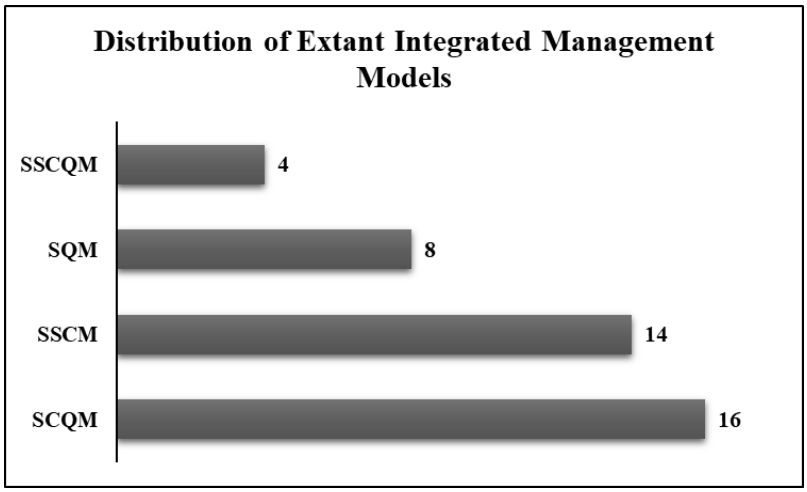


Figure 4.2: Distribution of extant management models, integrating QM, SCM and TBL

As demonstrated in Figure 4.3, the QM research taking TQM philosophy as the basis for an integrated management construct with SCM and/or sustainability, was noted as a focal integration research stream with 43% (12/28) of QM based integrated models incorporating this approach. The research integrating other key QM approaches such as ISO 9001, EFQM and MBNQA were observed to be highly limited, being noted as a gap for further analysis with potential unrevealed opportunities, in particular for ISO 9001 methodology.

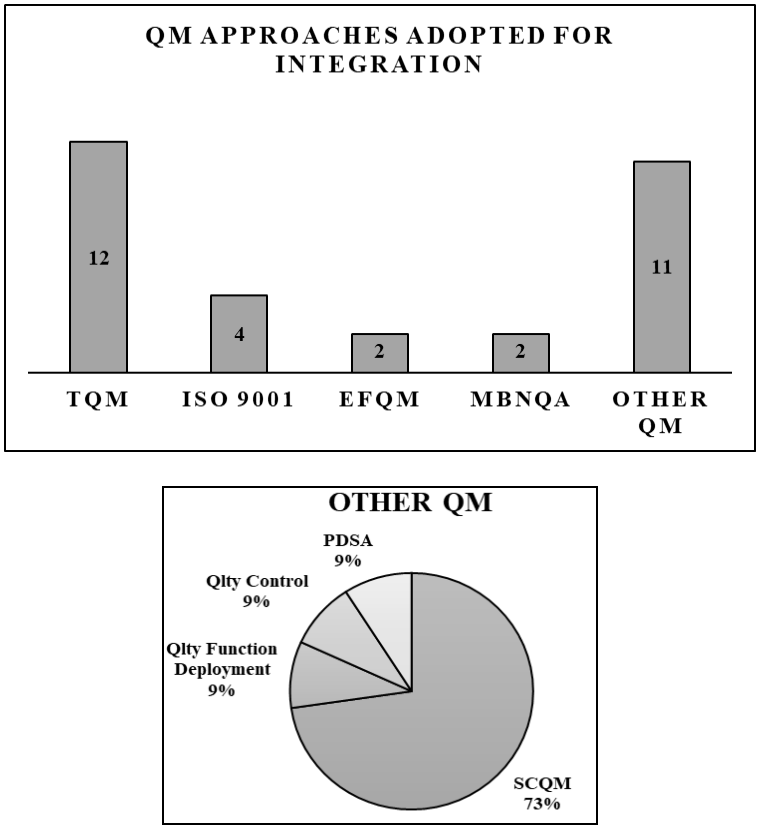


Figure 4.3: The distribution of QM approaches utilised in the literature for integration with sustainability and SCM

It was illustrated through Figure 4.4 that only 46% of the integrated models adopted a holistic approach, collectively taking into account economic, environmental and social sustainability (TBL) considerations. Additionally, it was seen that a remarkable portion of the literature (42%) only considered environmental sustainability considerations in their integrated models.

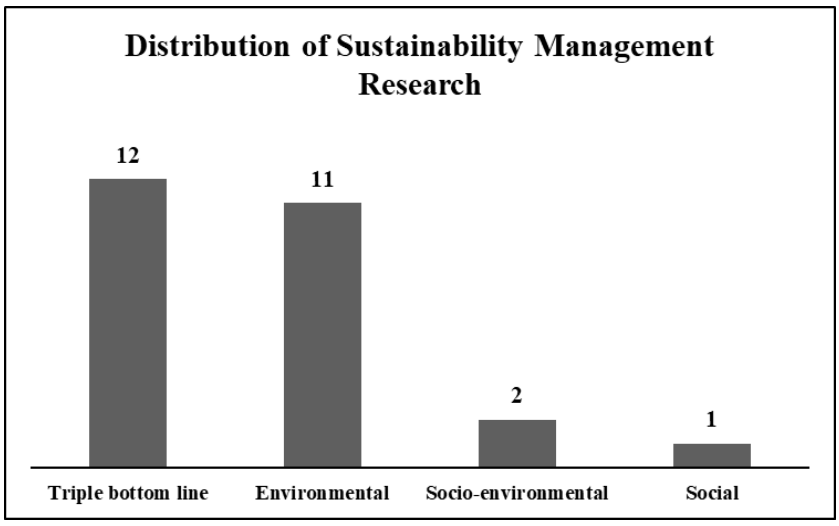


Figure 4.4: Distribution of sustainability management models with reference to TBL

This management research gap observation resonates with the sustainability integration literature that holistic and multi-dimensional management approaches are still very much required to support true organisational sustainable development (Ansari and Qureshi, 2015; Ashby et al., 2012; Awudu and Zhang, 2012; Beske and Seuring, 2014; Gold and Schleper, 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013).

In conclusion, taking into account:

- the development of the latest quality and supply chain management research;
- the sustainability research seeking approaches for full incorporation of TBL;
- the state-of-the-art integration research including Govindan et al. (2014), proposing prospective interdependencies between QM, SCM and supply chain TBL performance;

Further integration was projected, setting the direction for conceptual building; integrating QM, SCM and TBL sustainability, framed under the highly emerging and holistic concept named as "sustainable supply chain quality management (SSCQM)".

4.2.3. ISO 9001 as a Fruitful Avenue for Business Sustainability Integration

The two of the four models that were identified to collectively incorporate QM, SCM and sustainability were observed to include ISO 9001 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 (ISO 9001) in organisations 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 ISO 9001 as a building block for supply chain performance improvement, Carmignani (2009) discussing the increasing effect of ISO 9001 in driving improvements when implemented across the supply chain network, and Shalij et al. (2009) developing an integrated construct of ISO 9001 based SCM for higher performing organisations and supply chains.

Moreover, Allur et al. (2018) in their state-of-the-art systematic review study, concluded the facilitating role of ISO 9001 in the implementation of organisational environmental practices, and Jankalová et al. (2018) laid out the integral role of business excellence models and their associated management principles in organisational sustainability assessment. Rusinko (2005) underlined the high potential of ISO 9001 and quality management system implementation, putting forward that integration of ISO 9001 can provide structure and

support to driving sustainable development in organisations. A similar view point was shared by a study conducted on the incorporation of ISO 9001:2015 principles at banking sector, outlining that ISO 9001 principles possess the potential to facilitate sustainability improvements in organisations across all sectors (Luburić, 2015).

ISO 9001:2015 quality management framework, with over a million organisations certified around the globe in over 170 geographical areas and across a wide range of business sectors, has the following seven fundamental principles, which are also accepted as core principles by other management system frameworks such as organisational health and safety standard (i.e. ISO 45001) and environmental management system (i.e. ISO 14001) (Anttila and Jussila, 2017; Fonseca, 2015; ISO, 2015a):

- Customer focus
- Leadership
- Engagement of people
- Process approach
- Improvement
- Evidence based decision making
- Relationship management

ISO 9001 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, ISO 9001 certification is now a market standard to remain in business and a mandatory customer requirement therefore, ISO 9001 is widely implemented across many business sectors globally (Llach et al., 2011). Qui and Tannock (2010) supported this view, highlighting that the Chinese businesses adopt ISO 9001 to "facilitate acquisition of new business, improve customer relationships and enhance company image for marketing purposes", benefiting from the performance benefits capitalised from its support, structure and guidance to business management.

Unlike other QM approaches such as lean six sigma, there are less barriers to ISO 9001 implementation, and it is highly applicable to most business sectors including manufacturing (Briscoe et al., 2005; Koc, 2007), medical (Van Den Heuvel et al., 2005), education (Cheng et al., 2004), food (Fotopoulos et al., 2010), construction (Landin, 2000), banking (Luburić, 2015), and service (Psomas et al., 2013) sectors. Due to the remarkable demand levels in the

ISO 9001 standard across regions and industries (Llach et al., 2011), there are more training and support available to facilitate its implementation. Stemming from its deep roots and established history in business, ISO 9001 is better recognised by business managers in relation to other QM approaches.

As demonstrated in Figure 4.5, the number of organisations certified globally to ISO 9001 quality management is increasingly growing, underlining ISO 9001's significance for and impact on management of organisations in all geographical regions and business sectors (Astrini, 2018; Heras-Saizarbitoria and Boiral, 2013; ISO, 2017).

Figure 4.5: Worldwide ISO 9001 certification
(Source: ISO Survey (ISO, 2017))

Stemming from these facts, Anttila and Jussila (2017) described ISO 9001 as "the world's best-selling business management standard". Heras-Saizarbitoria and Boiral (2013) summarised the organisational benefits of adopting ISO 9001 as: "improvement of operational performance; greater customer satisfaction; improved relationships within the organisation; improvement in the internal efficiency of the company; improved image for competitors and stakeholders". Tarí et al. (2013) echoed with this view point, adding improvements in "profitability, systematisation, market share, product/service quality" to the benefits list, and indicating a trend of certified organisations performing better over non-certified ones due to remarkable improvements in the internal processes. Astrini (2018) evidenced that there is a high level of agreement among the cross-sectional empirical studies

that there is a positive linkage between ISO 9001 adoption and organisational performance.

Fonseca et al. (2019) in their highly recent empirical study, further evidenced the regional and sectoral diffusion of ISO 9001:2015 framework, putting forward that organisations with mature planning practices would realise remarkable benefits from its implementation, including facilitated organisational embracing of risk-based thinking along with "increased alignment with other management systems, increased top management commitment, enhanced identification of risks and opportunities, and more effective knowledge management". Such benefits are highly relevant to organisational sustainable development as risk-based thinking, analysis and action prioritisation are concepts located at the heart of sustainability integration and improvement in the business context (Asif and Searcy, 2014; Garcia et al., 2016; Nawaz and Koç, 2018; Perrott, 2015). Anttila and Jussila (2017), in their critical review of ISO 9001:2015 and business excellence models, emphasised the significance of simultaneous ISO 9001 implementation and integration with other management systems for coherent and effective organisational performance management.

On the other hand, the ISO 9001 methodology has certain barriers for its adoption by organisations including "top management commitment, employee resistance, difficulties associated with performing internal audits, lack of financial and human resources, and insufficient quality training, awareness and knowledge" (Al-Najjar and Jawad, 2011). In addition to these challenges, "short-sighted goal for getting certified, over-expectation on ISO 9001 standard, mandatory requirement (not wholehearted commitment) in some industries, and following others (the trend) in certification" were further established as barriers associated with its implementation however, with governmental supervision towards reinforcing the consulting and certifying bodies in conducting proper training, providing more structured communication about its benefits and enhanced support provided to its implementation, the effect of these factors could be mitigated (Zeng et al., 2007).

Nevertheless, Witjes et al. (2017) indicated a positive linkage between adoption of management systems (including ISO 9001) and corporate sustainability of SMEs, Engert et al. (2016) echoing with this view point that corporate sustainability and ISO 9001 adoption would complement each other. Jasiulewicz-Kaczmarek (2016) further resonated with these scholars, discussing the remarkable role of ISO 9001:2015 in organisational sustainable development agenda, describing the path of accomplishing sustainable development through ISO 9001:2015 and other ISO standards as "feasible and practicable".

However, despite its significance for organisations globally and its high potential indicated in a wide spectrum of integration literature, the extant literature on ISO 9001 integration with other management approaches and sustainability remains highly unexplored. The current body of knowledge was observed to particularly fall short in addressing the critical points of how this potential could be fully utilised, how such benefits could be fully capitalised from the lens of sustainability, and under which contexts or what circumstances. With a view to address the gaps evident in the literature, and to access this fruitful and fairly unrevealed potential for a holistic sustainability improvement model, ISO 9001:2015 framework was decided to be taken forward for further exploitation for conceptual framing.

4.3. Conceptual Framework

4.3.1. Conceptual Development

A "thorough" conceptual construction consists of four fundamental building blocks that describe, explain and contextualise the phenomenon under investigation, articulated as following (Bacharach, 1989; Dubin, 1978; Whetten, 1989):

- *What:* defines the variables, constructs and concepts that logically should be considered as part of the phenomena of interest, where comprehensiveness and parsimony should be balanced.
- *How:* introduces causality, describing the patterns and the relationships.
- *Why:* outlines the rationale for the psychological, economic or social dynamics and requirements, justifying the selection of constructs, concepts and causal relationships developed.
- *Who / where / when:* establish the contextual and temporal factors, describing the range, and the limitations of the propositions, which are typically explored or confirmed through empirical tests.

These four key ingredients of conceptual development were also noted to be in alignment with the research questions 3 and 4 outlined below, the comprehensive definition of which served towards paving the path for addressing the same:

RQ3: How can the QM and SCM approaches facilitate and/or accelerate integration of triple bottom line into organisational and supply chain mechanisms?

RQ4: What are the QM and SCM principles that can be coherently framed for

sustainable development of organisations and supply chains?

For establishment of principles and concepts forming the QM and SCM based business sustainable development phenomenon as part of the "what" ingredient (Dubin, 1978; Whetten, 1989); QM and SCM principles key to construction of such phenomenon were reviewed.

As part of this review, the key principles of QM approaches discussed in the literature with reference to sustainability literature were provided in Table 4.2 to allow for a comparative analysis among the approaches.

Table 4.2: Quality Management Framework Principles Comparative Analysis

ISO 9001 **Ref:** ISO (2015b)	**TQM** **Ref:** Black and Porter (1996)	**EFQM** **Ref:** EFQM (2013)	**MBNQA** **Ref:** MBNQA (2018)
Customer Focus	Customer Management, Customer Satisfaction Orientation, External Interface Management	Customer results	Customer-focused excellence
Leadership	Corporate Quality Culture & Strategic Quality Management	Leadership, Policy & Strategy	Visionary leadership (Strategy)
Engagement of People	People Management & Teamwork Structures	People	Valuing people (Workforce Focus)
Process Approach	Operational Quality Planning	Processes, Products & Services	Systems perspective
Improvement	Communication of Improvement Information	Results	Organisational learning and agility
Evidence based decision making	Quality Improvement Measurement Systems	Resources, Results	Management by fact
Relationship Management	Supplier Partnerships	Partnerships & Resources, Strategy	Societal contributions

A significant congruence between the principles of key QM approaches ISO 9001, TQM, EFQM and MBNQA was noted. This agreement pointed towards seven key areas, that revolved around and coincided with the seven principles outlined by ISO 9001:2015 framework. Furthermore, despite certain benefits offered by the TQM paradigm, and by its business self-assessment elaborations of EFQM and MBNQA, the level of dissemination, buy in or "take up" of these approaches by businesses across industries and geographical regions was seen to be relatively much lower in relation to the adoption of ISO 9001 framework (Allur, 2010; Brown, 2013). Stemming from this rationale, and given the detailed

argumentations established in Section 4.2.3 around its coherence, sustainability synergistic potential, comprehensiveness and wide implementation base globally, all ISO 9001:2015 quality management principles were identified as relevant and included from the QM side, as part of the conceptual construct (Agi and Nishant, 2016; Anttila and Jussila, 2017; Carmignani, 2009; Fonseca, 2015; Jabbour et al., 2014; Robinson and Malhotra, 2005; Rusinko, 2005; Shalij et al., 2009; Tarí et al., 2013).

On the supply chain management side, two key principles were noted to stand out during the analysis and synthesis of key themes for sustainability and SCM integration (SSCM), as part of the systematic literature review step of the research, highlighted in amber at Figure 4.6 below. As elaborated in Chapter 2 (Figure 2.18), during the thematic analysis undertaken as part of the systematic literature review, the supply chain integration and leadership principles of supply chain management were established as remarkable themes and "fundamentals" for integration of sustainability into organisations and supply chains by the SSCM literature (Beske and Seuring, 2014; Liebetruth, 2017; Rajeev et al., 2017).

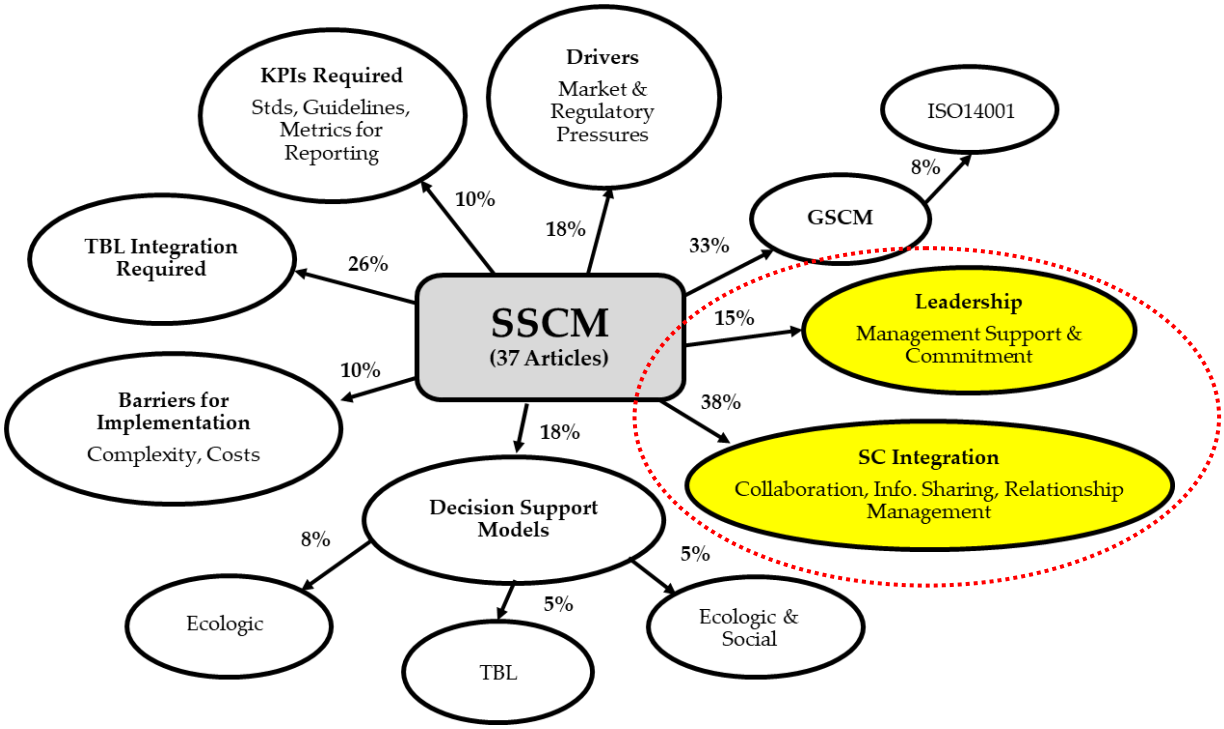


Figure 4.6: Supply chain integration and leadership as key SCM principles for sustainability

On the other hand, the leadership principle was already encapsulated in the conceptual development through inclusion of ISO 9001 principles. Other essential SCM principles including "customer service management, customer relationship management, supplier

relationship management and returns management" were also seen to be in congruence and captured as part of the ISO 9001 principles such as "customer focus and relationship management", supporting the comprehensive adoption of collective QM and SCM management view for business sustainability integration.

As a result, the conceptual construct was justified to consist of eight management principles, comprised of ISO 9001 and supply chain integration principles, extracted from the QM and SCM philosophies from the lens of sustainable development, as portrayed in Figure 4.7.

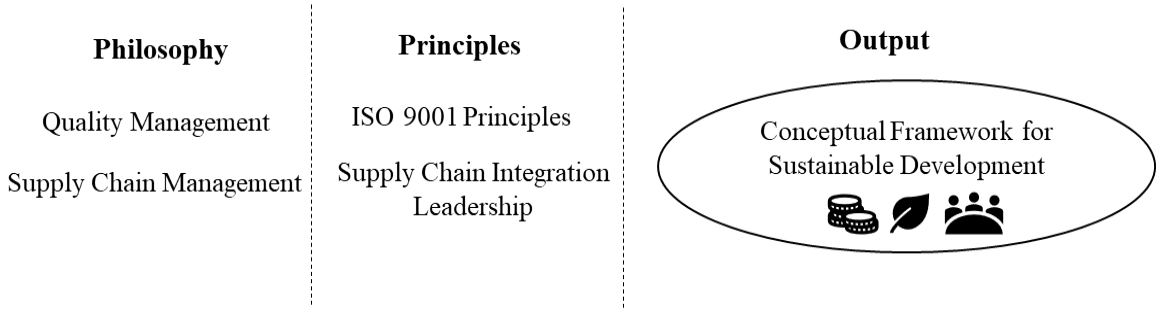


Figure 4.7: Eight principles extracted from QM and SCM, forming the conceptual framework

Other quality or supply chain management principles were excluded to ensure coherence of the ISO 9001 framework, maintain conciseness, avoid further complexity, eliminate overlapping and prevent confusions in practice that could arise from adoption of similar QM, SCM principles such as TQM principle of "customer satisfaction orientation", SCM principle of "customer relationship management" or MBNQA principle of "visionary leadership".

Furthermore, the existing management frameworks to sustainability integration are highly criticised by a wide base of authors, due to their high level of complexity, involvement of long term changes and not being systematic and straightforward for implementation (de Brito and Van der Laan, 2010; Engert et al., 2016; Kiron et al., 2015; Kuei and Lu, 2012; Machado et al., 2017; Morioka and Carvalho, 2016b; Schrettle et al., 2014; Seuring and Müller, 2008; Williams et al., 2017). For this reason, the conceptual framework that formed the foundations of the management solution of this research was kept comprehensive enough to capture the key issues and principles central to organisational catalysis of sustainability integration through a collective perspective of QM and SCM however, decided to be limited at eight principles to maintain the level of complexity and ease of application at a certain level. Despite additional QM and SCM principles could be considered further, inclusion of these

would not only negatively impact the ISO 9001 association of the solution, affecting its diffusion and growth in popularity but also increase the organisational difficulty and level of barriers linked to the application and operationalisation of the formulated solution.

In response to "how" (Dubin, 1978; Whetten, 1989); a detailed literature review was undertaken for conceptual framing and proposition formulation that included a wide spectrum of empirical findings and conceptual viewpoints, analysing the linkages between the extracted QM and SCM principles and all dimensions of sustainability (economic, environmental and social). As a result, based on the evidences in the literature, positive relationships were synthesised between the ISO 9001 and supply chain integration principles for organisational integration and improvement of triple bottom line sustainability, framed under the construct of SSCQM.

From the perspective of "why" constituent that contains the psychological, economic and societal motivations for the conceptual development (Dubin, 1978; Whetten, 1989); the primary arguments behind the research problem being tackled and the associated research motivation can be put forward. The multi-dimensional nature of sustainability point towards inherent complexity for integration, performance measurement and improvement in organisations and supply chains, underpinning the societal and industrial motivation behind the research and the associated conceptual construction (De Brito and Van der Laan, 2010; Seuring and Müller, 2008). Conceptual framework development for fostering of new management approaches and concepts were established as highly required to facilitate integration of triple bottom sustainability into business management for sustainable development (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, the research motivation behind the SSCQM framework was the development of synthesised set of theories, propositions and concepts for integration of triple bottom line sustainability into organisational and supply chain management processes and practices. The primary aim was to facilitate current state analysis, risk assessment, performance measurement, action deployment and improvement by industrial practitioners, with reference to their organisations. The ISO 9001 framework was selected due to its wide implementation level in organisations 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-recognised role in structuring and catalysing organisational

performance measurement and improvement (Anttila and Jussila, 2017; Carmignani, 2009; Fonseca, 2015; ISO, 2015a; Robinson and Malhotra, 2005; Shalij et al., 2009; Tarí et al., 2013). The supply chain integration principle was included as an imperative SSCM principle, forming the eighth principle of the framework to both increase the effects of ISO 9001 principles across the supply chain and embed the triple bottom line into the organisational supply chain management practices (Beske and Seuring, 2014; Liebetruth, 2017; Rajeev et al., 2017; Robinson and Malhotra, 2005; Shalij et al., 2009).

For contextualisation and application range formulation as part of the "who/where/when" aspect (Dubin, 1978; Whetten, 1989); no time dependence or variation over time periods was anticipated for the framework, 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 (Rajeev et al., 2017; Reefke and Sundaram, 2016; Siva et al., 2016). The conceptual framework of SSCQM was primarily designed for managers and leaders in strategic, tactical and operational levels in organisations and supply chains, operating in a wide range of industries including the manufacturing business sector.

The sustainable supply chain quality management framework formulated and its key ingredients as per Whetten (1989) and Dubin (1978) are presented in Table 4.3.

Table 4.3: The SSCQM framework and its key ingredients
(Adapted from: Whetten (1989))

Sustainable Supply Chain Quality Management (SSCQM) Framework		
Ingredient	**Element**	
Description	What?	ISO 9001 quality and SC (supply chain integration) management principles for business triple bottom line (economic, environmental and social) sustainability integration and improvement: • Customer Focus (4.3.1.1) • Leadership (4.3.1.2) • Engagement of people (4.3.1.3) • Process approach (4.3.1.4) • Improvement (4.3.1.5) • Evidence based decision making (4.3.1.6) • Relationship management (4.3.1.7) • Supply chain integration (4.3.1.8)

	How?	Positive relationship proposed for integration of triple bottom line sustainability into organisational management mechanisms and improvement.
Explanation	Why?	*Research problem:* The multi-dimensional nature of sustainability brings together inherent complexity for integration, performance measurement and improvement in organisations and supply chains (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 organisations and supply chains for sustainable development (Beske and Seuring, 2014; de Brito and Van der Laan, 2010; Rajeev et al., 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013). *Research motivation:* Development of a framework for integration of triple bottom line sustainability into organisational and supply chain management mechanisms to facilitate current state analysis, risk assessment, performance measurement, action deployment and improvement by industrial practitioners. *Justification of factors selection:* The ISO 9001 framework was selected due to its wide implementation level in organisations 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-recognised role in structuring and catalysing organisational performance measurement and improvement. The supply chain integration principle was included as the eighth principle to both increase the effects of ISO 9001 principles across the supply chain and embed the triple bottom line into the organisational supply chain management practices.
Context	Who?	Organisational managers and leaders in strategic, tactical and operational levels.
	Where?	Organisations and supply chains operating in a wide range of industries including the manufacturing business sector.
	When?	No time dependence identified (Considering current growing societal, industrial and research trends on sustainability). The propositions were subjected to subject matter expertise verification, validation, and further investigation in an organisational application study.

According to Whetten (1989), frameworks should be "built on a foundation of convincing argumentation, and grounded in reasonably explicit views of human nature and organisational practice", thus, viewpoints of a wide range of authors and evidence in the sustainability literature were captured as discussed in the subsequent sections (sections 4.3.1.1. to 4.3.1.8.), revealing the fruitful and collective potential of quality management and supply chain integration principles in the journey towards setting a management framework for integration of triple bottom line sustainability and organisational sustainable development. The literature was reviewed specifically, from the perspective of each SSCQM principle (e.g. customer focus, leadership etc.) and sustainability integration in the context of organisational integration and improvement. This resulted in the collective synthesis of the findings and standpoints of a wide base of authors (please refer to table 4.4 for a summary of the supporting references for each principle), enabling detailed justifications regarding the relationships between each SSCQM principle and triple bottom line sustainability. This supported the grounding for the argumentation behind the SSCQM framework and the constituting propositions (i.e. positive associations) between the SSCQM principles and organisational sustainable development.

4.3.1.1. 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 organisations 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 organisational 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 organisations to identify, integrate and improve sustainability is highly increased (Aquilani et al., 2016; Garvare and Isaksson, 2001).

Regulatory compliance and sustainability parameters including environmental key

performance indicators (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 organisational 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 optimise triple bottom line (Seuring et al., 2008).

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

4.3.1.2. Leadership

Leadership is at the core of ISO 9001 framework as well as the SSCM philosophy that requires the organisational 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, managing the organisational 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.

The positive impact of quality management's leadership principle on triple bottom line sustainability was 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, environmental and social sustainable development (Ansari and Qureshi, 2015; Reefke and Sundaram, 2016). A similar view point was put forward on the key role of leadership principle for integration and improvement of environmental sustainability in organisations 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 organisational 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 behaviours 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 organisations 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 interorganisational 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).

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

4.3.1.3. Engagement of people

Engagement of people principle includes involvement, recognition and empowerment of team members in achieving organisational goals (ISO, 2015b). The sustainability management literature strategically positions engagement of people principle as a fundamental parameter for economic, environmental and social sustainability performance of organisations 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 organisation, 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 organisation, and their involvement as an "important precondition" of adopting the sustainable development culture.

Rusinko (2005) highlighted that engagement and empowerment of employees results in organisation-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 organisations, 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 organisations and supply chains was proposed.

4.3.1.4. Process approach

Sustainability and triple bottom line performance requires a holistic view and integrated approaches not only through organisational focus on end results (products and services) but also through managing the value stream of activities that deliver these results (processes). 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 organisations and supply chains is embraced 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, environmental and social indicators into organisational 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 interorganisational communication, measurement and improvement activities for sustainable development. Isaksson (2006) put forward that the process approach principle "creates the basis for

integrating a set of TBL indicators, outlining the key parameters for high risk processes including analysis of inputs, enablers, outputs and outcomes", enhancing the understanding, communication, integration 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 organisational sustainability, from the perspective of defining high risk processes and determining high risk areas to be targeted (Isaksson, 2006).

Nguyen et al. (2018) established a positive relationship between triple bottom line sustainability and "how the organisation manages process related issues such as process objectives, authority and responsibility for process management, process risks, and process standardisation 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 optimises triple bottom line expectations of interested parties for stakeholder satisfaction is defined as the "mother of all processes", that enables collective adoption of economic, environmental and social issues for organisational sustainable development (Garvare and Isaksson, 2001).

Ultimately, a positive relationship between the process approach principle and the integration of triple bottom line sustainability into organisations and supply chains was derived.

4.3.1.5. Improvement

Stemming from the dynamic nature of the business climate, improvement principle is essential for organisational reflex to changes through an ongoing focus on innovation and capability development (ISO, 2015b). The improvement principle facilitates the organisational 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 organisational integration of triple bottom line sustainability and sustainable development (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 organisations, 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, environmental 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 or compromise on any TBL aspect, if deployed without favouring of a particular dimension (Nguyen et al. 2018).

The continual improvement philosophy increases the capability of organisations to adapt to changing stakeholder needs, catalysing the organisational 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 organisations, 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 organisations and supply chains was formulated.

4.3.1.6. 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 organisation, 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 organisation in 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 organisations and supply chains was proposed.

4.3.1.7. 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 business success and sustainability (ISO, 2015b). This principle leads to increased ability of value generation for organisations and their interested parties, reinforcing business flexibility and increased capability in responding to dynamic business and stakeholder conditions. Management of relationships with key stakeholders and the quality of relationships between supply chain members are identified as critical enablers of sustainable development of organisations 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 organisations 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 organisational 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 organisations and supply chains was developed.

4.3.1.8. 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 organisational and overall supply chain sustainability performance (Ashby et al., 2012; Beske and Seuring, 2014; Liebetruth, 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, maximised value generation and support of integration and improvement of sustainability parameters (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, organisational effectiveness and internal process efficiency improvements are realised. 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 categorised 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 interorganisational cooperation and synergy, supporting innovation towards sustainable development (Xia and Li-Ping Tang, 2011).

In the light of these viewpoints, a positive relationship between the supply chain integration principle and the integration of triple bottom line sustainability into organisations and supply chains was derived.

4.3.2. The Integrated Conceptual 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.

On the basis of the knowledge base established and conceptual considerations derived from the QM, SCM and sustainability integration research domain, the conceptual framework of sustainable supply chain quality management (SSCQM) was constructed.

The overview and description of management principles framed under SSCQM are provided in Table 4.4, along with supporting references of scholars positively associating each principle with integration of sustainability and sustainability management in the organisational management context.

Table 4.4: The overview of QM and SCM principles forming SSCQM framework

SSCQM Framework		Description	Supporting References
QM Principles (ISO 9001:2015)	1. Customer focus	Meeting customer requirements and exceeding customer expectations	(Aquilani et al., 2016; Garvare and Isaksson, 2001; Lin, 2013; Seuring et al., 2008; Somsuk and Laosirihongthong, 2016)
	2. Leadership	Creation of conditions where all team members are engaged to deliver business objectives	(Ansari and Qureshi, 2015; Aquilani et al., 2016; Nguyen et al., 2018; Reefke and Sundaram, 2016; Zink, 2007)
	3. Engagement of people	Involvement, recognition and empowerment of staff in achieving business goals	(Aquilani et al., 2016; Garvare and Isaksson, 2001; Luburić, 2015; Nguyen et al., 2018; Rusinko, 2005; Zink, 2007)
	4. Process approach	Management of key activities and their interrelations as a process through defined responsibilities, objectives, resources and interfaces for consistent results	(Aquilani et al., 2016; Garvare and Isaksson, 2001; Isaksson, 2006; Nguyen et al., 2018)
	5. Improvement	Firm reflex to changes through ongoing focus on innovation and capability development	(Aquilani et al., 2016; Nguyen et al., 2018; Rusinko, 2005; Zink, 2007)
	6. Evidence based decision making	More effective decisions with higher objectivity and confidence levels are made as a result of analysis of facts, evidence, information and data	(Aquilani et al., 2016; Chitaka et al., 2018; Garvare and Isaksson, 2001; Kuei and Lu, 2012; Zink, 2007)
	7. Relationship management	Identification and management of relationships with key business stakeholders, fundamental to success and sustainability of the organisation	(Ansari and Qureshi, 2015; Aquilani et al., 2016; Garvare and Isaksson, 2001; Gimenez et al., 2012; Reefke and Sundaram, 2016; Zink, 2007)
SCM	8. Supply chain integration	Close alignment, open communication, coordination and cooperation on the basis of continuous information flow (internally and externally) among the supply chain members	(Ashby et al., 2012; Beske and Seuring, 2014; Kang et al., 2018; Liebetruth, 2017; Rajeev et al., 2017; Reefke and Sundaram, 2016; Winter and Knemeyer, 2013; Xia and Li-Ping Tang, 2011)

The integrated framework of SSCQM, represented both schematically and from the supply chain view in Figure 4.8 and 4.9, stemmed from the latest indications in the QM, SCM and sustainability integration literature, building upon the prospective synergies offered by QM and SCM for deployment at organisations to drive sustainable development internally and across their supply chain network.

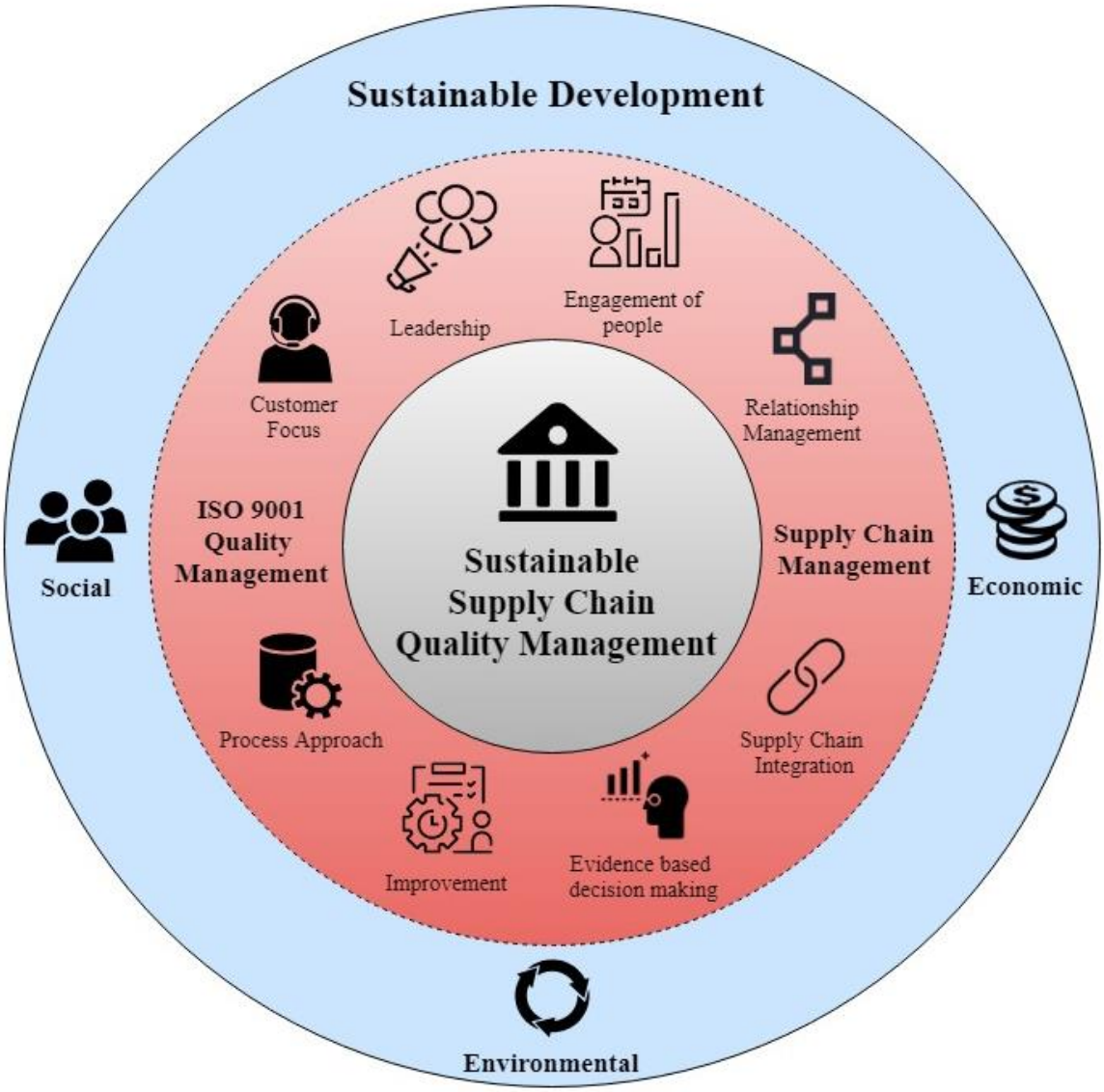


Figure 4.8: The framework of SSCQM – the schematic view

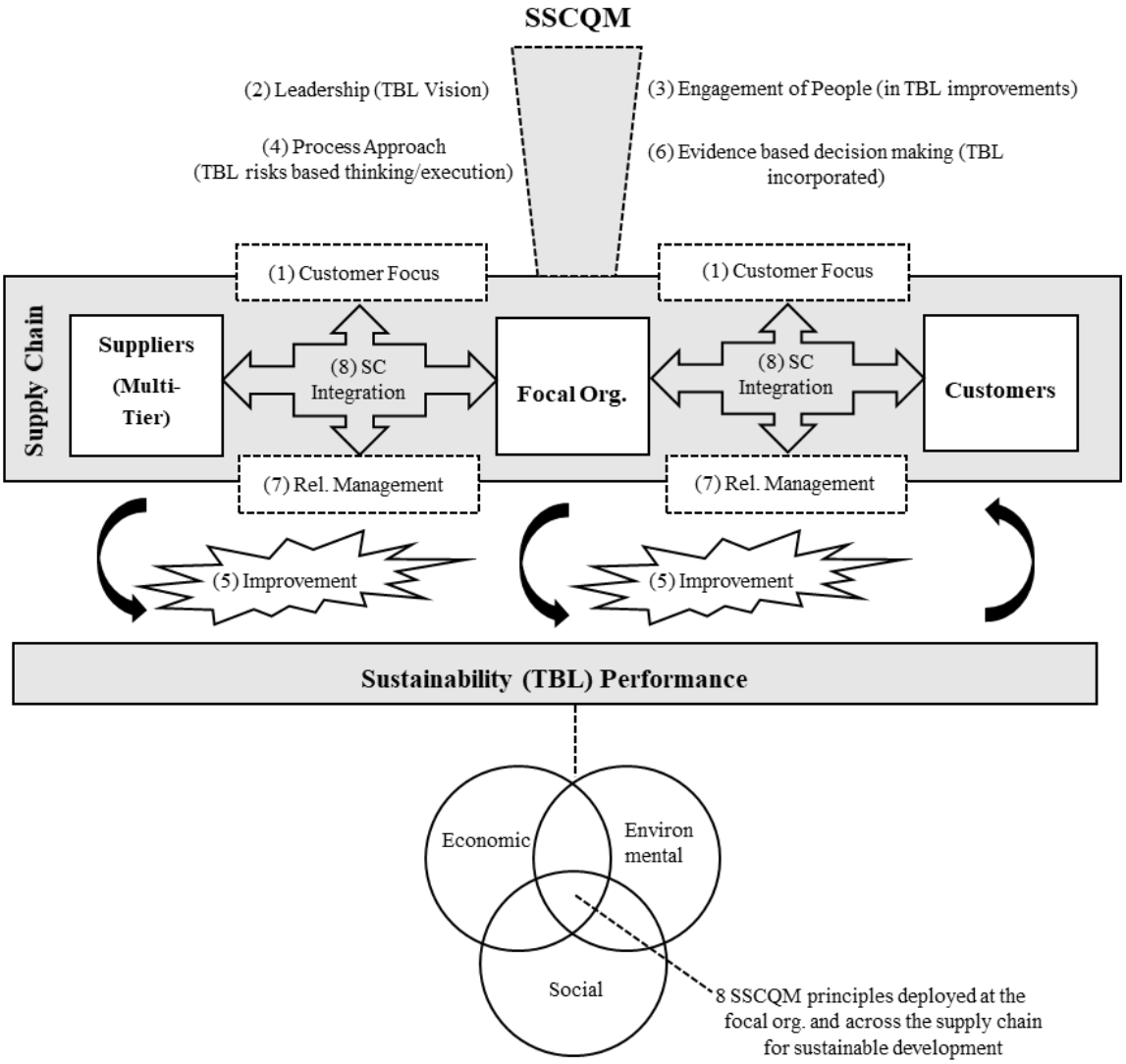


Figure 4.9: The framework of SSCQM – the supply chain view

4.4. Implementation Procedure

The SSCQM framework introduced in Section 4.3 set the way for a QM and SCM principle based organisational sustainable development concept for business managers and practitioners, with a view to address the research question 5 outlined below:

> **RQ5:** How can such a framework be operationalised by industrial practitioners and decision makers?

For development and framing of a conceptual construct that provides a meaningful and useful road map for operationalisation of such an approach; other approaches, models tools and techniques proposed in the existing body of knowledge were reviewed, weighing advantages, disadvantages and opportunities. The steps essential to implementation were then evaluated

and formulated from the practitioners' point of view, together forming the implementation procedure that clarifies and systematically guides application in the industry to facilitate organisational sustainability integration through the synergistic QM and SCM principles.

4.4.1. Review of Extant Approaches for Business Implementation of Sustainability

As part of the implementation procedure development stage of the research, it was important to capture and analyse the approaches already introduced for organisational sustainability integration and implementation to drive an informed and value-adding conceptual framework and application road map construction. This enabled not only capitalising the advantages of the extant methods, but also provided a platform for addressing the evident gaps, weaknesses and opportunities established in the existing approaches.

From this perspective, many approaches could be included in such a broad context however, only the approaches identified in the existing literature that were highly relevant to the scope of this research (i.e. organisational sustainability integration and implementation from a business management principles, systems, processes and action deployment perspective) were included in this analysis.

The individual tools, principles and techniques captured as part of the state-of-the-art model and framework constructs were assessed to provide an overall, comprehensive picture regarding the existing approaches at a higher management level, as opposed to a review conducted at a lower level (individual tool and technique level). In other words, it was decided that the required level of detail would be generated from the higher-level analysis through the critical lens of evaluating the complete philosophies towards business integration of sustainability, reviewing the tools utilised and commonalities across the approaches towards deriving the key methodologies in the latest literature approaches along with identification of their advantages and disadvantages.

Based on this rationale, a brief overview of each approach established in the extant body of knowledge was provided, assessing the key principles, tools and techniques adopted, and weighing the strengths and weaknesses. The findings of this critical and comparative review are presented in Table 4.5.

Table 4.5: Comparative analysis of extant approaches for business implementation of sustainability

Authors (Year)	Overview	Key Principles, Tools & Techniques Adopted	Strengths	Weaknesses
Asif and Searcy (2014)	Framework for management and continual improvement of sustainability through PDCA philosophy	*PDCA Structure:* Continual and cyclic structure for integration and improvement of sustainability *Plan:* Integrated and cross-functionally collaborating management approach to sustainability, stakeholder identification and engagement, organisational direction establishment *Do:* Execution of processes in line with sustainability objectives and development of structures and infrastructures for sustainability *Check:* Assessing impacts of sustainability initiatives and sustainability audits *Act:* Sustainability reporting, stakeholder communication and continuous improvement	Provides a simple and continuous loop of activities for a basic integration and improvement of business sustainability. Offers a step by step implementation guide under the well recognised facilitation of PDCA structure.	The implementation steps are highly abstract, subjective and not properly defined. The approach has not been verified or validated.
Asif et al. (2011)	Approach to integrate quality and sustainability management for CS integration	*BEMs:* BEMs (e.g. EFQM) fully embraced and implemented for operational excellence *GRI:* GRI framework is fully embraced for sustainability performance measurement and reporting *Context specific sustainability indicators development:* Activities and factors unique to every business are captured	Integrates GRI, BEM and business specific factors for CS integration and development	The implementation steps are highly abstract and not properly defined along with a lack of step-by-step approach for industrial operationalisation. The model was developed purely from a strategic level (tactical and operational levels are not considered for deployment and diffusion across the business)
Garcia et al. (2016)	Decision making model based on evaluation of CS and stakeholder parameters	*Evaluation of actual state:* CS indicator selection based on stakeholder requirements, goal and priority setting, aggregation and initial performance measurement *Selection of management options:* defining management options and selecting best actions for improvement *Evaluation of achieved state:* checking the effects of actions implemented and performance evaluation *Assessment of achieved state:* checking performance realised against goals, feedback and control	Provides a step-by-step approach towards establishing current state and evaluating options for improvement, monitoring and control. Allows aggregation of multiple CS indicators for a quantitative assessment and decision-making Enables prioritisation of key indicators Risk based approach	The analytical model for sustainability indicators and performance normalisation, aggregation and evaluation is highly complex. The model was developed purely from a strategic level (tactical and operational levels are not considered for deployment and diffusion across the business)

		GRI Indicators: utilised for definition, measurement and reporting of TBL sustainability		
Gond et al. (2012)	Integration of management control systems and sustainability control systems for strategic business incorporation of sustainability	*Maturity Assessment:* Organisational management and sustainability control system integration maturity is assessed (diagnostic vs. interactive) *Organisational Configuration Identification:* Organisational configuration is identified from the eight configuration categories, based on sustainability and management system maturity. *Strategy Formulation and Implementation:* Business improvement strategies are formulated and implemented, with a view to improve sustainability and management system control maturity and sustainability integration	Identifies various maturity levels, configurations, strategies and associated paths for organisational sustainability integration	The model was developed purely from a strategic level (tactical and operational levels are not considered for deployment and diffusion across the business) Does not guide CS indicator definition, measurement, performance evaluation according to a standard (e.g GRI) The implementation steps are highly abstract and not properly defined (lack of a step-by-step approach) for industrial operationalisation
Machado et al. (2017)	Maturity assessment based approach to CS integration through sustainable operations management capability development	*Maturity Levels Assessment:* CS integration progression through the levels of "compliance and conformity, ops eco-efficiency, sustainability management system, network and stakeholder integration, sustainable operations integration *Key Process Areas:* Inbound and outbound logistics, ops., marketing and sales, after-service, firm infrastructure, HRM, tech. development, procurement *Specific Goals:* Design for sustainability, life-cycle management, SSCM, Sustainable Production, Integrated Performance Management, CSR	Establishes the key characteristics and activities for sustainable operations management, considering a wide range of external and internal issues Structures organisational sustainability improvement through formalised maturity assessments and associated development	Does not guide CS indicator definition, measurement, performance evaluation according to a standard (e.g GRI) The implementation steps are highly abstract and not properly defined (lack of a step-by-step approach) for industrial operationalisation
Meza-Ruiz et al. (2017)	Practices and maturity level assessment approaches for CS integration and development	*Sustainability maturity-level assessment:* Organisation categorised into four key levels of beginner, elementary, satisfactory and sophisticated to direct CS integration progression *Use of standards and certifications:* Using standards such as GRI and management system certifications such as ISO 9001 to guide integration *Utilisation of BEMs:* Systematic implementation and embracing of EFQM, MBNQA and TQM principles *Adoption of key processes:* Using the processes of	Key practices and processes for CS integration are specified Presents a practical and applied approach to CS integration	The implementation steps are not properly defined (lack of step-by-step approach) for industrial operationalisation Does not specify a clear and systematic road map to guide CS integration and improvement

		self-assessment, benchmarking, corporate reporting, strategic planning, and systematic training for CS integration		
Morioka and Carvalho (2016a)	Conceptual framework for organisational integration of sustainability performance	*Principles:* Stakeholder engagement, product life-cycle and triple bottom line for CS integration and performance measurement *Core Elements:* Alignment of; processes and practices (production and SCM), capabilities (human, financial, tools and tech.), offerings (products and services) and contributions (short, medium, long term impacts), with CS performance measurement *Context Factors:* Alignment of internal (strategy, corporate governance and structure, culture and values) and external (legislation, industry specific factors, society and environmental pressures) factors with CS	Identifies a wide range of principles, elements and contextual parameters and considerations, key to business integration of CS performance Stakeholder focus	The implementation steps are highly abstract and not properly defined (lack of a step-by-step approach) for industrial operationalisation Does not specify a clear and systematic road map to guide CS integration and improvement
Nawaz and Koç (2018)	Management systems based business sustainability integration framework	*Vision, scope and principles:* Leadership recognising the necessity and relevance of sustainability to their business and presenting a vivid description of its ambitions in accordance with the scope of the organisation *Criteria, risk assessment and objectives:* Identification of stakeholders and their requirements, determining high risk CS issues and formulating goals *Initiatives for risk reduction:* Implementation of risk reduction initiatives, managing uncertainty, conflict with other objectives, and the fail-safe condition *Preparation and organisation:* development of organisational capacity and resources; and preparation of data gathering and analysing procedures *Implement, monitor & analyse:* adaptive monitoring and control *Review and continuous improvement:* Review of system's performance to identify improvement	Comprehensive framework, detailing the steps and sub-steps for integration of sustainability, considering a wide base of organisational sustainability integration issues Risk based approach Stakeholder focus	Formulated purely from the focal organisational point of view in the absence of a supply chain view. SCM principles not considered for integration and collective improvement for sustainability.

		opportunities in the subsequent cycle		
Peace et al. (2018)	Toolkit framework to support integration of sustainability into industrial decision making	*Materiality setup:* Determination of the most significant CS issues for the business, setting clear targets *Integrated qualitative screening:* Assessment of TBL issues and opportunities along with identification of associated technological solutions *Quantitative assessment:* Evaluating the hot-spots in the business processes through CS data input, aggregation and evaluation, evaluating the technological solutions for improvement	Adopts a priority and risk based approach Utilises a combination of qualitative and quantitative organisational approaches for sustainability impact assessments, and improvement	High level framework from the perspective of a project team for organisational change Does not guide CS indicator definition, measurement, performance evaluation according to a standard (e.g. GRI) The implementation steps are vaguely defined for industrial operationalisation
Perrott (2015)	Strategic sustainability management framework for organisations	*Sustainability issue identification and prioritisation* *Sustainable strategy action planning* *Implementation, tactical management, cultural change management* *Monitoring and Measurement of progress* *Review and strategic issue assessment*	Outlines the key steps for strategic implementation of CS, including stakeholder engagement, risk analysis and prioritisation, action deployment, measurement, monitoring and control	Formulated purely from the focal organisational point of view in the absence of a supply chain view. SCM principles not considered for integration and collective improvement for sustainability. The implementation steps are highly abstract and not properly defined
Witjes et al. (2017)	Key factors and tools outlined for sustainability integration of SMEs	*Growth curve:* Generation of past, present and future regarding CS (Maturity assessment) for vision and direction *Triggers:* Establishment of internal and external CS motivators of the business *Elements to ensure CS:* Implementation of key elements for CS (vision, strategy, management system, change agent and performance assessment) *Physical and social focus of integration activities:* Inclusion of physical (result, process, product, resources) and social (behaviour, leadership, shared belief) factors	Provides several tools and establishes contextual factors for sustainability integration, validity of which were confirmed through practical business implementation	Highly contextual (SMEs only) Does not outline the steps required for a successful and systematic implementation

BEM: Business Excellence Models, CS: Corporate Sustainability, CSR: Corporate Social Responsibility, HRM: Human Resource Management, Tech: Technology, Ops: Operations

A number of common features, themes and principles were established in the existing frameworks proposed to date for organisational management embedding and incorporation of sustainability including the following:

- Identification of key business stakeholders and their requirements, important to the organisation and its sustainability
- Adoption of GRI framework and its indicators for definition, measurement and reporting of TBL sustainability
- Selection and prioritisation of TBL sustainability indicators for risk analysis, driving formulation of associated business objectives and standards
- Progressive and cyclic approach to organisational development through various forms of maturity assessment and current / future state mapping
- Improvement strategy and action formulation through a stakeholder and risk based approach
- Performance assessment, monitoring, control and improvement action management

On the other hand, the following opportunities were spotted across the models and frameworks reviewed for business implementation and integration of sustainability:

- Lack of a coherent, complete, systematic and practical implementation approach that takes the industrial practitioners through the key and continual steps of planning, current state and risk analysis, prioritisation, execution, evaluation, improvement and standardisation for sustainability integration and sustainable development.
- Lack of both an overall approach and an instrument / tool that enables gauging of QM and SCM principle implementation level in relation to sustainability integration and improvement.
- Lack of an overall supply chain view and highly limited supply chain principle utilisation for driving supply chain collaboration and collective improvement.

It was concluded that although there were several valuable contributions already put forward by a range of authors to guide organisational embedding of sustainability, a significant opportunity was noted for a new implementation procedure that not only capitalised on the common strengths and learnings offered by the extant approaches but also addressed the limitations of the approaches proposed to date, along with fostering the application of a QM and SCM based industrial implementation of sustainability.

4.4.2. Implementation Procedure Development

In the light of the critical review of the extant implementation frameworks and assessment of their strengths and weaknesses, steps key to application and operationalisation of the QM and SCM principles based SSCQM framework for organisational sustainable development were identified and described in the subsequent sections.

The strategic, tactical and operational aspects were articulated and incorporated in the conceptual framework, which is fundamental to well-rounded organisational planning, decision making and transformation practices (Ackoff, 1974; Gunasekaran et al., 2001). The distinction between the relative terms of strategy and tactics is articulated as: "strategy is concerned with long-range objectives and ways of pursuing them that affect the system as a whole; tactics are concerned with shorter-run goals and means for reaching them that generally affect only a part of the organisation" (Ackoff, 1974).

Strategic aspects include the long term view (mission, vision, objectives, policies) at the highest management level, tactical aspects concern the middle management and how to achieve policies in the medium term, and operational aspects involve lower managers and simpler issues on the day-to-day basis, harmony of which is essential for attaining organisational goals and driving sustainable change (Ackoff, 1974).

4.4.2.1. Step 0 - Identification of Sustainability Priorities

Identification, prioritisation, engagement and management of business stakeholder (internal and external) sustainability expectations is identified as a key driver of triple-bottom line sustainability integration and improvement in organisations, utilised as a key stage in extant integrated sustainability management concepts in the literature (Cherrafi et al., 2017; Engert et al., 2016; Garvare and Isaksson, 2001; Morioka and Carvalho, 2016a; Perrott, 2015; Witjes et al., 2017; Zink, 2007).

According to Peace et al. (2018), targeting too many sustainability indicators hinders decision making and prevents addressing of issues essential to the firm's sustainability whereas, inclusion of very few parameters oversimplifies the integration process, limiting the managers from effectively analysing the "compromise" during the incorporation of various triple bottom line agendas. Thus, the triple bottom line sustainability voice of the stakeholders (VOS) identification and prioritisation step for selection and optimisation of sustainability integration initiatives, in line with the context of implementing organisation, formed the foundations of the SSCQM concept.

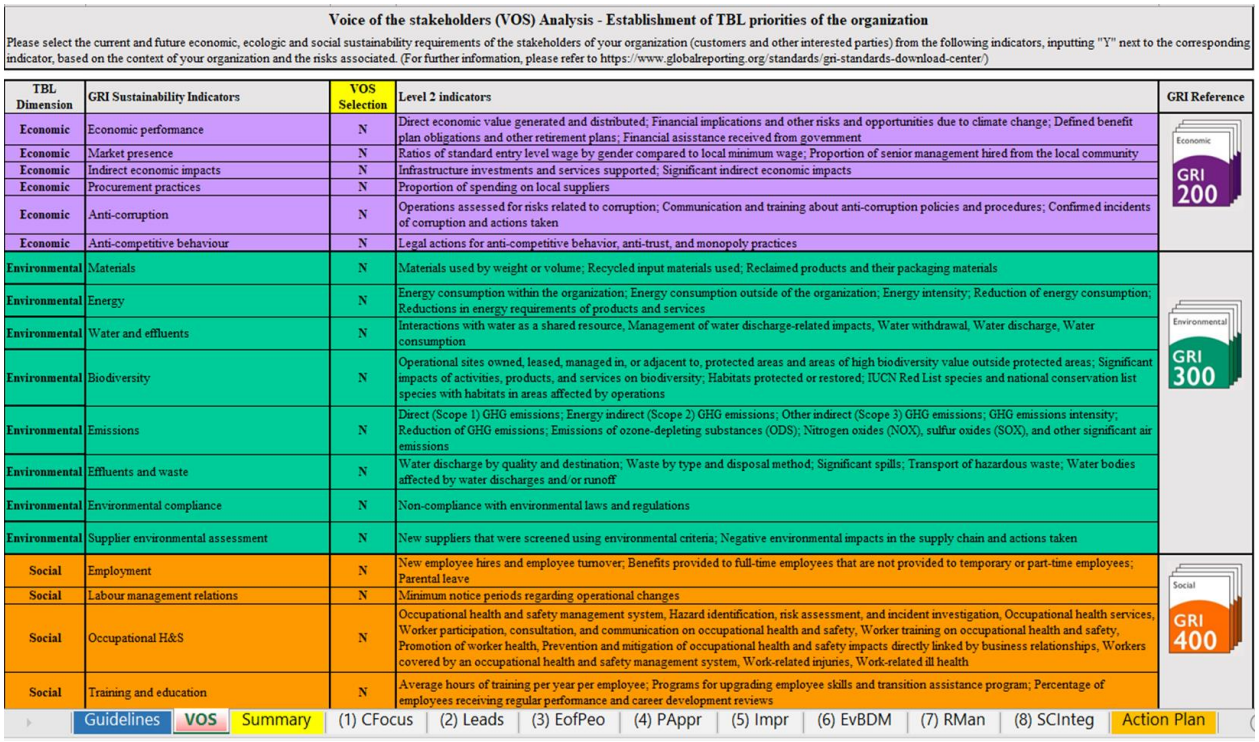
Established as *Step 0* in the implementation procedure, economic, environmental and social parameters essential for the stakeholders of the organisation are determined, adopting a balanced triple bottom line view. The management principles utilised in the SSCQM construct such as "leadership, relationship management and customer focus", carry the potential of enhancing this stage of establishing organisational stakeholder sustainability needs and requirements. These principles were further identified to foster communication and formulation of business objectives, aligning the firm's direction with issues fundamental to its stakeholders for sustainability.

The triple bottom line indicators set out by Global Reporting Initiative (GRI) were selected to be adopted for determination, reporting and performance measurement of sustainability priorities, which is a framework widely adopted by sustainability scholars and practitioners in the existing frameworks. The GRI framework was concluded to possess a holistic nature to organisational sustainability integration, incorporating a wide scope of stakeholder sustainability considerations (GRI, 2018; Vigneau et al., 2015).

This step and associated activities were established to be carried out by the senior management of the implementing organisation at the strategic level, who would be in the best position to engage with and capture the diverse range of information from the wide stakeholder base. This approach was further reflected upon as consistent and in agreement with the extant frameworks in the literature (Morioka and Carvalho, 2016a; Nawaz and Koç, 2018).

A simple tool on MS Excel was designed as a supplement to the maturity assessment diagnostic tool (presented in Section 4.5), to facilitate the voice of the stakeholders and sustainability priorities identification step as demonstrated in Figure 4.10.

This tool included the complete list of GRI indicators for each sustainability dimension (economic, environmental and social), allowing the practitioners in the implementing organisation to review all the relevant indicators (e.g. market presence for economic dimension) and the associated level 2 indicators or metrics (e.g. proportion of senior management hired from the local community for market presence), select (through indicating Y in the VOS selection column), and carry forward the key sustainability indicators for integration through the SSCQM principles.



Voice of the stakeholders (VOS) Analysis - Establishment of TBL priorities of the organization

Please select the current and future economic, ecologic and social sustainability requirements of the stakeholders of your organization (customers and other interested parties) from the following indicators, inputting "Y" next to the corresponding indicator, based on the context of your organization and the risks associated. (For further information, please refer to https://www.globalreporting.org/standards/gri-standards-download-center/)

TBL Dimension	GRI Sustainability Indicators	VOS Selection	Level 2 indicators	GRI Reference
Economic	Economic performance	N	Direct economic value generated and distributed; Financial implications and other risks and opportunities due to climate change; Defined benefit plan obligations and other retirement plans; Financial assistance received from government	
Economic	Market presence	N	Ratios of standard entry level wage by gender compared to local minimum wage; Proportion of senior management hired from the local community	
Economic	Indirect economic impacts	N	Infrastructure investments and services supported; Significant indirect economic impacts	
Economic	Procurement practices	N	Proportion of spending on local suppliers	
Economic	Anti-corruption	N	Operations assessed for risks related to corruption; Communication and training about anti-corruption policies and procedures; Confirmed incidents of corruption and actions taken	
Economic	Anti-competitive behaviour	N	Legal actions for anti-competitive behavior, anti-trust, and monopoly practices	
Environmental	Materials	N	Materials used by weight or volume; Recycled input materials used; Reclaimed products and their packaging materials	
Environmental	Energy	N	Energy consumption within the organization; Energy consumption outside of the organization; Energy intensity; Reduction of energy consumption; Reductions in energy requirements of products and services	
Environmental	Water and effluents	N	Interactions with water as a shared resource, Management of water discharge-related impacts, Water withdrawal, Water discharge, Water consumption	
Environmental	Biodiversity	N	Operational sites owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas; Significant impacts of activities, products, and services on biodiversity; Habitats protected or restored; IUCN Red List species and national conservation list species with habitats in areas affected by operations	
Environmental	Emissions	N	Direct (Scope 1) GHG emissions; Energy indirect (Scope 2) GHG emissions; Other indirect (Scope 3) GHG emissions; GHG emissions intensity; Reduction of GHG emissions; Emissions of ozone-depleting substances (ODS); Nitrogen oxides (NOX), sulfur oxides (SOX), and other significant air emissions	
Environmental	Effluents and waste	N	Water discharge by quality and destination; Waste by type and disposal method; Significant spills; Transport of hazardous waste; Water bodies affected by water discharges and/or runoff	
Environmental	Environmental compliance	N	Non-compliance with environmental laws and regulations	
Environmental	Supplier environmental assessment	N	New suppliers that were screened using environmental criteria; Negative environmental impacts in the supply chain and actions taken	
Social	Employment	N	New employee hires and employee turnover; Benefits provided to full-time employees that are not provided to temporary or part-time employees; Parental leave	
Social	Labour management relations	N	Minimum notice periods regarding operational changes	
Social	Occupational H&S	N	Occupational health and safety management system, Hazard identification, risk assessment, and incident investigation, Occupational health services, Worker participation, consultation, and communication on occupational health and safety, Worker training on occupational health and safety, Promotion of worker health, Prevention and mitigation of occupational health and safety impacts directly linked by business relationships, Workers covered by an occupational health and safety management system, Work-related injuries, Work-related ill health	
Social	Training and education	N	Average hours of training per year per employee; Programs for upgrading employee skills and transition assistance program; Percentage of employees receiving regular performance and career development reviews	

Figure 4.10: Voice of the stakeholders selection tool for identification of sustainability priorities through the GRI framework

4.4.2.2. Step 1 - Current State Analysis

Organisational diagnostics involve "tapping into existing information channels and the opening of new ones to clarify and define the issues", forming the basis of organisational maturity assessment, decision making and improvement (Mintzberg et al., 1976). Maturity in the business context refers to "the stages through which an organisation progresses in realising an end goal" (van Looy et al., 2011), and it involves "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).

Maturity assessment models not only offer a reference platform for establishment, directing and prioritisation of improvement actions towards organisational transformation in a particular area (e.g. sustainable development), but also facilitate progress towards business objectives through development of new knowledge, enhanced communication and catalysed alignment to the new implementation initiative (Röglinger et al., 2012). Such an organisational diagnostic and maturity assessment step is highly utilised in the existing frameworks and approaches for sustainability integration, acting as an essential step towards current and future state mapping, and directing sustainability improvement efforts (Gond et al., 2012; Machado et al., 2017; Meza-Ruiz et al., 2017; Witjes et al., 2017).

Subsequent to establishment of voice of the stakeholders, the current state of the organisation with reference to sustainability management integration is mapped through deployment of SSCQM principle maturity assessment diagnostic tool. In this stage denoted as *Step 1*, the organisation is assessed (self or external) against the indicators of each SSCQM principle as per set criteria, against triple bottom line parameters established in *Step 0*. This provides a detailed diagnostic for the organisational practitioners regarding sustainability synergistic principles of SSCQM, gauging associated triple bottom line sustainability integration levels, and supporting adoption of a risk based prioritisation approach through the stakeholder focus incorporated in *Step 0*.

A sample snapshot of the SSCQM diagnostic tool as an outcome of the maturity assessment conducted in this step is presented in Figure 4.11, demonstrating the maturity levels of each SSCQM principle and corresponding sustainability dimension integration levels. The organisational indicators for each SSCQM principle (e.g. customer focus, leadership etc.) are assessed as per defined criteria, awarding scores (0 to 5) depending on the maturity level of each indicator for each sustainability dimension, resulting in the maturity level calculations for each principle and integration level for each sustainability dimension, average of sustainability integration levels generating the final value of "Organisational SSCQM Score". Please refer to Section 4.5 for further details on the SSCQM diagnostic tool and the associated SSCQM principle maturity and sustainability integration level assessment process.

SSCQM Principle	Maturity	Economic	Envir.	Social
1 - Customer Focus	0%	0%	0%	0%
2 - Leadership	32%	60%	33%	3%
3 - Engagement of people	40%	73%	40%	7%
4 - Process Approach	31%	60%	30%	3%
5 - Improvement	27%	40%	20%	20%
6 - Evidence Based Decision Making	40%	75%	25%	20%
7 - Relationship Management	22%	30%	35%	0%
8 - Supply Chain Integration	7%	0%	20%	0%
Unidimensional TBL score		42%	25%	7%
Organizational SSCQM Score				25%

Figure 4.11: SSCQM diagnostic tool summary dashboard sample for current state analysis

This step was also identified as a strategic step, requiring senior management engagement and support to enable evaluation of SSCQM management principle maturity levels across the organisational management processes and associated sustainability integration levels. On the other hand, depending on the size of the organisation (large, SME, SMB), tactical management could also be suitably positioned to lead or support the various elements of the

assessment, undertaking the detailed evaluation with reference to the same.

4.4.2.3. Step 2 - Identification of Risks and Opportunities

Following on from Step 1, a current state picture exemplified in Figure 4.11 is drawn regarding the SSCQM principles and sustainability integration. Analysis and evaluation process of the outcomes of this diagnostic step and its outcomes, was set to form the basis of *Step 2*, revealing the strengths, weaknesses, opportunities and threats (SWOT) for the organisational practitioners, with a view to improve maturity of SSCQM principles and integrate triple bottom line through an informed approach for mitigation of key stakeholder sustainability risks. The current sustainability performance levels for the economic, environmental and social parameters identified as key in *Step 0* are established to draw a baseline towards maturity improvement and sustainable development.

GRI framework provides an extensive reference platform for performance measurement and reporting regarding the sustainability indicators (Alonso-Almeida et al., 2014; GRI, 2018). Such a managerial analysis, risk assessment and evaluation is a fundamental step in the existing approaches for sustainability integration in the business management context (Asif and Searcy, 2014; Garcia et al., 2016; Nawaz and Koç, 2018; Peace et al., 2018; Perrott, 2015; Witjes et al., 2017). As a fruit of this organisational sustainability management diagnostic, the established risks are elaborated in terms of the organisational areas and processes with the highest sustainability impact, which were described by Peace et al. (2018) as sustainability "hot spots", pointing towards the immediate and high impact areas of improvement.

Moreover, benchmarking was identified as a highly beneficial process, extending current knowledge on an area being targeted for improvement and capturing sectoral "best-in-class" insights, applicable to a wide range of business management domains and highly contributory to organisational development (Pryor, 1989), including sustainable development (Springett, 2003). In this context, benchmarking analysis with similar organisations and operations was incorporated as part of this step, placing the implementing organisation's sustainability maturity with reference to competition, and facilitating establishment of further gaps and opportunities for sustainable development.

This step was noted to not only entail strategic management elements (SWOT analysis and associated strategic business analyses) but also tactical management elements (performance measurement regarding the indicators determined as TBL priorities in Step 0).

4.4.2.4. Step 3 - Action and Policy Deployment

For making the organisational change happen towards sustainable management and development, policies, projects and actions are required to be implemented in the light of the maturity assessment diagnostics and SWOT analysis findings. Taking into account the importance of risk based approaches for effective business sustainability integration (Asif and Searcy, 2014; Garcia et al., 2016; Nawaz and Koç, 2018; Peace et al., 2018; Perrott, 2015; Witjes et al., 2017), cultural and resistance aspects inherent in every organisational change process (Todnem By, 2005), and limited intra and interorganisational resources irrespective of firm size and scale (Kelliher and Reinl, 2009), planning and prioritisation of actions were identified as key practices for the successful implementation of SSCQM approach.

Practical decision making tools such as the impact effort matrix were established to carry the potential to facilitate this crucial prioritisation process, with a view to channel the organisational resources in the best possible way, towards the actions that will provide the highest impact in the short term and building momentum towards a positive and effective transition for sustainability (Nawaz and Koç, 2018; Todnem By, 2005). Such an approach is paramount for addressing the change and cultural management aspects of the organisational transition towards sustainability (Azapagic, 2003; Peace et al., 2018; Perrott, 2015). Commitment and support from senior management was also defined as a critical factor for the effective and successful implementation of organisational transformations (Appelbaum et al., 1998), especially for change towards sustainability through reinforcing communication, people development, cooperation and direction in the journey towards sustainable development (Miller, 2004; Stone, 2006).

As a result, the deployment and implementation of countermeasures, policies, strategies, processes and improvement actions internally and across the supply network, with key stakeholders, on fundamental sustainability issues, was established as a central activity to *Step 3.* Both Nawaz and Koç (2018) and Asif and Searcy (2014) articulated such organisational sustainability transformation activities as “sustainability initiatives”, turning the planned changes into “reality”, progressing towards the intended direction of sustainable development. This step entails strategic (formulation and reinforcing of long term business direction towards sustainable management and development), tactical (management of key processes in line with TBL objectives and management of sustainability improvement projects for change) and operational (execution of operations in line with sustainability objectives and supporting sustainability improvement actions for change) aspects.

4.4.2.5. Step 4 - Monitoring, Control and Improvement

During the operationalisation and implementation period of changes towards management maturity and sustainability integration level improvements, misunderstandings, misinterpretations, practical complications, skill limitations, communication issues, undocumented and informal practices, resource limitations, turbulence stemming from the changes and business politics are likely to occur (Durlak and DuPre, 2008; Nawaz and Koç, 2018). Additionally, unpredicted changes, variations and deviations from the initial plans are expected during organisational transition periods and embracing of new initiatives (Kramer and Magee, 1990), necessitating the adaptation principle through monitoring, evaluation, control and realignment of improvement activities (Espinosa and Porter, 2011; Lindenmayer and Likens, 2009; Nawaz and Koç, 2018).

Stemming from this rationale, *Step 4* comprised of the monitoring and control of the effects of actions implemented, reviewing progress, reinforcing the cultural transformation and ensuring their effectiveness. The "check" phase, involving the measurement and review process to test whether the changes implemented delivered the desired outcomes, deploying appropriate countermeasures as required, is a critical phase of organisational improvement (Jagusiak-kocik, 2017). A similar checking, monitoring, control and countermeasuring step is widely adopted in sustainability management integration frameworks (Asif and Searcy, 2014; Nawaz and Koç, 2018; Perrott, 2015). The strategic elements of this step included the review of effectiveness of the policies and strategies adopted towards SSCQM maturity and sustainability integration level improvement; tactical elements were comprised of the evaluation of processes according to TBL objectives along with action formulation towards the areas not meeting objectives; and operational elements revolved around the lower level execution of the performance measurement and countermeasure actions.

The role of organisational learning and knowledge management in implementing and locking in organisational changes for sustainable development are highly recognised (Edwards, 2009; Espinosa and Porter, 2011; Gloet, 2006; Meppem and Gill, 1998; Robinson et al., 2006). Organisational learning sought is captured as part of standard work, training and knowledge management practices, with a view to freeze and sustain effective organisational changes with reference to TBL sustainability integration and performance improvement (Jarrar, 2002; Pun and Nathai-Balkissoon, 2011). Wang and Ahmed (2003) concluded "focus on collectivity of individual learning, implementation of a formalised and effective process or system for organisational learning, culture, knowledge management, and continuous

improvement" as key to organisational learning, which were established as aspects highly relevant from a practitioners' view of learning acquisition, extended sustainability knowledge and understanding throughout the organisation, and permanent shift towards sustainable development.

Recognising sustainable development as "a journey, not a destination" for organisations (Crews, 2010; Milne et al., 2005), *Steps 0 and 1* were set to be revisited in a cyclic manner for continual improvement. This is undertaken through periodical reassessment of stakeholder requirements that are susceptible to changes due to the dynamic business environment and tracking of anticipated progression in SSCQM principle maturity levels along with TBL sustainability integration levels for continual sustainable development.

4.4.3. The Implementation Procedure of SSCQM

The combination of steps 0 to 4 resulted in a continual, organisational improvement framework structure of Deming's Plan-Do-Check-Act (PDCA), which is positively associated with performance improvement, change management and sustainable development (Kuei and Lu, 2012; Rusinko, 2005; Taylor et al., 2014).

According to Moen and Norman (2009), the PDCA approach offers the following benefits with reference to organisational transformation:

- "Is applicable to and easy to learn / use in all types of organisations, and to all groups and levels in an organisation"
- "Provides a framework for the application of improvement methods and tools guided by theory of knowledge"
- "Allows project plans to adapt as learning occurs"
- "Provides a simple way for people to empower themselves to take action that leads to useful results in the pragmatic tradition of learning"
- "Facilitates the use of teamwork to make improvements and achieve change goals"

Such a structure was argued to provide an implementation structure that is well recognised by industrial practitioners for deployment, and cyclic approach for enhanced business transition management (Johnson, 2002; Sokovic et al., 2010). A similar PDCA based construct has also been adopted by Asif and Searcy (2014), with a view to provide a platform for integration, management and continual improvement of organisational sustainability.

Ultimately, the PDCA philosophy was adopted to provide a platform for continual management maturity and risk assessment, action deployment, monitoring and control on the basis of SSCQM principles, contributing to organisational progression in the endless journey of sustainable development, as conceptualised in Figure 4.12.

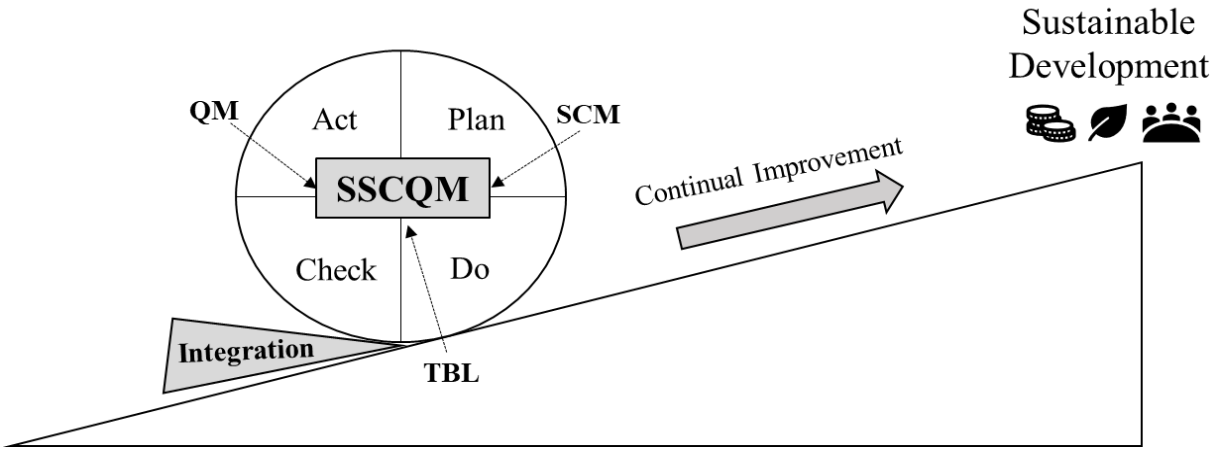


Figure 4.12: PDCA structure adopted for business sustainability integration and continual improvement

The application stages of the SSCQM implementation procedure are illustrated in Figure 4.13 and tabulated in Table 4.6, providing brief descriptions of each step, intended management implementation level and desired outputs from each step. The areas introduced in the light of Delphi expert panel verification and validation feedback (presented in Chapter 5) have been denoted with "*".

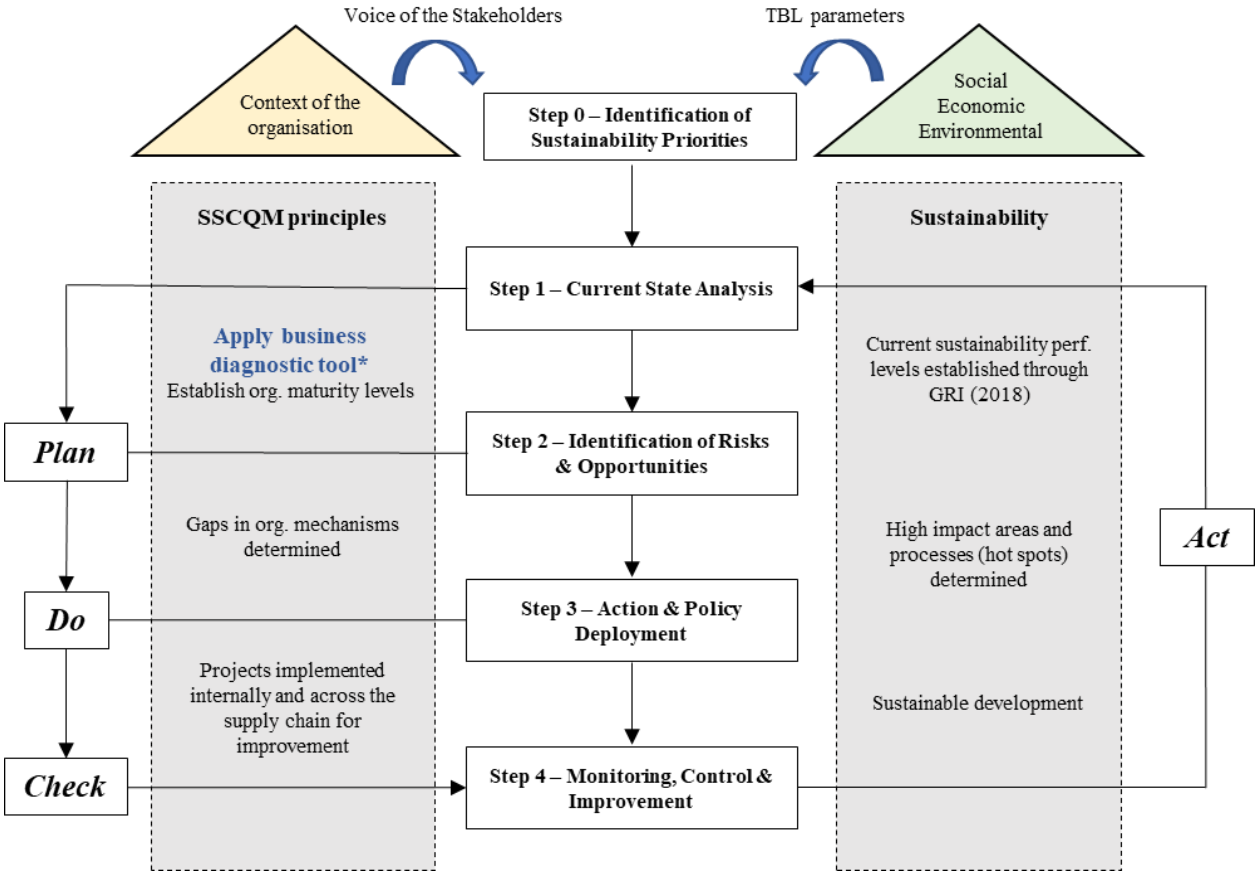


Figure 4.13: SSCQM implementation procedure

* Please refer to Section 4.5 for business diagnostic tool

Table 4.6: SSCQM implementation procedure and application stages for sustainable development

PDCA Step	Description	Management Level*	Output
Plan – Step 0	Identify the key economic, environmental and social sustainability requirements of the stakeholders of your organisation (voice of the stakeholders – VOS). Consider sustainability requirements of your customers and other interested parties (e.g. Public, Legislative Bodies). Establish the key economic, social and environmental sustainability indicators from the GRI framework, in line with the stakeholder requirements of your organisation, adopting a balanced view on triple bottom line*.	Strategic	Sustainability priorities of the organisation identified
Plan – Step 1	Using the SSCQM principle maturity assessment tool (diagnostic tool), assess your organisation against the indicators of each principle versus economic, environmental and social sustainability parameters identified in Step 0, as per the assessment criteria**.	Strategic (and/or Tactical)	SSCQM principles maturity with reference to triple bottom line sustainability established
Plan – Step 2	Analyse the findings, establishing the organisational strengths, weaknesses, risks and opportunities with reference to the SSCQM principle maturity levels and embedding level of economic, environmental and social sustainability parameters. Measure and determine current sustainability performance levels for the economic, environmental and social parameters identified as key in Step 0. Refer to GRI framework for performance measurement and reporting. Conduct benchmarking analysis with similar organisations and operations*.	Strategic and Tactical	Strengths, Weaknesses, Opportunities and Risks with reference to sustainable management established. Current sustainability performance levels determined as per GRI*. Benchmarking conducted with similar organisations*. Hot spots established.
Do – Step 3	Deploy policies and improvement projects internally (within the organisation) and across the supply chain for the areas identified as high risk and requiring improvement.	Strategic, Tactical and Operational	Sustainability improvement strategy and action plan generated
Check – Step 4	Measure and monitor effects of policies, strategies and improvement projects deployed. Redeploy improvement actions and sustain improvements through standard work as required.	Strategic, Tactical and Operational	The effect of improvement actions monitored and controlled for sustainable development
Act	Revisit Steps 0 and 1, reassessing the voice of the stakeholders and organisational maturity levels against triple bottom line sustainability for continual sustainable development.	Strategic and Tactical	Continual cycle of sustainable development through PDCA

**Included as per Delphi study validation feedback (presented in Chapter 5)*

*****Assessment Criteria: "0"**- No evidence of implementation; **"1"**- Informal/inadequate processes in place; **"2"**- Partially implemented (All VOS TBL indicators not included or implemented); **"3"** - Formal process in place inclusive of all VOS TBL sustainability parameters; **"4"**- "3" plus evidence of continuous improvement; **"5"**- Fully implemented inclusive of all GRI sustainability indicators.*

4.5. Organisational Maturity Assessment and Diagnostic Tool

4.5.1. Maturity Assessment for Business Improvement

Maturity assessment is a highly emerging concept in management research, both as an informed path to continual improvement and as a tool for self or 3rd party assessment, articulated as "an evolutionary progress in the demonstration of a specific ability or in the accomplishment of a target, from an initial to a desired or normally occurring end stage" (Mettler, 2011). Business improvement through maturity models are growing in popularity across a broad implementation base, deployed by organisational practitioners "to assess as-is situations, to guide improvement initiatives, and to control progress through a sequence of levels (or stages) that form an anticipated, desired, or logical path from an initial state to maturity" (Röglinger et al., 2012).

Measurement and reporting tools such as grids, graphs and radar plots are usually incorporated in maturity assessment reports for facilitated communication of information regarding the key characteristics of areas under development, providing a clear picture of the current position and progression realised to date, along with the strengths and weaknesses. Such a portraying of current state outlines the actions and steps required to be taken towards the organisational goals through increasing the maturity level on the particular aspects. Such an approach was also considered as highly applicable and synergistic for implementation of the SSCQM philosophy towards organisational sustainability integration and development.

4.5.2. Business Diagnostic Tool

With a view to structure application of the fundamental step (*Step 1 – current state analysis*) in the SSCQM framework, a MS Excel based diagnostic tool was constructed to facilitate:

- Maturity assessment of prospective sustainability management principles (identified as "Principle Maturity")
- Gauging the alignment level of organisational mechanisms, structures and processes with triple bottom line sustainability (denoted as "Sustainability Integration")

This is achieved through assessment of maturity levels (self or 3rd party, awarding scores of 0

to 5 as per set criteria) against the indicators of each principle with reference to economic, environmental and social sustainability parameters (i.e. maturity assessment of principle indicators presented in Table 4.8).

The proposed tool was developed to facilitate organisational practitioners' drawing of the current state (current SSCQM principle maturity and sustainability integration scores) and the future state (future SSCQM principle maturity and sustainability integration scores) maps, developing internal and cross-enterprise development policies and strategies, harmonious with triple bottom line sustainability, providing a platform for gap analysis and benchmarking, and formulating sustainability improvement objectives along with the development of mechanisms, processes and maturity levels required to achieve them.

An iterative approach was adopted during the development of the tool as schematically demonstrated in Figure 4.14, the tool going through a number of major updates prior to its validation with reference to its fitness for purpose, content, format and user friendliness aspects (Greer and Ruhe, 2004; Rauterberg et al., 1995). Scoring system as per assessment criteria has been implemented for enhanced maturity assessment sensitivity (as opposed to Yes / No tick boxes), scoring calculations have been automated for enhancing the ease of implementation, and automatic display of voice of the stakeholders sustainability indicators has been embedded on the individual SSCQM principle assessment screens.

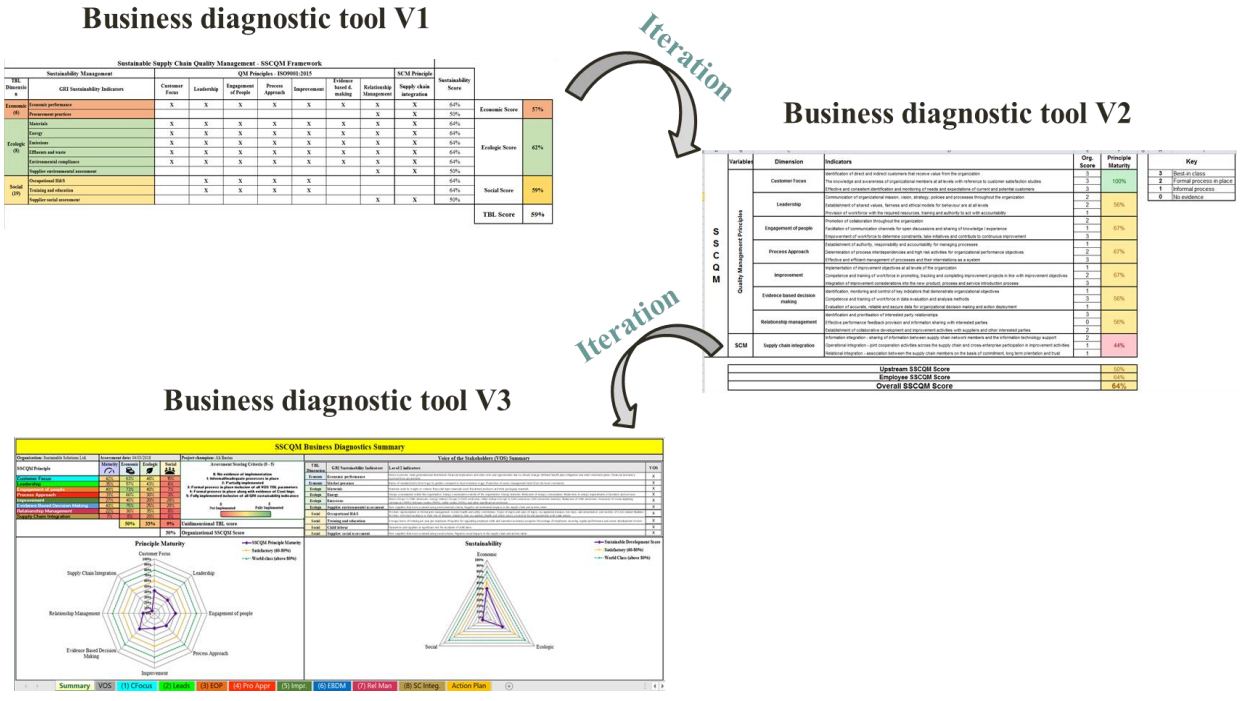


Figure 4.14: Iterative approach adopted during the development of the diagnostic tool

The principle maturity and sustainability integration level calculations are generated through scoring of indicators (presented in Table 4.8), for each SSCQM principle (customer focus etc.), as per the assessment criteria (presented in Table 4.7) for economic, environmental and social dimensions. This is achieved through the establishment of indicator score (1.1, 1.2 etc.) for each sustainability dimension, which is the average score of sub-indicators (1.1a, 1.1b etc.) for each principle. The sub-indicators were incorporated as part of Delphi study validation feedback to reduce assessment subjectivity, enhance repeatability and prescribe tangible management mechanisms / processes / structures to increase maturity of the relevant principle (Please refer to Chapter 5 for further elaboration on this development). During the sub-indicator maturity assessments, the particular mechanism and/or process is evaluated from the perspective of GRI indicators of corresponding sustainability dimension (e.g. economic performance and market presence for economic) on whether this indicator is embedded through the management mechanism under investigation.

The average score calculation of each indicator (1.1, 1.2 etc.) for each sustainability dimension subsequently results in the uni-dimensional sustainability integration score for each principle i.e. the level of integration for each sustainability dimension for the relevant management principle. The average of the triple bottom line (economic, environmental and social) scores for the indicators of each principle is taken to calculate the maturity of each principle. Ultimately, as presented at the summary dashboard, an example of which is shown in Figure 4.15, the average of sustainability integration scores for economic, environmental and social dimensions for all principles are calculated, resulting in an overall SSCQM score for the organisation under assessment

In the case of sample scenario demonstrated in Figure 4.15 (designed as a simulation for demo purposes), the summary dashboard of the tool is indicating that the principles of “customer focus” with maturity score of 0% and supply chain integration with maturity score of 7% offer significant opportunities for directing improvement efforts through development of policies, procedures, processes and culture for integration of sustainability. Moreover, the TBL dimension of “social” is indicated as weakest sustainability dimension, suggesting management focus in this area for achieving balance across the TBL dimensions through embedding of social parameters, key performance indicators and considerations (prioritised based on voice of the stakeholders of the organisation), integration of which is expected to be catalysed through the synthesised set of sustainability synergistic SSCQM principles.

Radar plots are an effective and efficient way of illustrating information that provoke

thinking and facilitate analysis, in particular during reporting of information involving multiple independent variables (Saary, 2008). The Radar plotting system was embedded into the diagnostic tool summary dashboard view to enhance communication of results regarding the principle maturity and sustainability integration assessment levels.

SSCQM Principle	Maturity	Economic	Envir.	Social
1 - Customer Focus	0%	0%	0%	0%
2 - Leadership	32%	60%	33%	3%
3 - Engagement of people	40%	73%	40%	7%
4 - Process Approach	31%	60%	30%	3%
5 - Improvement	27%	40%	20%	20%
6 - Evidence Based Decision Making	40%	75%	25%	20%
7 - Relationship Management	22%	30%	35%	0%
8 - Supply Chain Integration	7%	0%	20%	0%
Unidimensional TBL score		42%	25%	7%
Organizational SSCQM Score				25%

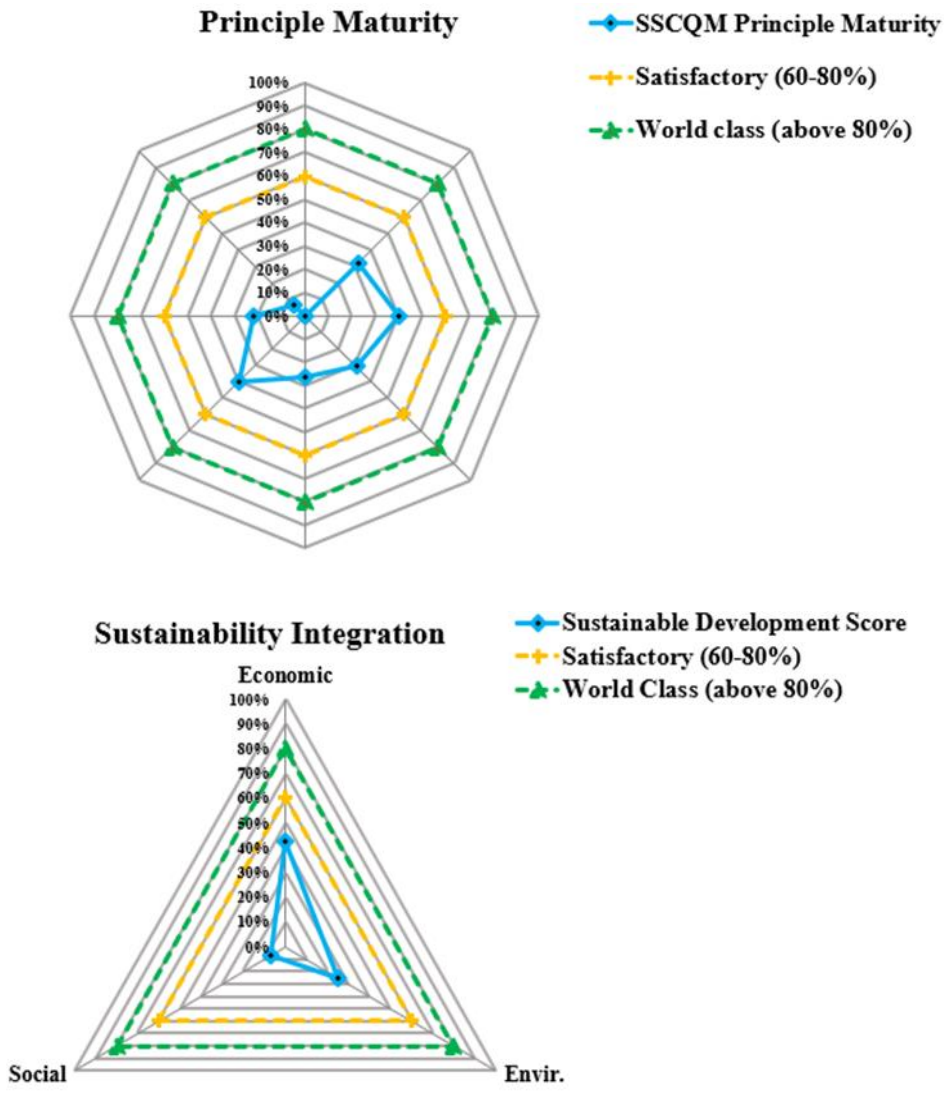


Figure 4.15: SSCQM Diagnostic Tool Summary Dashboard (Sample)

The assessment scoring criteria of 0 to 5 were defined in Table 4.7, with a view to enable quantitative assessment, tangible and objective reference platform during evaluation, and provide a sufficient level of differentiation granularity among the maturity level categories.

Table 4.7: Description of each maturity assessment scoring category

Score - Category	Description
"0" - No evidence of implementation	Sustainability priorities not established. No awareness of GRI framework and its indicators. Management mechanism or process not aligned with the sustainability dimension measurement and reporting requirements.
"1" - Informal/inadequate processes in place	Sustainability priorities informally established / not documented. Management mechanism or process informally aligned with all or some of the sustainability priorities. Measurement and reporting informally carried out.
"2" - Partially implemented (All VOS TBL indicators not included or implemented)	Sustainability priorities established. Management mechanism or process formally aligned for some but not all of the sustainability priorities. Measurement and reporting formally carried out for some but not all of the sustainability priorities.
"3" - Formal process in place inclusive of all VOS TBL sustainability parameters	Sustainability priorities established. Management mechanism or process formally aligned for all of the sustainability priorities. Measurement and reporting formally carried out for all of the sustainability priorities.
"4" - "3" plus evidence of continuous improvement	In addition to "3", improvement actions documented and controlled for the sustainability priorities. Continual improvement with reference to the management process or mechanism and priorities can be demonstrated.
"5" - Fully implemented inclusive of all GRI sustainability indicators	All GRI indicators for the sustainability dimension (all 6 for economic, all 8 for environmental, all 19 for social) are in place for the management mechanism or process along with documented and controlled improvement actions.

The definition and establishment of indicators for the 8 SSCQM principles formed the foundations of the diagnostic tool, which were initially extracted from the indicative QM and SCM literature (Chang et al., 2016; ISO, 2015b). These indicators were adapted from the lens of sustainable development, and additional indicators included as a result of Delphi expert panel feedback to capture a wide scope of issues integral to implementation and organisational maturity of each principle, as outlined in Table 4.8, where each indicator is assessed for current state analysis and managerial improvement action identification.

Table 4.8: Indicators of SSCQM principles for organisational maturity assessment

1. Customer focus	
1.1	**Are the current and future sustainability needs and requirements of current and potential customers identified, and risk analysis conducted?**
1.1a	Sustainability awareness and expectations feedback sought from key markets and customers
1.1b	Current and future TBL sustainability requirements of key customers identified
1.1c	Risk analyses with reference to customer sustainability needs and requirements carried out
1.2*	**Is there engagement with the customers with regards to their sustainability awareness and expectations?**
1.2a	Customer and market sustainability awareness and expectations questionnaires/interviews conducted
1.2b	Customer sustainability awareness training conducted periodically with key customers of the business
1.2c	Sustainability improvement projects and outcomes communicated periodically to key customers
1.3	**Are the sustainability needs and requirements of customers aligned with the objectives of the organisation?**
1.3a	Sustainability needs and requirements of key customers/markets identified
1.3b	Sustainability KPIs established as per GRI framework, aligned with customer/market needs and requirements
1.3c	Customer sustainability KPIs are embedded into organisational objectives for monitoring and improvement
1.4	**Is the customer satisfaction with reference to sustainability of the organisation measured and monitored along with implementation of actions as required?**
1.4a	Customer and market sustainability satisfaction feedback captured, evaluated and actioned via questionnaires/interviews or similar
1.4b	Customer satisfaction feedback capturing process includes sustainability
1.5	**Are the sustainability needs and requirements of customers communicated throughout the organisation?**
1.5a	Sustainability needs and requirements of customers communicated to employees at all levels periodically
1.5b	Sustainability communication channels identified
1.5c	Sustainability communication channels supported and in place
1.6	**Are the organisational members at all levels aware of customer sustainability needs and requirements?**
1.6a	Employee awareness feedback with reference to customer sustainability requirements captured
1.6b	Employee awareness feedback with reference to customer sustainability requirements evaluated
1.6c	Employee awareness feedback with reference to customer sustainability requirements actioned and effects monitored
1.7	**Are the needs and expectations of the interested parties** that can affect customer satisfaction regarding sustainability performance identified and actioned?**
1.7a	Needs and expectations of key stakeholders (interested parties) that can affect customer satisfaction with reference to sustainability performance identified
1.7b	Risk analysis conducted regarding needs and expectations of key interested parties that can affect customer satisfaction with reference to sustainability performance
1.7c	Risk mitigation actions with reference to above are taken and effects monitored
1.8	**Are the products, services and processes of the organisation aligned with the sustainability needs and requirements of the customers and the market?**
1.8a	Current product/services/processes sustainability performance monitored and controlled in line with customer sustainability performance expectations
1.8b	Customer sustainability needs/requirements reviewed and implemented as part of New Product/Service/Process introduction processes.

2. Leadership

2.1	**Are the leaders of the organisation committed to sustainable development through clear mission, vision, policies and objectives?**
2.1a	Sustainability mission, vision and policies for environmental, social and economic sustainability in place and reviewed periodically
2.1b	Sustainability objectives for economic, social and environmental sustainability in place in line with the voice of the stakeholders analysis of the organisation
2.1c	Performance against the sustainability objectives monitored by senior management and controlled
2.2	**Are the sustainable development mission, vision, policies and objectives articulated throughout the organisation?**
2.2a	Sustainability mission, vision, policies and objectives for environmental, social and economic sustainability communicated periodically at all levels of the organisation
2.2b	Communication channels for above identified
2.2c	Communication channels for above supported and in place
2.3	**Is the organisation-wide commitment to sustainable development encouraged?**
2.3a	Organisational sustainability values in place and part of the recruitment processes with reference to sustainable development
2.3b	Organisational commitment statement in place and communicated to key stakeholders (employees, suppliers, public etc.)
2.3c	Contribution to sustainability improvement activities encouraged, recognised and rewarded
2.4	**Is the workforce provided with the necessary resources, training and authority to drive sustainability improvement activities?**
2.4a	Sustainability awareness and performance measurement training conducted
2.4b	Resources required for key sustainability KPI monitoring and improvement identified and supported
2.4c	Roles & responsibilities with reference to sustainability improvement activities defined and authority established
2.5	**Are people in the organisation inspired and encouraged to engage in sustainability improvement activities, being recognised both at individual and team levels?**
2.5a	Key contributors (teams and individuals) to sustainability improvement activities at individual and team levels identified
2.5b	Key contributors (teams and individuals) to sustainability improvement activities at individual and team levels recognised and rewarded
2.6*	**Is benchmarking analysis conducted with similar operations and organisations?**
2.6a	Benchmarking analysis conducted with similar organisations and operations identified in the market, for key sustainability KPIs of the organisation
2.6b	Sustainability information transferred between similar organisations for benchmarking, cooperation and improvement
2.6c	Improvement actions deployed and monitored as per benchmarking analysis outcomes
2.7	**Are the leaders of the organisation at all levels positive examples to people in the organisation with reference to sustainable development?**
2.7a	Sustainability values of the organisation are part of the leadership recruitment process
2.7b	Sustainable development values of the organisation reinforced by the leaders
2.8*	**Does the organisation review the effectiveness of its sustainability leadership policies? Is feedback collected and actioned?**
2.8a	Effectiveness of and adherence to sustainability policies evaluated and controlled
2.8b	Feedback is captured from employees at all levels for evaluation, control and development

3. Engagement of people

3.1*	**Is there a common understanding and awareness of sustainability among the employees at all levels of the organisation?**
3.1a	Sustainability awareness training conducted periodically for employees at all levels, importance of sustainability and sustainable development articulated
3.1b	Benefits of sustainability improvement projects demonstrated

3.1c	Sustainability mission, vision, policies and objectives articulated to employees at all levels
3.2	**Is collaboration promoted for sustainable development throughout the organisation?**
3.2a	Organisational sustainability objectives aligned with departmental, team and individual objectives
3.2b	Cross-functional teams and sustainability circles established to facilitate collaboration for sustainability improvement
3.3	**Is sharing of knowledge, experience and information facilitated among employees for sustainable development?**
3.3a	Information, knowledge and experience sharing sessions held periodically for employees at all levels
3.3b	Channels and resources for above identified
3.3c	Channels and resources for above in place and supported
3.4	**Is the workforce empowered to determine constraints, challenge current practices, take initiatives and contribute to sustainable development as required?**
3.4a	Key contributions to sustainability improvement and learning activities at individual and team levels identified, recognised and rewarded
3.4b	Self-managing teams established for sustainability performance measurement and improvement
3.4c	Contribution to sustainability improvement encouraged through clear mission, vision, policies and objectives
3.5	**Is there an established communication with people to promote understanding of the importance of their individual contribution to sustainable development?**
3.5a	Employees at all levels encouraged to participate in sustainability improvement activities and benefits of sustainability improvement projects demonstrated
3.5b	Sustainability communication sessions are held periodically for employees at all levels, demonstrating the importance and influence of contributions at the individual level
3.5c	Channels and resources for above identified, in place and supported
3.6	**Is people's contribution, learning and improvement with reference to sustainable development recognised and acknowledged?**
3.6a	Key contributions to sustainability improvement and learning activities at individual and team levels identified
3.6b	Key contributions to sustainability improvement and learning activities at individual and team levels recognised and rewarded
3.7*	**Are roles, responsibilities and levels of authority for individuals defined with reference to sustainability?**
3.7a	Roles & responsibilities with reference to sustainability performance measurement and improvement activities defined
3.7b	Decision making, monitoring and control mechanisms and authority with reference to sustainability performance measurement and improvement activities established
3.8	**Do the people conduct self-evaluation of performance with reference to their contribution to sustainable development against personal objectives?**
3.8a	Sustainability improvement objectives of the organisation and teams are linked with personal objectives of the employees
3.8b	Employees can self-evaluate their performance in line with their personal objectives that are linked to the sustainability performance of the organisation
3.8c	Sustainability KPIs of the organisation measured and available to all employees

4. Process approach

4.1	**Are the sustainability objectives of the organisation defined along with the processes necessary to achieve them?**
4.1a	Sustainability objectives for economic, social and environmental sustainability are in place in line with the voice of the stakeholders analysis of the organisation
4.1b	Sustainability KPI monitoring and improvement processes are established and in place
4.2	**Are high risk activities and processes determined for organisational sustainability performance (sustainability risk-based thinking)?**
4.2a	Risk analyses conducted for organisational sustainability performance
4.2b	High risk activities and processes for organisational sustainability performance determined

4.3	**Are the high risk processes and their interrelations managed effectively and efficiently as a coherent system in line with sustainability objectives?**
4.3a	Sustainability performance of high risk activities and processes measured, evaluated and controlled
4.3b	Effectiveness of sustainability improvement projects on high risk processes evaluated periodically
4.4	**Are the organisational capabilities understood and resource constraints established and actioned with reference to sustainable development?**
4.4a	Organisational capabilities, processes and resources required to achieve sustainability objectives identified
4.4b	Organisational capabilities, processes and resources required to achieve sustainability objectives supported and in place
4.5	**Is the necessary information available to monitor, analyse and improve the sustainability performance of the overall system?**
4.5a	Sustainability KPI information and data of key processes and the overall system is captured periodically
4.5b	Sustainability KPI information and data of key processes and the overall system is reviewed periodically and actioned
4.6*	**Is there an established process to capture organisational learning with reference to sustainable development?**
4.6a	Process in place for sustainability information, knowledge, learnings and experiences to be documented and shared periodically among the employees at all levels of the organisation
4.6b	Sustainability improvement projects status and their benefits to key stakeholders documented and communicated periodically
4.7	**Is the authority, responsibility and accountability established for managing processes in line with sustainability objectives?**
4.7a	Owners of sustainability objectives identified for key processes including the authority, responsibility and accountability
4.7b	Monitoring and control mechanisms identified and in place for management of key processes in line with sustainability objectives
5. Improvement	
5.1	**Are the sustainability improvement objectives implemented at all levels of the organisation?**
5.1a	Sustainability objectives for economic, social and environmental sustainability are in place in line with the voice of the stakeholders analysis of the organisation
5.1b	Sustainability objectives are communicated at all levels and are aligned with departmental and personal objectives
5.2*	**Are sustainability performance KPIs implemented along with defined measurement and improvement processes, in line with sustainability priorities (Step 0)?**
5.2a	Economic, social and environmental sustainability KPIs for measurement, reporting and improvement established as per the GRI framework in line with the VOS analysis
5.2b	Improvement objectives for each KPI in place along with timescales and review mechanisms
5.3	**Is the workforce trained and competent in promoting, tracking and completing sustainability improvement projects in line with the objectives?**
5.3a	Workforce trained in improvement project management tools and techniques
5.3b	Workforce fully aware of sustainability KPIs and objectives of the organisation
5.3c	Roles, responsibilities and authority for sustainability improvement projects established
5.4	**Are the sustainability improvement considerations incorporated into the new product, process and service introduction processes?**
5.4a	New Product/Service/Process introduction processes include sustainability performance considerations and improvement, in line with the organisational mission, vision, policies and objectives
5.4b	Sustainability aspects and impacts reviewed and actioned as part of New Product/Process/Service introduction processes
5.5*	**Does the organisation promote innovation with regards to sustainability when developing and introducing new products and services?**
5.5a	Key contributions and innovations for sustainable product and service development identified
5.5b	Key contributions and innovations for sustainable product and service development recognised and rewarded

5.6	**Are the sustainability improvement projects' planning, implementation, completion and results tracked, reviewed and audited?**
5.6a	Sustainability improvement project tracking process in place
5.6b	Project management resources in place for sustainability improvement projects
5.6c	Sustainability improvement projects status formally reviewed by senior management and issues logged and actioned appropriately
5.7	**Is organisational sustainability improvement recognised and acknowledged?**
5.7a	Key contributions to organisational sustainability performance improvement recognised and rewarded
5.7b	Organisational sustainability improvement scheme in place
5.8	**Is there a process to implement sustainability improvement projects throughout the organisation?**
5.8a	Sustainability improvement projects developed, evaluated, prioritised and supported based on risk analysis
5.8b	Resources required for each improvement project identified and supported

6. Evidence based decision making

6.1	**Are the KPIs for organisational sustainability improvement objectives identified, monitored and controlled?**
6.1a	Voice of the stakeholders analysis conducted, identifying the TBL sustainability priorities of the organisation
6.1b	Economic, social and environmental sustainability KPIs for measurement, reporting and improvement established as per the GRI framework
6.1c	Improvement objectives for each KPI in place along with timescales and review mechanisms
6.2	**Is the workforce trained and competent in sustainability performance data capturing, evaluation and analysis methods?**
6.2a	Sustainability KPIs are communicated to employees at all levels along with defined roles & responsibilities
6.2b	Sustainability awareness training conducted to all personnel periodically
6.2c	Sustainability performance measurement tools & techniques training conducted to all relevant personnel
6.3	**Is accurate and reliable data and information measured and evaluated for organisational decision making and sustainability improvement action deployment?**
6.3a	Sustainability performance data and information captured as per GRI framework guidelines
6.3b	Sustainability performance data reported periodically to senior management for monitoring and control purposes
6.3c	Sustainability performance improvement actions documented and tracked
6.4*	**Is employee feedback on sustainability within the organisation captured and evaluated?**
6.4a	Feedback captured periodically from employees at all levels with reference to sustainability performance and improvement
6.4b	Employee sustainability improvement scheme in place
6.4c	Employee sustainability feedback analysis and improvement process in place
6.5	**Is all data and information with reference to sustainability improvement available to the relevant people throughout the organisation?**
6.5a	Roles & responsibilities with reference to sustainability KPI monitoring and improvement defined throughout the organisation
6.5b	Sustainability performance data and information captured and presented to process owners at all levels and performance reviewed by senior management

7. Relationship Management

7.1	**Are the current and future sustainability needs and requirements of **interested parties identified, and risk analysis conducted?**
7.1a	Key stakeholders identified, sustainability awareness and feedback sought from key stakeholders
7.1b	Current and future TBL sustainability requirements of key stakeholders identified

7.1c Risk analyses with reference to stakeholder sustainability needs and requirements carried out

7.2* Are relationships with employees managed for sustainable development?
7.2a Employee relationship management process in place
7.2b Feedback sought from employees with reference to TBL sustainability performance and improvement
7.2c Employees at all levels encouraged to participate in sustainability improvement projects and benefits of sustainability improvement projects demonstrated

7.3* Are relationships with customers managed for sustainable development?
7.3a Customer relationship management process in place
7.3b Feedback obtained from customers with reference to their sustainability needs and requirements, market analysis conducted
7.3c Customers included in sustainability improvement projects, benefits of sustainability improvement projects communicated to key customers

7.4 Is information, feedback, expertise and resources being exchanged with other interested parties for sustainable development?
7.4a Key information and resources required for TBL sustainability performance / priorities identified
7.4b Key stakeholders identified along with their information needs and categorisation of resources possessed / availability
7.4c Process in place for periodical exchange of information, expertise and resources with key stakeholders

7.5 Are collaborative sustainability improvement activities established with suppliers, partners and other interested parties?
7.5a Current and future TBL sustainability requirements of key stakeholders identified
7.5b Risk analyses with reference to stakeholder sustainability needs and requirements carried out
7.5c Sustainability improvement projects established for high risk areas with key stakeholders.

7.6 Are sustainability improvements and achievements by external providers and partners recognised and encouraged?
7.6a Sustainability performance and improvement part of long term business deals and contractual agreements with suppliers
7.6b Improvement targets of cross-enterprise sustainability projects agreed and in place
7.6c Process in place for supply chain members that take part in sustainability improvement projects to be recognised and awarded, benefits sought communicated and mutually-shared.

8. Supply chain integration

8.1* Is sustainability a shared value across the supply chain network?
8.1a Sustainability training and awareness sessions held with key supply chain members
8.1b Sustainability communicated as a core value of the business
8.1c Sustainability forms part of contractual supply chain agreements

8.2 Is information being shared between supply chain members with reference to sustainable development?
8.2a IT Support for sustainability information sharing in place
8.2b Key communication channels for sustainability performance monitoring and improvement identified and in place between supply chain members
8.2c Accuracy and reliability of the information periodically verified between all parties

8.3 Are joint cooperation activities being held across the supply chain including cross-enterprise participation for sustainable development?
8.3a Team members identified from each participating organisation in the supply chain
8.3b Joint sustainability improvement projects in place
8.3c Participation in joint cooperation activities agreed contractually

8.4*	**Is supply chain integration for sustainable development encouraged, rewarded and benefits mutually shared?**
8.4a	Suppliers / customers that actively take part in sustainability improvement projects identified
8.4b	Rewarding process in place for key contributors
8.4c	Sustainability benefits sought as a result of joint activities mutually shared
8.5*	**Is future business linked to supply chain integration for sustainable development?**
8.5a	Sustainability performance is part of supplier selection process
8.5b	Sourcing decisions include sustainability performance and engagement of the suppliers / supply chain
8.5c	Suppliers / customers that actively take part in joint sustainability improvement projects recognised and awarded future business
8.6*	**Is risk analysis conducted, identifying high risk supply chains and suppliers for prioritisation of supply chain integration for sustainable development?**
8.6a	Risk analyses for environmental, social and economic sustainability conducted periodically
8.6b	High risk supply chains and suppliers for sustainability identified and prioritised
8.6c	Sustainability improvement projects coordinated across the supply chain based on risk
8.7	**Is there an association among supply chain members based on commitment, long term orientation and trust with reference to sustainable development?**
8.7a	Sustainability performance and improvement is part of long term business deals and contractual agreements with suppliers
8.7b	Improvement targets of cross-enterprise sustainability projects agreed and in place
8.7c	Process in place for supply chain members that take part in sustainability improvement projects to be recognised and awarded
8.8*	**Is a supply chain integration statement in place with appropriate KPIs to monitor effectiveness and drive improvement?**
8.8a	Declaration of commitment to sustainable development objectives in place between all parties
8.8b	Improvement targets of cross-enterprise sustainability projects agreed and in place
8.8c	KPIs with reference to TBL sustainability are identified, monitored and controlled by all parties

All indicators denoted with "*" and all sub-indicators (e.g. 1.1a, b etc.) were included as per Delphi study validation feedback (presented in Chapter 5)

****Interested parties include:** Legislative Bodies (e.g. Governmental Institutions, British Safety Council); Public (e.g. local community); Suppliers / external providers / partners; Customers; Employees; Shareholders / Owners; Certification bodies e.g. UKAS, TURKAK.

KPI: Key performance indicator

The inclusion of sub-indicators in the light of the Delphi subject matter expert recommendations, provided a three-level granularity as conceptualised in Figure 4.16, that comprised of principle, indicator and mechanism / process levels for breaking down the maturity assessment and associated improvement action formulation into manageable, representative and meaningful chunks.

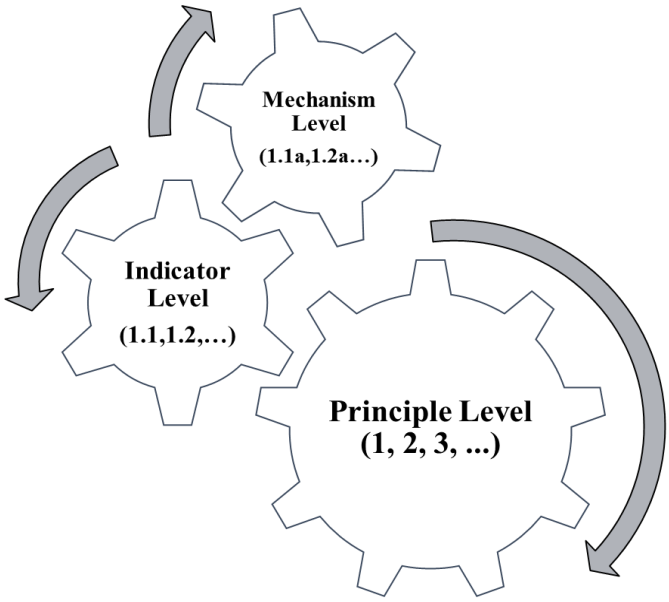


Figure 4.16: Three-level granularity adopted for SSCQM principle maturity development

On the other hand, it was noteworthy that in particular instances, practitioners in different business sectors may feel the need to simplify or add to these set of indicators to capture industry-specific issues and tailor the tool in line with the context of their organisations and stakeholder needs. Arguably, taking into account the diverse nature of stakeholders and business sectors, one set of indicators might not provide a fit to all business types and sectors therefore, the tool was designed with the flexibility to allow such modifications by the practitioners with a view to adopt this approach fully in line with the contextual and temporal circumstances of their businesses through a risk based approach to sustainable development, under the umbrella of SSCQM.

Although a stakeholder risk and prioritisation based approach was utilised in the SSCQM concept, ultimate goal for each organisation is required to be implementation and improvement of all applicable GRI indicators, outlined for each TBL dimension (economic, environmental and social), SSCQM principle maturity assessment translation of which equates to a judgement of 5 out of 5 in the diagnostic tool (GRI, 2018). Depending on the

management principle maturity level and sustainability integration level, a score range of 60-80% was identified as "satisfactory", which equates to overall scores of 3 and 4, indicating implementation of all triple bottom line agendas key to the stakeholders of the organisation (sustainability priorities as per voice of the stakeholders). The overall assessment scores of 4 and 5 would result in the overall score of above 80%, which was denoted as "world class".

Scores lower than 60% were classed as "requiring immediate improvement". Such an organisational quantitative assessment scoring and maturity categorisation further provides a benchmarking avenue for organisations globally, facilitating comparison against similar operations and offering a reference point for sustainable development (Springett, 2003). A similar classification, based on the level of corporate sustainability integration was adopted in the literature (Benn et al., 2006), and divided into three fundamental phases of "reactive, proactive and sustainable" (Witjes et al., 2017). The three key scoring categories formulated were reflected to align with the extant literature definitions on corporate sustainability integration maturity as following (Benn et al., 2006; Witjes et al., 2017):

Scores < 60% *(Requiring Immediate Improvement): Reactive Organisation*

Scores between 60-80% *(Satisfactory): Proactive Organisation*

Scores > 80% *(World Class): Sustainable Organisation*

In summary, through benchmarking against the SSCQM business diagnostic tool, the industrial practitioners can:

- Determine the maturity level of each SSCQM principle in their organisations;
- Holistically evaluate alignment of existing organisational culture, mechanisms, practices and processes against triple bottom line (economic, environmental and social) parameters;
- Establish organisational strengths, weaknesses, opportunities and threats (SWOT) with reference to sustainability synergistic SSCQM principles;
- Integrate triple bottom line (economic, environmental and social) considerations into organisational quality and supply chain management systems and processes;
- Undertake organisational current state (current SSCQM score) and future state analyses (desired SSCQM score) towards sustainable development;
- Assign sustainability improvement objectives aligned with organisational mechanisms, monitoring and controlling effect of improvement projects implemented;
- Deploy sustainability synergistic intra and interorganisational policies, strategies and processes for continual sustainable development.

4.6. Supply Chain Deployment Strategy

True sustainable development requires a global perspective and commitment, highlighting the importance of life cycle and holistic supply chain approaches (Reefke and Sundaram, 2016). Outsourcing unsustainable products, processes and services leads to transferring of sustainability impacts upstream or downstream the supply chain network. Such an approach equates to pushing of sustainability issues outside the boundaries of organisations or relocating their geographical regions, however the overall sustainability impact "remains unaffected" (Rajeev et al., 2017).

Although the supply chain vision was incorporated within the proposed SSCQM concept through the key sustainable SCM principles of leadership and supply chain integration, the synthesised theories and concepts enable sustainability integration, evaluation and implementation at the organisational level, but not across supply chains. With a view to address this issue and facilitate application at supply chain level, a deployment strategy was formulated. As framed in Figure 4.17, SSCQM scores of suppliers, the focal organisation and customers can be generated, enabling cumulative supply chain sustainability management maturity assessments (SSCQM assessments) and improvement. This concept introduced significant implications for the sustainability of supply chains along with the potential of realising further supply chain collaboration, enhanced cross-enterprise communication, interorganisational exchange of know-how, aligned sustainability goals across the supply chain network, shared resources and efficiencies for sustainable development of the overall supply chain.

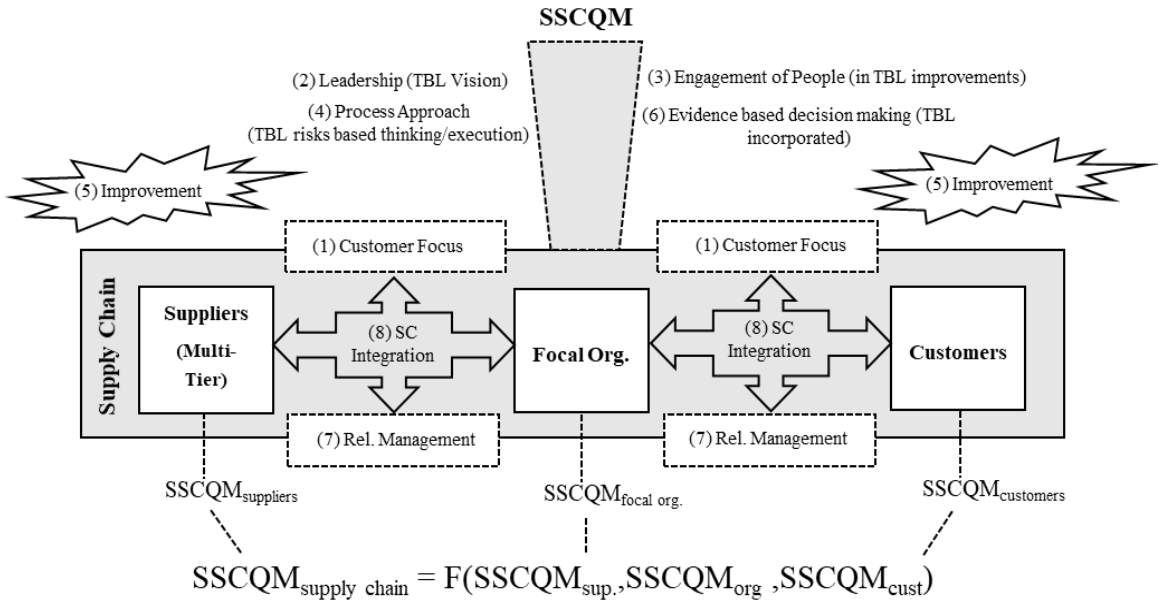


Figure 4.17: SSCQM for sustainable development of supply chains

4.7. Summary and Conclusions

This chapter introduced the conceptual evolution of the research towards addressing the research questions 3, 4 and 5. A comprehensive gap analysis into the extant literature models and frameworks revealed a key opportunity for the conceptual framework, constructed based on the synergies offered by the ISO 9001 and supply chain integration principles for organisational sustainable development. This opportunity was utilised through the integrated contribution of sustainable supply chain quality management (SSCQM), shedding light into RQ3 through articulating how QM and SCM approaches can facilitate sustainability integration, and into RQ4 through setting out which principles of the same would be better suited and strategically positioned for a coherent and synergistic framework.

Stemming from this conceptual position and linkages established between QM, SCM and triple bottom line sustainability in the business management context, an implementation procedure as a road map for application was formulated in line with RQ5, discussing steps central to successful operationalisation of the SSCQM philosophy. This procedure was built with the strengths, weaknesses and learnings of the existing management approaches to integration of sustainability in mind, filling an evident gap in the extant body of knowledge through paving the path for managerial practice with reference to embedding of triple bottom line sustainability through QM and SCM.

Furthermore, a novel, organisational diagnostic tool was developed, utilising the benefits offered by the maturity assessment approach to organisational improvement, and aiding operationalisation of the implementation procedure. Ultimately, a conceptual strategy for deployment and diffusion of the SSCQM approach to supply chains was formulated, recognising that true business sustainability will be accelerated through sustainable development of overall supply chains, as opposed to pursuing of individual firm initiatives.

CHAPTER 5 – VERIFICATION AND VALIDATION

5.1. Introduction

This chapter includes the verification and validation (stage 1) aspects of the research, which were undertaken through the Delphi study method, with a view to address the research question 6. The Delphi study design and process adopted is detailed, along with the articulation of expert criteria adopted, descriptive statistics of the expert panel, and specification of particular Delphi study objectives in line with RQ6.

Following the discussion of methods adopted, the findings reached as a result of the study are presented. The findings are structured in terms of quantitative and qualitative analysis components, as part of the mixed research design adopted, revolving around the consensus analysis and thematic synthesis methods. The relationships framed under the SSCQM framework are verified through expert consensus, along with the initial expert validation of various aspects of the implementation procedure developed, including the business diagnostic tool. Although the high consensus rates reached on each and every aspect of the implementation procedure, a number of improvements were conducted in the light of qualitative feedback captured, maturifying further the managerial solution formulated for organisational integration of sustainability.

5.2. Delphi Study - Design and Methodology

5.2.1. Objectives and Overview

Following development of the conceptual framework along with the implementation procedure and diagnostic tool, the questions of verification and validity arised for the conceptual positions put forward, and for the practicality, applicability and usefulness of the concepts put together for an effective operationalisation, as per the research question 6 outlined below:

> **RQ6:** Would such a framework provide a practically verified and validated solution to industrial and academic subject matter expertise for organisational and supply chain integration of sustainability?

In accordance with RQ6, the key objectives of the Delphi study were established as verification and validation of the following through expert feedback:

- *Verification of conceptual framework:* Verify the relationships between the seven ISO 9001:2015 quality management principles, supply chain integration principle of

supply chain management and triple bottom line sustainability in the context of organisational sustainable development (Section 5.3).

- *Validation of implementation procedure:* Validate the SSCQM implementation procedure developed to facilitate organisational sustainability integration and improvement (Section 5.4.1).

- *Validation of business diagnostic tool:* Validate the diagnostic tool developed to enable maturity assessment of the eight principle synthesised under the SSCQM implemenation procedure, facilitating organisational gap analysis (Section 5.4.2).

The key characteristics of the Delphi method are its iterative nature that seeks improvement in the novel development through capturing, review and circulation of expert views until an acceptable level (consensus) is achieved, its anonymous nature that allows experts to freely criticise and guide the way to improvement without feeling under pressure, and its structured nature that enables control, direction and alignment towards collecting expert feedback in line with the research inquiries (Rowe and Wright, 2013).

A panel of experts is established based on a qualification criteria, their opinions, feedback and criticism about the novel development is collected, feedback analysed, aspects of consensus determined, improvement areas established and as a result, the solution under investigation is maturified (Dalkey and Helmer, 1963; Hung et al., 2008; Linstone and Turoff, 1975). The summary of findings are shared with the panel of experts in terms of rounds, along with any changes implemented in the phenomenon under investigation, providing the experts with the opportunity of both re-evaluating their initial positions and confirming the changes seeking to improve the phenomenon, which is repeated until a satisfactory consensus level is secured by the researcher (Dalkey and Helmer, 1963; Hung et al., 2008; Linstone and Turoff, 1975).

5.2.2. Delphi Panel Selection

The output quality for Delphi studies is heavily dependent on the expert criteria and selection (Hsu and Sandford, 2007b), willingness and interest of experts to participation identified as key factors for obtaining fruitful and meaningful outcomes (Linstone and Turoff, 1975). As the opinion of the Delphi panellists is shaped by and based upon their experiences, knowledge and perceptions of the field, and diversification on the basis of research orientations, backgrounds and sectors are fundamental for not only capturing a rich level of

data but also for minimisation of bias due to similar experiences. Stemming from this consideration and to contribute towards development of a management solution applicable and generalisable to a significant range of industries and geographical regions, experts from a wide base of industrial and academic backgrounds, and regions were approached to take part in the Delphi study.

Experts possessing a scholar and/or research background were classified as "academics" whereas, experts with industrial management, decision making, and implementation background were described as "practitioners". Established academic and practitioner specialists in the area of operations, supply chain and quality management with established experience/knowledge on sustainability were included based on the following expert selection criteria:

- Must possess a minimum 4 years of organisational management, decision making, working, teaching or research experience of sustainable development and supply chain, quality and operations management *AND / OR;*

- Must have an active engagement in organisational sustainable development research with international publication contributions in high impact journals in the field (e.g. Sustainability (MDPI), Journal of Cleaner Production (Elsevier)).

Delphi studies were reviewed from the perspective of sample size (i.e. number of participants or size of the Delphi panel) as a significant variable, panel size ranging from 3 to 345 experts and 80% accommodating between 20 and 50 participants (Skulmoski et al., 2007). Low number of participants were noted to result in limiting the scope of information captured along with the risk of missing key information and data essential to the study (Rowe and Wright, 2013). On the other hand, very high numbers were deducted to carry the risk of resulting in unconstructive conflicts, overload of data and diversion of focus to issues that are irrelevant or non-value added to the research inquiry (Rowe and Wright, 2013). In the case of this study that adopted heterogenous sampling (through various participant traits), optimum number of participants was concluded to be between 20 and 40 (Delbecq et al., 1976).

Academics and practitioners were identified and invited through formal invitation letters as per defined expert criteria above, with a view to include specialists that represented a wide range of industrial, academic and regional backgrounds (Please refer to Appendix Six for the invitation letter template utilised). As a result, as presented in Table 5.1, 20 academic and industrial experts from various business sectors (e.g. automotive, construction, steel

manufacturing, aerospace, research etc.), international institutions and world class organisations took part in the study from a wide scope of geographical regions including Mexico, UK, USA, Turkey, Cyprus, Macedonia and Morocco.

Table 5.1: Distribution of Delphi panel experts by type of institution, sector, experience and geographical region

Expert No	Type of Institution	Sector	Experience and Expertise	Country
1	University	Research	Lecturer in Sustainable Supply Chain Management	UK
2	University	Research	Researcher in Sustainability, Lean and Circular Economy	UK
3	University	Research	Sustainability and Engineering Scholar	USA
4	Industry	Manufacturing - Automotive	Lean and Supply Chain Development Professional	UK
5	University	Research	Researcher in Sustainable Supply Chain Management	Mexico
6	Industry	Manufacturing - Steel	Quality Assurance Manager	UK
7	University	Research	Senior Lecturer in Supply Chain Improvement	UK
8	University	Research	Sustainability Management Modelling and Decision Making Scholar	UK
9	Industry	Manufacturing - Aerospace & OEM	Supply Chain Performance Manager	UK
10	University	Research	Associate Professor in Sustainability Decision Making	Macedonia
11	University	Research	Associate Professor in Sustainable Development and Engineering	Cyprus
12	Industry	Manufacturing - Steel	Quality Systems Manager	Turkey
13	Industry	Manufacturing - Steel	Continuous Improvement and Planning Manager	Turkey
14	Industry	Manufacturing - Automotive	Senior Corporate Manager in Environment & Energy	Mexico
15	Industry	Construction	Business and Continuous Improvement Director	Cyprus
16	University	Research	Lean, Green and Sustainability Scholar	Morocco

17	University	Research	Researcher in Sustainable Supply Chain Management	UK
18	Industry	Manufacturing - Chemical & Service	Organisational Development and Management Consultant	Cyprus
19	University	Research	Sustainability Management Scholar	Cyprus
20	Industry	Manufacturing - OEM	Supply Chain Development Professional & Management Systems Auditor	UK

OEM: Original Equipment Manufacturer

The descriptive statistics of the Delphi panel participants are presented in Figure 5.1, including the distribution by sector and by geographical region. The experts that took part in the study possessed an extensive knowledge of a range of industries including the various manufacturing sectors, construction and service sector, from a diverse geographical background.

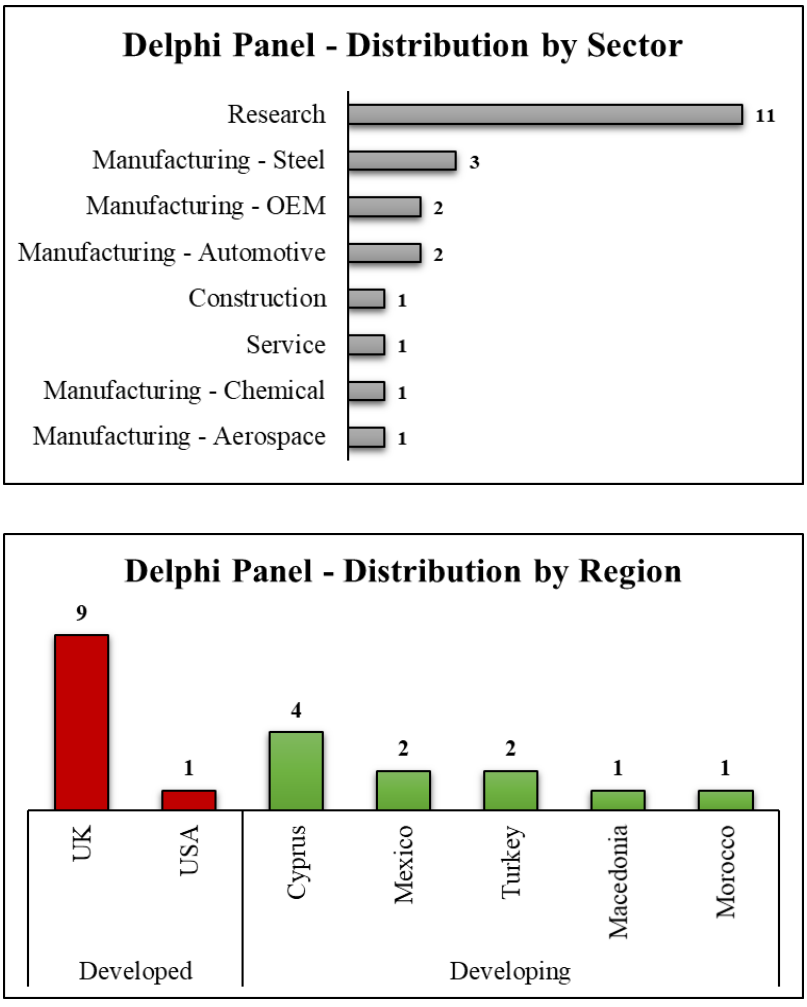


Figure 5.1: Descriptive statistics of expert Delphi panel engaged in the study

Although a relative manufacturing sector background dominance among the practitioner specialist participants, it was noted that the expert profile consisted of a 1:1 ratio of panellists from developing (e.g. Turkey) and developed (e.g. UK) countries along with a 55% to 45% split between academics and practitioners, both of which were reflected as balanced ratios. This balance suggested low selection bias implications with reference to expert verification and validation data capture for development of a conceptual management solution that is reasonably applicable and generalisable to a range of industries and regions.

5.2.3. Design, Process and Data Collection

Stemming from the pragmatic worldview embraced in the research, a convergent parallel mixed-method design was adopted for the Delphi study, utilising between-method triangulation through quantitative (Likert scale - consensus / percent agreement analysis) and qualitative (open ended questioning - thematic synthesis) elements to not only quantitatively gauge the expert agreement levels on the various aspects of the conceptual framework and the implementation procedure, but also to qualitatively provide the experts with the opportunity of freely discussing their views and suggestions for improvement. Such a combination of qualitative and quantitative methods was noted to lead to leveraging the strengths of both approaches, data enrichment, and establishment of more balanced views regarding the generalisability and contextual aspects of the phenomenon under investigation (Leech and Onwuegbuzie, 2009; Saunders et al., 2015; Tranfield et al., 2003).

The Delphi study was undertaken through an online survey, constructed in the Google Forms platform, which was identified as a free, user-friendly and a highly recognised online research survey tool, taking into account the key considerations for a robust data collection, and minimised bias and errors (Statistics NZ, 2015). The online survey method was justified as the most appropriate due to the geographical distribution of the participants and resource limitations associated to conducting face to face visits.

Prior to circulation to the Delphi panel participants and data collection, a pilot test was run on the online survey with a view to iron out any issues and optimise the online survey compiled in line with the Delphi study research objectives. Subsequent to the pilot test and refinement step, the subject matter experts selected as per the defined criteria outlined, all provided their feedback on the predetermined set of verification and validation questions through the online survey (de Vaus, 2001). The Delphi study survey template utilised is provided in Appendix Four. The Likert scale adopted for quantitatively capturing expert agreement levels consisted of four categories outlined below, in the absence of a neutral (neither agree, nor disagree)

category to establish a clear picture regarding the aspects under investigation (Garland, 1991):

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Agree
- 4 – Strongly Agree

As an exception, for capturing of expert feedback on the relative importance of SSCQM principles for integration of sustainability, a higher level of granularity was embedded (9-level Likert scale) to enable capturing of the level of detail required for establishment of relativity among several principles. The section on the validation of business diagnostic tool indicators, that were formulated to enable maturity assessment of SSCQM principles, embedded a simplified three-level scale (i.e. "Yes", "No", "I am not an expert in this area") to confirm whether or not the indicators defined accurately and comprehensively represented the associated SSCQM principles. "I am not an expert in this area" option was justified to be included in this section, due to the high level of specific details, and subject-based knowledge and expertise required in this area, adoption of this option contributing towards the rigour of the assessment regarding the indicators included in the diagnostic tool. Such amendments and adoption of higher and/or lower levels of granularity in the Likert scale is recognised, as "the optimal number of scale categories is content specific and a function of the conditions of measurement" (Cox, 1980; Garland, 1991).

Verification and validation through reaching expert consensus is central to Delphi studies, for which various perspectives in the literature can be observed such as the quantification of uncertainty levels regarding a particular aspect, acceptance above a certain percentage of agreement, and the extent of expert feedback on a particular aspect (Black et al., 1999; Diamond et al., 2014; Graham et al., 2003; Hsu and Sandford, 2007a; Linstone and Turoff, 1975). A significant ratio of Delphi studies adopted percent agreement approach for establishment of consensus (Diamond et al., 2014), which was judged to be an appropriate and objective way of defining consensus thus, selected for adoption in the Delphi study of this research.

The decision for the percentage value of agreement is often variable and down to the researcher's interpretation (Keeney et al., 2001), 51% accepted by some (McKenna, 1994), and 100% accepted by the others (Williams and Webb, 1994), for consensus. Above 75%

was decided to be considered as consensus in this study, providing a sufficient level of rigour for assessment, amendment or acceptance of each and every aspect of the conceptual developments under investigation through expert feedback (Chang et al., 2010). The percent agreement for consensus analysis was calculated through the ratio of agree / disagree feedback captured to individual questions, relating to various aspects of the framework under investigation, the condition of more than 75% of the expert participants indicating 3 (agree) or above (strongly agree) being considered as consensus achieved on the particular line of inquiry.

The Delphi study process adopted for the verification and validation of the conceptual elements of the research is demonstrated in Figure 5.2.

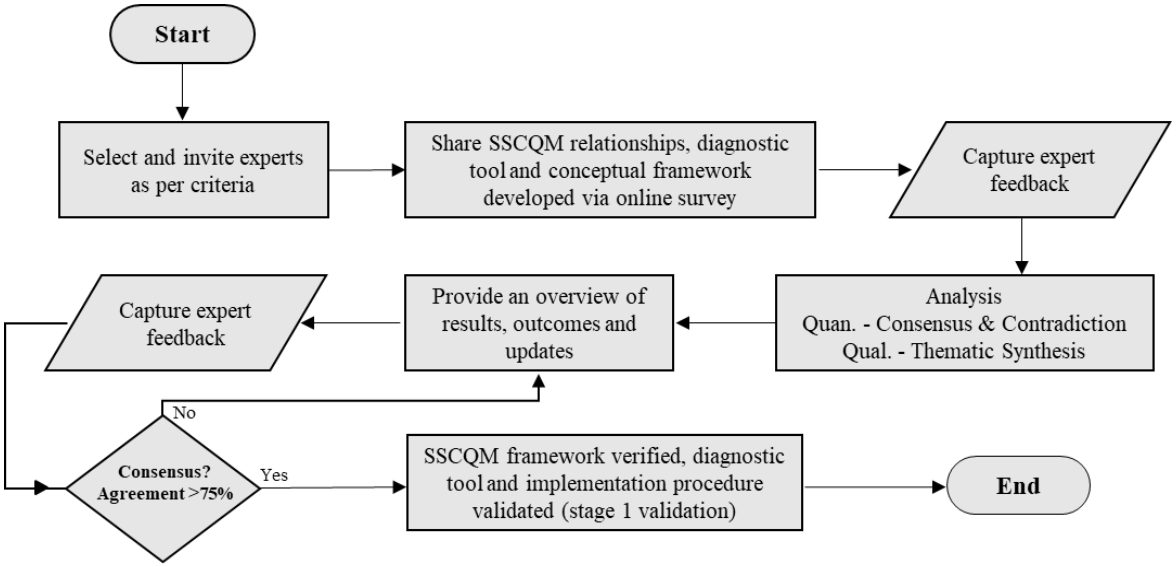


Figure 5.2: Delphi study verification, validation and analysis process

According to Bacharach (1989), every organisational management theory, concept or framework is subject to evaluation and verification through two key criteria of "falsifiability" that refers to empirical refutability, and "utility" that refers to usefulness with reference to correct explanation and prediction. Moreover, verification of conceptual standpoints enables "checking, confirming, making sure, and being certain, with a view to ensure reliability and rigour" for delivery of a robust, coherent and solid management solution (Kvale, 1989; Morse et al., 2002). The SSCQM conceptual framework was constructed with falsifiable propositions, putting forward positive relationships between the 8 SSCQM principles and triple bottom line sustainability, utility of which was verified through expert feedback as presented in Section 5.3.

The “usefulness, practicality and representativeness” of new management developments are central principles from the point of view of validation in management research (Landry et al., 1983). These principles are captured within the validation and evaluation criteria for new conceptual constructs outlined below (Fawcett, 2005; Holsapple and Joshi, 2002; Sanders and Nafziger, 2011):

- *Correctness:* the compatibility of its context and content with established theories, and logical and structural consistency of the framework.
- *Completeness:* the validity of its context of development including the philosophical standpoints, concepts, tools and domains adopted, and its completeness as a management framework to drive integration and continual sustainable development.
- *Clarity*: the feasibility, objective perception of its contents, along with its adequacy for practitioner understanding, without relying on high levels of skills and training.
- *Conciseness or Parsimony:* the simplicity and practicality of its contents and structure for practitioners, neither missing the key information central to systematic management integration of sustainability (i.e. oversimplified), nor containing information that are not influential to integration of sustainability in the organisational management context (i.e. overcomplicated).

The expert validation feedback was collected on these aspects of the implementation procedure formulated, which are essential to formulation of an effective management solution for business sustainability integration and improvement practice, documenting expert opinions in a structured manner, highlighting strengths, weaknesses and areas for improvement. The expert feedback with reference to the practicality, feasibility and content of the business diagnostic tool was also captured to validate the maturity assessment tool developed as part of a key step of the implementation procedure.

The consensus (above 75% agreement) was reached on all conceptual aspects of the managerial solution development for integration of sustainability at the first round. On the other hand, although the achievement of expert consensus, a number of improvement areas were identified and implemented as a result of the qualitative thematic feedback analyses on the areas of relatively lower consensus, and circulated back to the Delphi panel for further feedback and confirmation. The ratio of response obtained at the first round was realised as 100%, all 20 experts meeting the criteria and accepting the invitations taking part in this round. The response at the final confirmation stage was not mandatory therefore, the ratio of response measure was not deemed as applicable to this stage.

5.3. Delphi Study – Verification Findings

5.3.1. Quantitative Analysis – Conceptual Framework

The aim of this section was to verify the relationships between the ISO 9001:2015 QM principles, supply chain integration principle of SCM and triple bottom line sustainability, framed under the conceptual umbrella of SSCQM. Delphi panellists were asked to indicate their level of agreement or disagreement with the management principles under consideration for being used towards organisational integration, facilitation and improvement of economic, environmental and social sustainability. The levels of agreement captured from the Delphi panel specialists are presented in Figure 5.3.

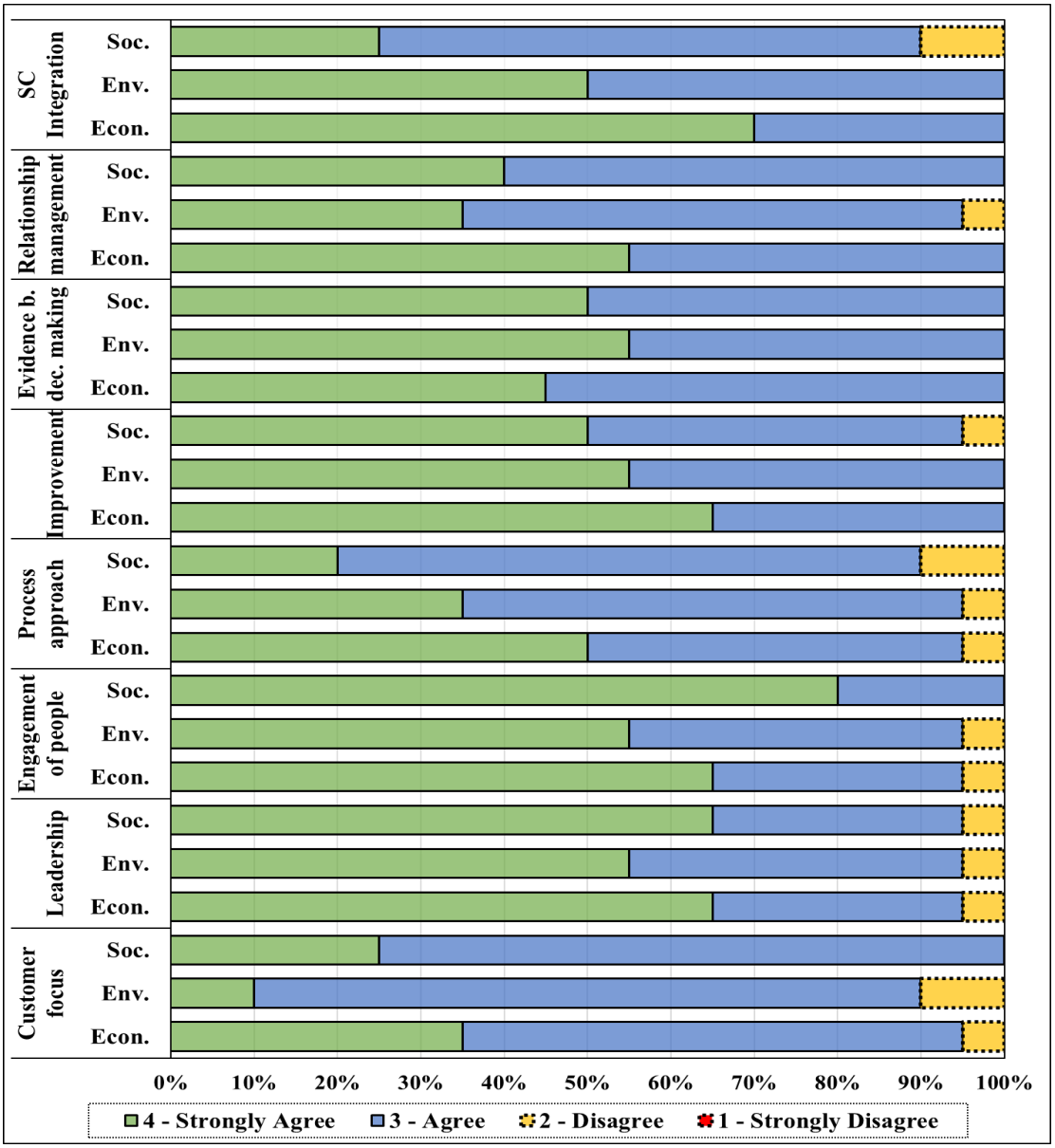


Figure 5.3: Expert agreement levels regarding SSCQM principles versus triple bottom line sustainability improvement

The experts further ranked the eight SSCQM principles according to their relative importance to integration and improvement of sustainability in the organisational context, using a scale of 1 (not important) to 9 (extremely important). Box plot is a statistical approach, highly utilised in a range of research applications (Williamson et al., 1989), for "visually summarising and comparing groups of data, using the median, the approximate quartiles, and the lowest and highest data points to convey the level, spread, and symmetry of a distribution of data values, identifying outlier values and facilitating reasoning regarding quantitative information" (Frigge et al., 1989). The box plot presented in Figure 5.4 demonstrates the statistical range and quartile values of the relative importance rankings, outlining the significantly low level of variability, and spread that was mainly established over the rating of 6 (higher than moderately important), according to the judgements of the Delphi panel.

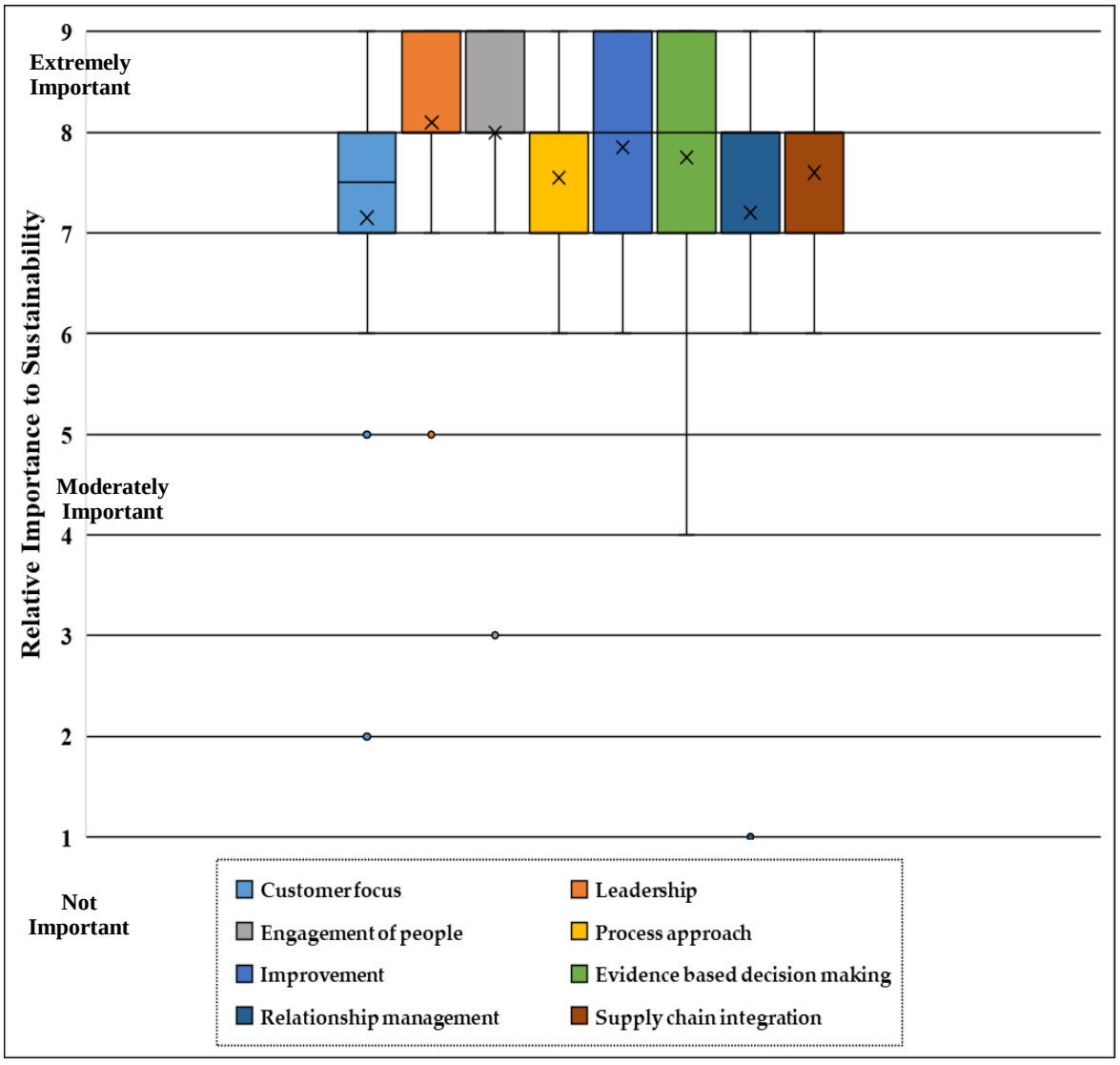


Figure 5.4: Box plot summary: relative importance judgements regarding SSCQM principles

The rankings of the 20 Delphi panellists were averaged, resulting in the final relative importance scores and determination of the principle hierarchy rankings for integration and improvement of sustainability. For example, the average of the expert judgements regarding the relative importance of the "leadership" principle was concluded as "8.10", which was calculated through taking the sum of all 20 Delphi participant judgements (that could range between 1 to 9), and dividing the sum with 20. The findings are presented in Table 5.2 along with the consensus levels established.

Table 5.2: Expert consensus analysis results on the relationships between the 8 management principles framed under the conceptual framework of SSCQM

SSCQM Principle	Consensus (Percent Agreement)				
	Economic	Env.	Social	Relative Importance to Sustainability	Hierarchy Ranking
Leadership	95%	95%	95%	8.10	1st
Engagement of People	95%	95%	100%	8.00	2nd
Improvement	100%	100%	95%	7.75	3rd
Evidence based decision making	100%	100%	100%	7.75	4th
Supply chain integration	100%	100%	90%	7.60	5th
Process Approach	95%	95%	90%	7.55	6th
Relationship management	100%	95%	100%	7.20	7th
Customer Focus	95%	90%	100%	7.15	8th

5.3.2. Review of Findings and Conclusions

Ultimately, the positive relationships between the 8 SSCQM principles and TBL sustainability were verified through establishment of remarkably high percent agreement (90% and above) consensus rates among the Delphi study experts, evidencing and supporting the proposed relationships between the ISO 9001:2015 principles, supply chain integration principle of SCM and TBL sustainability. Furthermore, the SSCQM principles were all rated as highly important to organisational integration and improvement of sustainability (the average of importance scores ranging from 7.15 to 8.10 where 9 is extremely important). These findings supported the propositions put forward by the SSCQM conceptual framework, pointing towards positive relationships between QM, SCM and sustainability. These results were reflected to resonate with the QM and sustainability integration literature (Allur et al.,

2018; Aquilani et al., 2016; Isaksson, 2006; Jankalová et al., 2018; Kuei and Lu, 2012; Nguyen et al., 2018; Siva et al., 2016; Zink, 2007); as well as the stakeholder management, supply chain management and sustainability integration literature (Beske and Seuring, 2014; Chitaka et al., 2018; Qorri et al., 2018; Reefke and Sundaram, 2016), reinforcing the role of QM and SCM in firm performance improvement and organisational sustainable development.

Additionally, the relative importance of the principles to sustainable development was established pointing towards emergence of a priority based approach to implementation of SSCQM through focus and prioritisation of SSCQM principle maturity development, based on the hierarchy rankings determined. The experts relatively preferred or pointed towards prioritisation of the principles of; *"leadership"* with average importance rating 8.1 out of 9 (Ansari and Qureshi, 2015; Aquilani et al., 2016; Nguyen et al., 2018; Reefke and Sundaram, 2016; Zink, 2007); *"engagement of people"* with average rating 8 out of 9 (Aquilani et al., 2016; Garvare and Isaksson, 2001; Luburić, 2015; Nguyen et al., 2018; Rusinko, 2005; Zink, 2007); *"improvement"* with average rating 7.75 out of 9 (Aquilani et al., 2016; Nguyen et al., 2018; Rusinko, 2005; Zink, 2007); and *"evidence based decision making"* with average rating 7.75 out of 9 (Aquilani et al., 2016; Chitaka et al., 2018; Garvare and Isaksson, 2001; Kuei and Lu, 2012; Zink, 2007); for organisational sustainability integration, and improvement.

On the other hand, at least one expert considered "customer focus", "engagement of people" and "relationship management" as not significantly important to sustainability, denoted as outliers in the box plot presented in Figure 5.4. The further analysis outlined that it was the same expert that provided the outlier judgements however, no trends in terms of business sectors or geographical regions were identified, as experts from the same region and sectors provided highly positive ratings for the same principles. Taking into account the significantly high consensus rates and the outlier judgements being concluded as of higly limited nature to an individual expert, the conceptual verification results were accepted as positive for all propositions.

5.4. Delphi Study – Validation Findings

5.4.1. Validation of Implementation Procedure

5.4.1.1. Quantitative Analysis – Implementation Procedure

For validating the implementation procedure of SSCQM, the correctness, completeness, clarity and conciseness of the framework was evaluated along with its suitability for being deployed at the supply chain level, as essential features to effective implementation and

operationalisation of the SSCQM philosophy (Fawcett, 2005; Holsapple and Joshi, 2002; Sanders and Nafziger, 2011).

Delphi panellists were asked to indicate their level of agreement or disagreement with these various essential aspects of the proposed implementation procedure. The levels of agreement captured from the Delphi expert respondents are presented in Figure 5.5, where the various features constituting the key validation categories of correctness, completeness, clarity, conciseness and supply chain deployment were aggregated to provide an overall picture for each category.

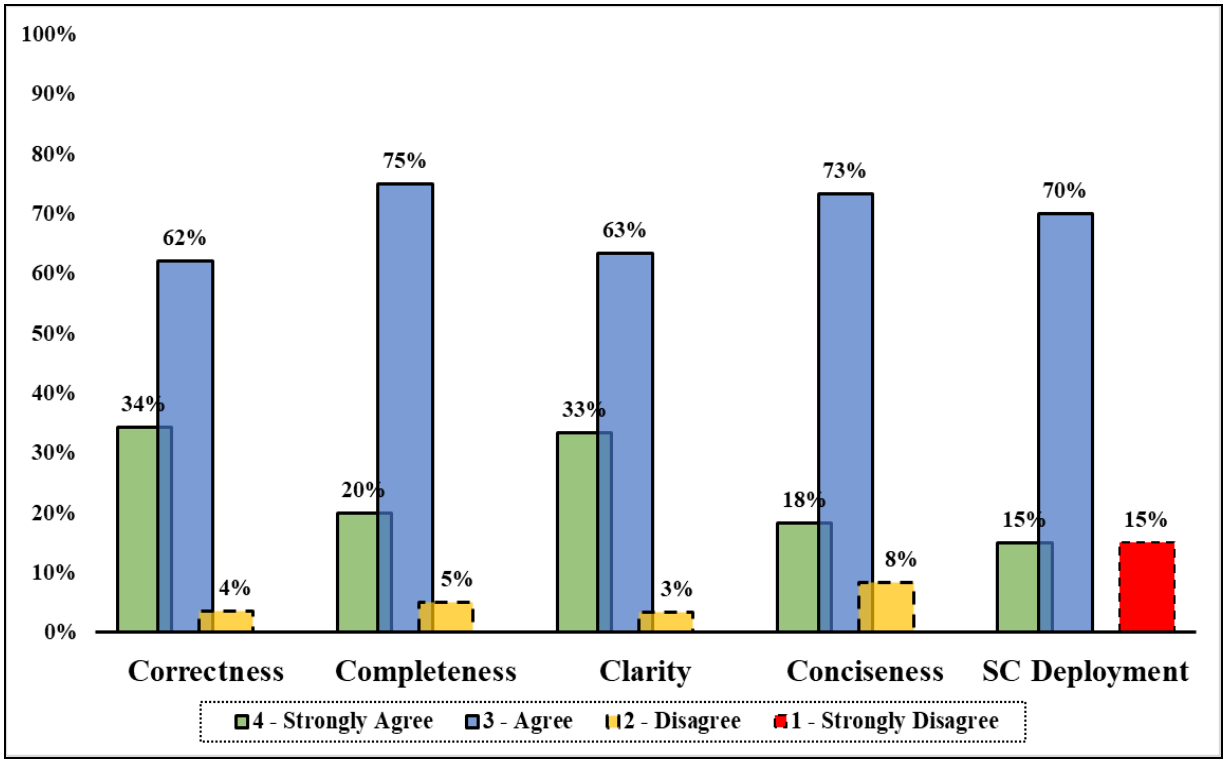


Figure 5.5: Expert agreement levels regarding key aspects of the implementation procedure

The various features forming the key validation categories of correctness, completeness, clarity, conciseness and supply chain deployment are listed in Table 5.3, along with the consensus levels established on the same.

Table 5.3: Expert consensus analysis on the correctness, completeness, clarity, conciseness and supply chain deployment aspects of the implementation procedure

Correctness	**Rating**
New management approaches are much required for integration of sustainability into management processes for sustainable development	100%
The components of the framework are aligned with established theories and methodologies	95%
Quality and supply chain management principles adopted in this framework are compatible for integration of sustainability into management structures of organisations	95%
Plan-Do-Check-Act and step-by-step structure utilised is feasible for this type of framework for driving continual sustainability improvement	100%
The framework facilitates measurement and improvement of organisational sustainability performance	90%
The framework facilitates managerial decision making and action deployment with reference to sustainable development	100%
The framework contributes to the body of knowledge through a novel framework integrating sustainability with quality and supply chain management	95%
Completeness	
The framework is complete to drive integration of sustainability into organisational processes	95%
The framework covers all essential steps necessary to drive continual sustainable development	95%
Clarity	
The description of the components aligns with the framework	100%
The description of the framework is explicit and clear	95%
The application of the framework is feasible	95%
Conciseness	
The framework is neither complex nor over simplified	90%
The interconnections between the components of the framework are clear	90%
The framework is of practical use to industry	95%
Supply Chain Deployment	
The promotion and implementation of similar SSCQM assessments at the upstream and downstream of supply chain networks will provide cumulative sustainability assessments and improvements for supply chains	85%

5.4.1.2. Qualitative Analysis – Implementation Procedure

The experts expressed and discussed their opinions, suggestions and criticism freely through open ended questions, providing their reasons for disagreement with any particular aspect of the implementation procedure and outlining their suggestions for improvement. The qualitative data collected was then analysed systematically through following the five key stages (compiling, disassembling, reassembling, interpreting and concluding) for thematic coding and synthesis as suggested by Castleberry and Nolen (2018), which were outlined below:

- *Compiling:* All recommendations recorded as part of the qualitative feedback were first compiled in the form of a list, and validity of the suggestions confirmed.
- *Disassembling:* Valid Delphi panel feedback and suggestions were disassembled into codes and themes.
- *Reassembling:* The feedback and suggestions were reassembled according to these codes and themes.
- *Interpreting:* The results were interpreted, and schematically represented in the form of a concept map.
- *Concluding:* Conclusions were drawn from the concept map, implementing improvement actions as required.

8 suggestions were recognised as valid, which were categorised into various validation aspects and key improvement codes / themes as itemised in Table 5.4.

Table 5.4: Qualitative feedback captured on the implementation procedure and key themes generated

Aspect	Feedback	Code / Theme
Correctness	"Have you considered pilot studies as part of the process?"	Pilot study required to demonstrate practical implementation aspects
Completeness	"More attention should be given to preventing economic prevalence over the 2 remaining pillars of the sustainability concept"	More detail required on prevention of economic prevalence over environmental and social dimensions
Completeness	"There needs to be more consideration of hard measurements with regards to performance - what does good performance actually look like?"	More detail required on performance measurement and benchmarking on what good looks

		like
Clarity	“I understand the principle. I just find it complicated and wonder how it would be taken and understood in the workplace.”	Pilot study required to demonstrate practical implementation aspects
Clarity	“Subjective and difficult to apply in a "complete" or "wide" scope in big companies with large labour force.”	Pilot study required to demonstrate practical implementation aspects
Clarity	“Relationships need further elaboration for clear understanding. It is a good starting point.”	Clarify mechanisms and relationships between each step
Clarity	“The mechanisms between areas are not clear.”	Clarify mechanisms and relationships between each step
SC Deployment	“Seems difficult to apply. Need further study and practical use to confirm.”	Pilot study required to demonstrate practical implementation aspects

As shown in Figure 5.6, the concept map of the qualitative feedback collected was drawn, schematically representing the key improvement themes. The 8 suggestions were concluded as three key areas of “completeness”, “clarity” and “pilot study required to demonstrate practical implementation aspects”, pointing towards improvement opportunities regarding these areas of the implementation procedure, along with their weightings represented with percentages (e.g 25% of the suggestions were noted with regards to the “completeness” aspect of the implementation procedure).

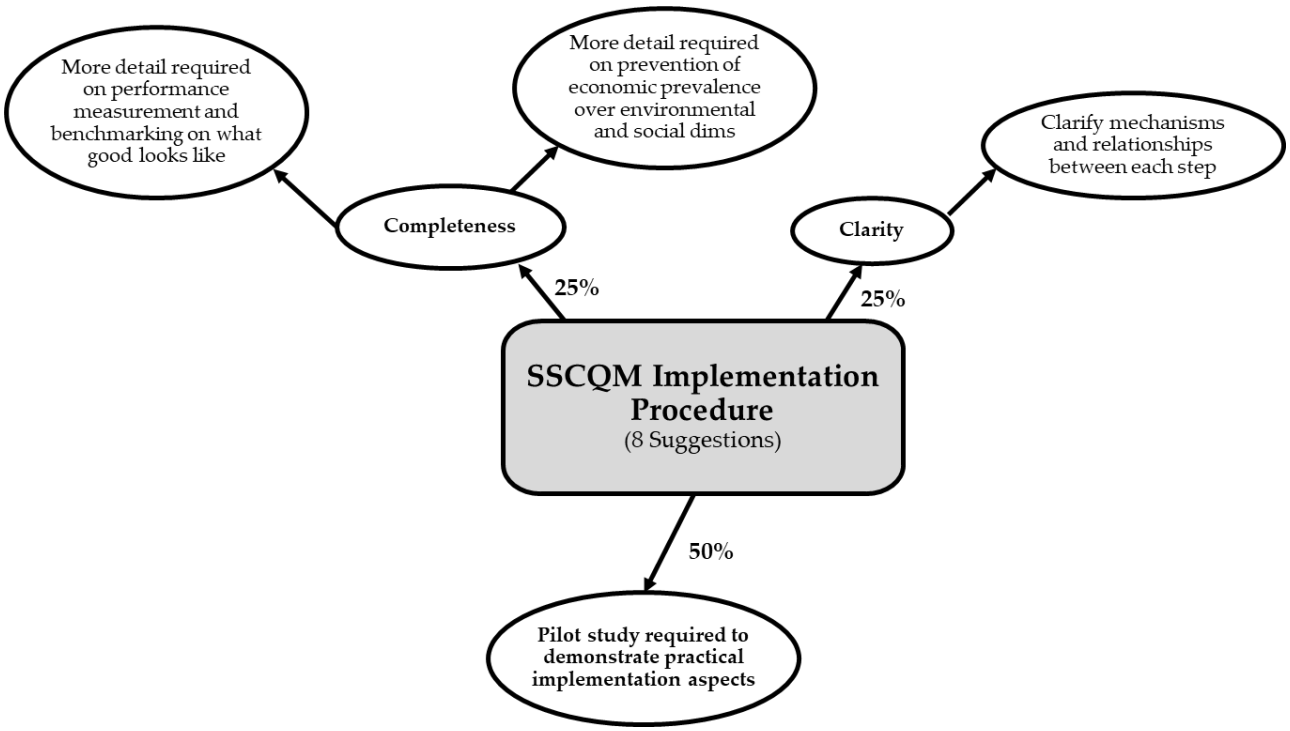


Figure 5.6: Thematic map for SSCQM implementation procedure qualitative feedback

5.4.1.3. Changes Adopted and Conclusions – Implementation Procedure

Consensus was reached on all validation aspects (i.e. correctness, completeness, clarity, conciseness and supply chain deployment) of the implementation procedure (85% and above against the consensus acceptance rate of 75%).

On the other hand, in the light of the qualitative analysis, several key further development themes were established as presented in Figure 5.6, and the implementation procedure updated and re-shared with the Delphi panel for confirmation, as described in Table 5.5. The changes implemented as a result of the Delphi panel feedback and suggestions were further denoted in Table 4.6 with "*" (presented in Chapter 4).

Table 5.5: Key suggestion themes and actions implemented in the implementation procedure

Suggestion Theme	Action Implemented
Pilot study required to demonstrate practical implementation aspects	As the subsequent step of the research, the application of the diagnostic tool and implementation procedure has been demonstrated through an action research study in a real business operation, outlining the key practical implementation aspects
Clarify mechanisms and relationships between each step	"Management level" column added for further clarity and detail on the management level of planning / decision making
Further detail required on performance measurement and benchmarking on "what good looks like"	Detail on GRI sustainability indicators, reporting and benchmarking added to clarify KPI identification and measurement aspects
Further detail required on prevention of economic prevalence over environmental and social dimensions	Additional comment added on clear separation of economic, environmental and social sustainability, along with emphasis on adoption of a balanced view on triple bottom line

Finally, it was seen as particularly noteworthy that the Delphi specialists fully resonated on the following statements with 100% consensus and agreement levels:

- *"New management approaches are much required for integration of sustainability into management processes for sustainable development"*

- *"Plan-Do-Check-Act and step-by-step structure utilised is feasible for this type of framework for driving continual sustainability improvement"*

- *"The framework facilitates managerial decision making and action deployment with reference to sustainable development"*

The first statement was with reference to the evident research gap in the current body of knowledge that there is a remarkable need for new approaches for management integration and improvement of sustainability, which formed the basis for this research, primary aim of which was to provide a novel approach to facilitate business management integration of sustainability. Both the diverse base of experts that participated in the Delphi panel and a wide base of authors emphasised such a research requirement (Beske and Seuring, 2014; de Brito and Van der Laan, 2010; Engert et al., 2016; Lozano, 2015; Rajeev et al., 2017; Reefke and Sundaram, 2016; Williams et al., 2017; Winter and Knemeyer, 2013), validating or acting as a proof of the academic and industrial need being addressed by this research.

From the perspective of second statement, the suitability and facilitating role of the PDCA structure was further evidenced by the strong support of the Delphi specialist panel, that formed the backbone of operationalisation of the SSCQM approach. Despite the key role of PDCA philosophy in change management and improvement is well recognised (Johnson, 2002; Moen and Norman, 2009; Sokovic et al., 2010; Taylor et al., 2014), its contribution to organisational sustainable development and triple bottom line integration was only supported by a few authors (Asif and Searcy, 2014; Kuei and Lu, 2012; Rusinko, 2005).

Ultimately, the Delphi specialist panel fully echoed with the SSCQM implementation procedure's strength in facilitating managerial decision making and action deployment for sustainable development, which confirmed that the conceptual and practical implementation approach developed does serve its primary purpose in line with the aim of this research (i.e. design and development of a management framework through integration of QM, SCM and sustainability for facilitation of sustainability integration, and improvement of organisations).

5.4.2. Validation of Business Diagnostic Tool

5.4.2.1. Quantitative Analysis – Business Diagnostic Tool

The aim of this section was to validate the indicators articulated for the maturity assessment of the eight SSCQM principles, and validate the practicality aspects of the diagnostic tool developed.

The specialist Delphi panel respondents first indicated their opinions on whether they agree or disagree (through choosing "yes", "no", or "I am not an expert" options), that the indicators falling under their expertise area, accurately and comprehensively represented the relevant management principles under consideration to allow maturity level assessments. The results of this quantitative evaluation are presented in Figure 5.7, and the percent agreement / consensus analysis results are listed in Table 5.6.

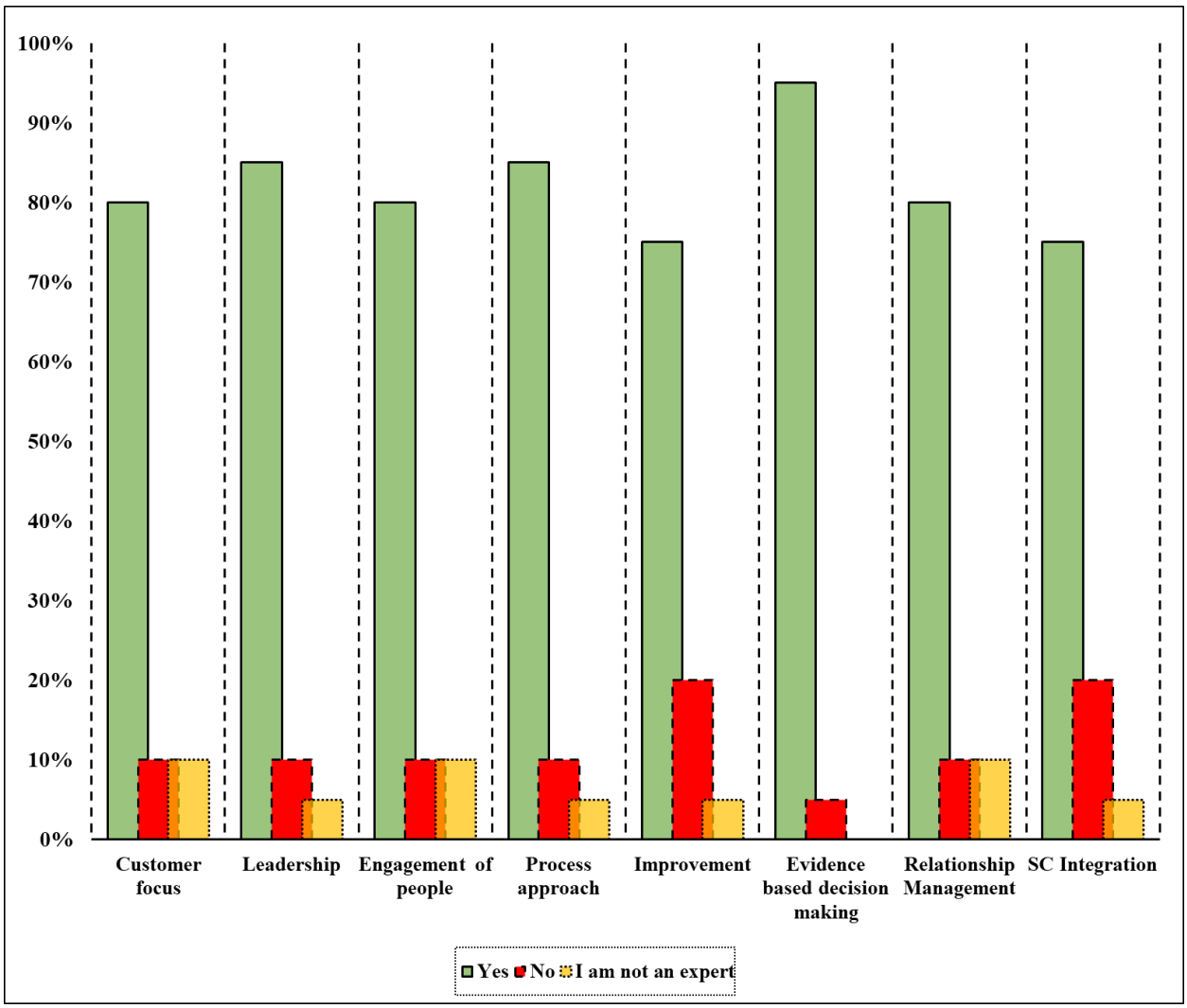


Figure 5.7: Expert agreement levels regarding the indicators defined for SSCQM principles

Table 5.6: Expert consensus analysis results on the articulated SSCQM principle indicators

Principle	Consensus Rate
Customer Focus	89%
Leadership	89%
Engagement of People	89%
Process Approach	89%
Improvement	79%
Evidence based decision making	95%
Relationship management	89%
Supply chain integration	79%

The experts were then asked to rate their agreement levels on the various key aspects of the business diagnostic tool developed (i.e. enabling of SSCQM principle maturity assessment, enabling alignment of management processes with TBL sustainability, feasibility and practical use to industry) and the findings are presented in Figure 5.8.

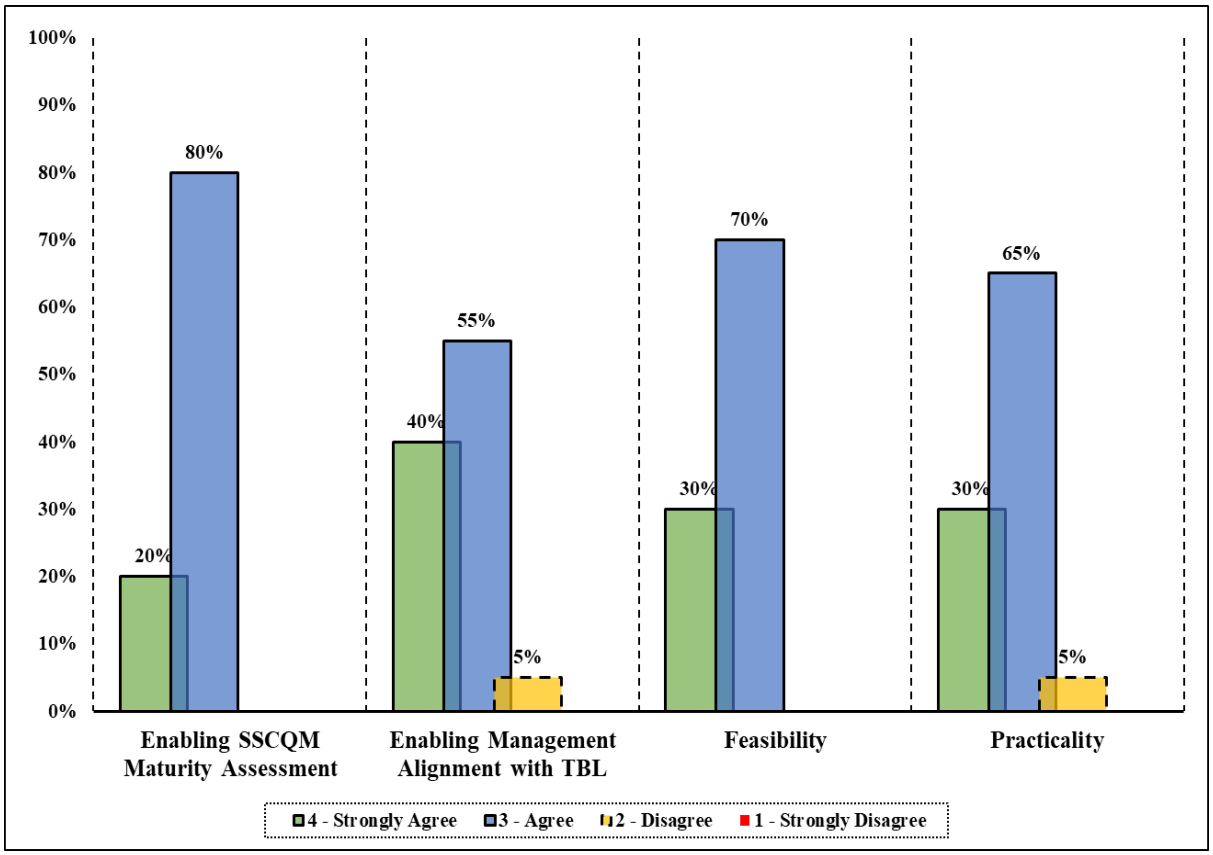


Figure 5.8: Expert agreement levels regarding the various validation aspects of the diagnostic tool developed

Subsequent to gauging of the Delphi panel's agreement on the various validation aspects of the formulated business diagnostic tool, the consensus rates were established on the same as demonstrated in Table 5.7.

Table 5.7: Expert consensus analysis on the practical relevance of the diagnostic tool developed

Aspect	**Rating**
The diagnostics tool enables maturity assessment of prospective sustainability management (SSCQM) principles	100%
The diagnostics tool enables gauging alignment of organisational mechanisms, structures and processes with (TBL) sustainability parameters	95%
The application of the tool is feasible	100%
The tool is of practical use to industry	95%

5.4.2.2. Qualitative Analysis – Business Diagnostic Tool

Similar to the implementation procedure, qualitative feedback was collected from the Delphi panel regarding the diagnostic tool and its indicators, capturing potential suggestions for improvement, and additional indicators judged as essential to definition and maturity assessment of the management principles synthesised under the SSCQM framework.

The systematic thematic synthesis process described in Section 5.4.1.2 was also followed (compiling, disassembling, reassembling, interpreting and concluding) for structured and rigorous analysis, interpretation and conclusion of the qualitative feedback captured for the diagnostic tool developed (Castleberry and Nolen, 2018), which was designed to not only enable maturity assessment of SSCQM principles but also provide a platform for improvement action formulation for management integration of sustainability.

The qualitative feedback captured on the various elements of the business diagnostic tool including the suggestions for inclusion of additional indicators are provided in Table 5.8, along with the key themes reached, and improvement actions taken as required. In spite of the high consensus rates achieved for the various aspects and indicators of the initially designed tool, the thematic synthesis results contributed to the further development of the tool, in the light of the subject matter expertise input and recommendations.

Table 5.8: Qualitative feedback captured on the business diagnostic tool, key themes generated, and actions implemented as required

Principle / Aspect	Feedback	Included Y/N	Code / Theme	Response / Action
Customer Focus	"Sustainability is very general here - the three have quite different dimensions so it might not be suitable to be so general"	Y	Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Customer Focus	"I think we need to separate "natural" customer sustainability which is primarily for competitive purpose from the TBL sustainability. In my opinion, the indicators for customer focus for TBL should be specific and clearly separated for eco., env. and soc. sustainability. For example; Ques 1.1. Can be "Are the current and future economic / social / environmental needs and requirements..."	Y	More emphasis required on the clear separation of economic, environmental and social sustainability	Additional comment added to the implementation procedure on clear separation of economic, environmental and social sustainability along with emphasis on adoption of a balanced view
Leadership	"In my opinion, I think the indicators should be more specific, in order to capture where exactly amongst the three sustainability dimensions that leadership is influencing"	Y	Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Engagement of people	"Too broad. Surely people's definitions of contribution or sharing of knowledge differs?"	Y	Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Engagement of	"I have the same concern with these indicators. Though	Y	Indicators are required to	An extra level of granularity (e.g. 1.1a,

people	"collaboration" in "engagement of people" may lead to for example, environmental protection, it's natural purpose was not. hence, the questions have to be specific in terms of meeting the TBL objectives"		be more specific / less subjective	1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Improvement	"Far too broad"	Y	Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Evidence Based Decision Making	"Not sure how measurable this really is"	Y	Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Relationship Management	"There are no specifics here. You use the phrase 'interested parties' - shouldn't you mention them all?"	Y	Indicators are required to be more specific / less subjective	Key interested parties for organisations specified on the relationship management principle section of the tool, in addition to the extra level of granularity embedded
Diagnostic tool	"I do like your tool, at a high level. But there could be a lot of ambiguity with the questions you ask, and people would definitely interpret them differently. I nearly put 'disagree' to 'the tool is of practical use to industry'"	Y	Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Diagnostic tool	"Not quite sure how feasible it will be to implement?"	Y	Practical implementation aspects are required to be demonstrated	As the subsequent step of the research, the application of the diagnostic tool and implementation procedure has been

				demonstrated through an action research study in a real business operation, outlining the key practical implementation aspects
Diagnostic tool	"Depth on actual mechanisms is lacking as the model could just reflect perceptions"	Y	Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Diagnostic tool	"Complex to apply to large multinational companies"	Y	Practical implementation aspects are required to be demonstrated	As the subsequent step of the research, the application of the diagnostic tool and implementation procedure has been demonstrated through an action research study in a real business operation, outlining the key practical implementation aspects
Leadership	*"So, you are happy with yes/no answers? Or should these be to what extent?"*	*N*	*N/a*	*The tool utilises a scoring system that ranges from 0 to 5 depending on the level of implementation - No action required*
Supply chain integration	*"In my experience joint cooperation activities among supply chain members are often very slow in providing results and influenced by commercial matters more than sustainability focused"*	*N*	*N/a*	*This still does not limit the principle from being used to improve sustainability of supply chains - No action required*
Principle	**Other indicators to be considered**			**Analysis/Action**
Customer Focus	"One of the preliminary questions is that are the customers aware of sustainability?"	Y	Additional indicators required	An indicator (1.2) to cover this point included in the tool, for this principle

Customer Focus	Sustainability education of the general population, market historical background and responses to new approach, sustainability assessment and introducing new directions that will lead the market and educate clients/customers in the possibilities. Market is strong as the supply and demands are met, innovation introduced while education of the benefits is going in parallel"	Y	Additional indicators required	An indicator (1.2) to cover this point included in the tool, for this principle
Customer Focus	"There is nothing about engagement with the customer, customer feedback etc."	Y	Additional indicators required	An indicator (1.2) to cover this point included in the tool, for this principle
Leadership	"Measurement of leadership, what indicators are there to measure leadership and drive culture to enable the required results throughout the business?"	Y	Additional indicators required	An indicator (2.8) to cover this point included in the tool, for this principle
Leadership	"Performance indicators and benchmarking among comparable operations"	Y	Additional indicators required	An indicator (2.6) to cover this point included in the tool, for this principle
Leadership	"Does the organisation review the effectiveness of its leadership policies? Is feedback collected and encouraged?"	Y	Additional indicators required	An indicator (2.8) to cover this point included in the tool, for this principle
Engagement of people	"Are roles, responsibilities and levels of authority well defined?"	Y	Additional indicators required	An indicator (3.7) to cover this point included in the tool, for this principle
Engagement of people	"Understanding of sustainability is commonly confused among operators, that in my company are more than 80% of total labour"	Y	Additional indicators required	An indicator (3.1) to cover this point included in the tool, for this principle
Process Approach	"More depth on actual process types or mechanisms to learn as an organisation"	Y	Additional indicators required	An indicator (4.6) to cover this point included in the tool, for this principle
Process Approach	"Consider adding an indicator to evaluate preparedness of management and employees to challenge current practices"	Y	Additional indicators required	The indicator (3.4) updated to capture this point
Improvement	"More depth in the definition of an indicator would be useful - e.g. what is actually being measured"	Y	Additional indicators required	An indicator (5.2) to cover this point included in the tool, for this principle
Improvement	"Does the organisation promote innovation with regards to	Y	Additional indicators	An indicator (5.5) to cover this point

	sustainability when developing and introducing new products and services?"		required	included in the tool, for this principle
Evidence based decision making	"Employee feedback on the sustainability within the organisation, the question being related to the sustainability implementation within the organisation"	Y	Additional indicators required	An indicator (6.4) to cover this point included in the tool, for this principle
Relationship Management	"How about employee relationship management?"	Y	Additional indicators required	An indicator (7.2) to cover this point included in the tool, for this principle
Relationship Management	"How do we measure customer relationship management (CRM) and enable us to focus on the right areas?"	Y	Additional indicators required	An indicator (7.3) to cover this point included in the tool, for this principle
Supply chain integration	"In my opinion, the first question appears too general, perhaps specify what kind of information, perhaps this information refers practices-operations that allow them to be coordinated within this supply chain framework?"	Y	Additional indicators required	Captured as part of the extra level of granularity incorporated
Supply chain integration	"Something about sustainability being a shared value across the supply chain would be useful"	Y	Additional indicators required	An indicator (8.1) to cover this point included in the tool, for this principle
Supply chain integration	"What's in it for me… for supply chain integration for all parties"	Y	Additional indicators required	Indicators (8.4 & 8.5) to cover this point included in the tool, for this principle
Supply chain integration	"Please consider adding indicators to cross-check real with declarative commitment of all included parties"	Y	Additional indicators required	An indicator (8.8) to cover this point included in the tool, for this principle
Supply chain integration	"Is a supply chain integration statement in place with appropriate KPIs to monitor effectiveness and drive improvement?"	Y	Additional indicators required	An indicator (8.8) to cover this point included in the tool, for this principle
Leadership	*"With further extension to question 2.6. You can also ask how often?"*	*N*	*N/a*	*How often here is dependent on the organisation, its stakeholders and its sustainability requirements*
Engagement of people	*"Is collaboration promoted for the purpose of social development throughout the organisation?"*	*N*	*N/a*	*This is captured by the indicator "3.2"*

32 valid suggestions were recognised and grouped under four main improvement categories of “additional indicators required”, “indicators are required to be more specific and less subjective”, “more emphasis required on the clear separation of TBL” and “demonstration of practical implementation aspects” as presented in the thematic concept map in Figure 5.9. The weightings of these suggestions are represented with percentages e.g. 28% of the suggestions (i.e. 9 suggestions out of 32) were noted with regards to the “indicators are required to be more specific and less subjective” aspect of the diagnostic tool.

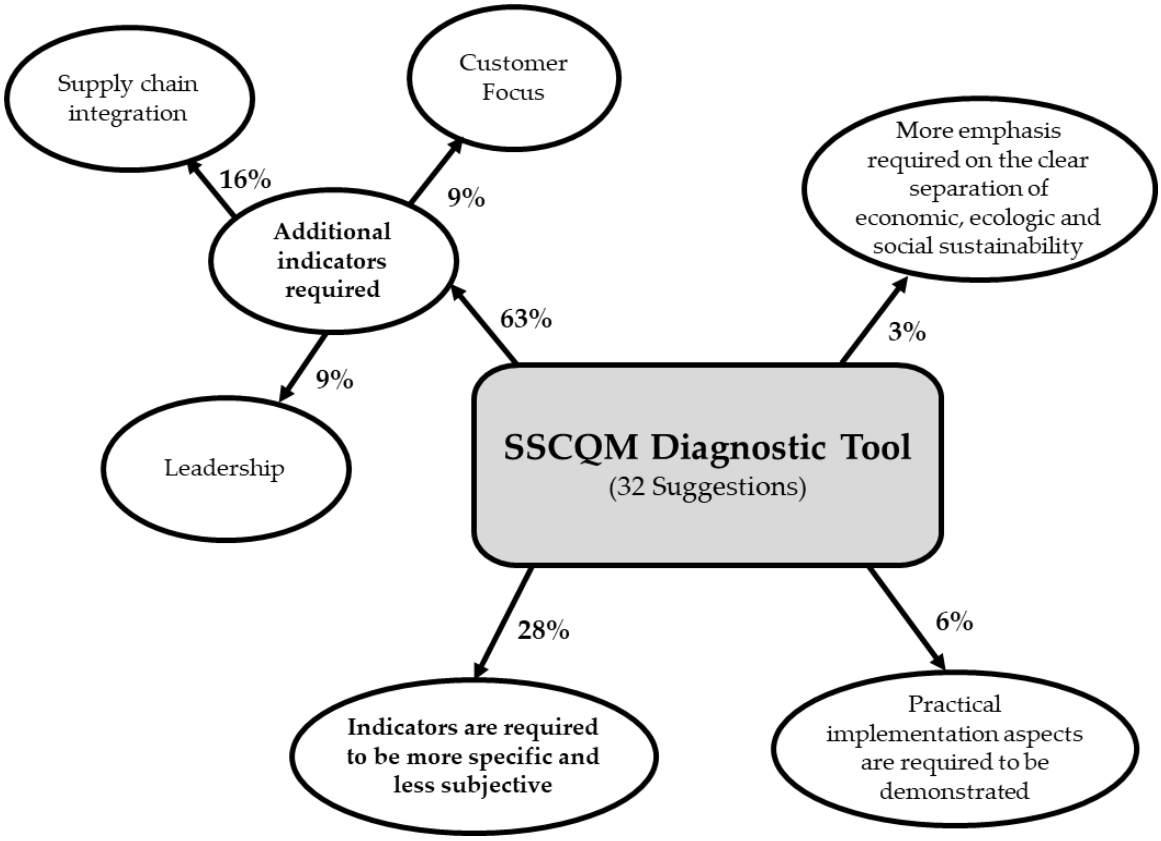


Figure 5.9: Thematic map for SSCQM diagnostic tool qualitative feedback

5.4.2.3. Changes Adopted and Conclusions – Business Diagnostic Tool

The quantitative analyses demonstrated that consensus was achieved in all aspects (indicators and practical relevance) of the diagnostic tool (79% and above against the consensus acceptance rate of 75%), which took maturity assessment as the basis to organisational current state analysis and progressive improvement for sustainable development, in agreement with a number of scholars (van Looy et al., 2011; Mettler, 2011; Meza-Ruiz et al., 2017; Röglinger et al., 2012). Contrariwise, in the light of the qualitative analysis, several key further development themes were established, and the diagnostic tool updated and re-shared with the Delphi panel for confirmation as shown in Table 5.9.

Table 5.9: Key suggestion themes and actions implemented in the diagnostic tool

Suggestion Theme	Action Implemented
Additional indicators required	Indicators for each principle fully revised, embedding 14 additional indicators as per Delphi panellist suggestions
Indicators are required to be more specific / less subjective	An extra level of granularity (e.g. 1.1a, 1.1b etc.) incorporated into the indicators for each SSCQM principle, specifying organisational mechanisms and/or specific requirements for each indicator
Practical implementation aspects are required to be demonstrated	As the subsequent step of the research, the application of the diagnostic tool and implementation procedure has been demonstrated through an action research study in a real business operation, outlining the key practical implementation aspects
More emphasis required on the clear separation of economic, environmental and social sustainability	Additional comment added to the implementation procedure on clear separation of economic, environmental and social sustainability along with emphasis on adoption of a balanced view on triple bottom line

As demonstrated in Figure 5.9, a key suggestion theme was established around inclusion of additional indicators to enable more accurate and representative maturity assessments, in particular for the “supply chain integration”, “customer focus” and “leadership” principles. With a view to address this, indicators put forward by the Delphi specialists were captured as part of the qualitative feedback, and included in the diagnostic tool, as denoted in Table 4.8 with “*” (presented in Chapter 4).

The Delphi participants further brought attention to development of more specific and less subjective indicators to mitigate risk of assessment variability. Stemming from this recommendation, an extra level of granularity (e.g. 1.1a, 1.1b etc.) was incorporated into the indicators for each SSCQM principle as demonstrated in Table 4.8 (presented in Chapter 4), implemented as a fundamental development action through definition of specific mechanisms, processes and activities key to implementation of each indicator to allow more objective and repeatable assessments. This resulted in a revolutionary development in the SSCQM principle maturity assessment screens as shown in Figure 5.10, highly increasing its objectivity and usability as a maturity assessment tool, driving specific management improvement actions for business integration of sustainability and sustainable development.

SSCQM Principle 3 - Engagement of People				
	Indicators	Economic	Ecologic	Social
3.1	Is collaboration promoted for sustainable development throughout the organization ?	4	2	0
3.2	Is sharing of knowledge, experience and information facilitated among employees for sustainable development ?	3	2	1
3.3	Is the workforce empowered to determine constraints, take initiatives and contribute to sustainable development as required ?	5	2	0
3.4	Is there an established communication with people to promote understanding of the importance of their individual contribution to sustainable development ?	3	3	0
3.5	Is people's contribution, learning and improvement with reference to sustainable development recognized and acknowledged ?	4	2	0
3.6	Do the people of the organization conduct self-evaluation of performance with reference to their contribution to the sustainable development against personal objectives ?	3	1	1
	Unidimensional TBL score	73%	40%	7%
	Principle Maturity		40%	

Before

Delphi Feedback

SSCQM Principle 3 - Engagement of people				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented – 5 Fully Implemented		Economic	Ecologic	Social
		Economic performance; Indirect economic impacts; Procurement practices; Anti-corruption; Anti-competitive behaviour	Materials; Energy; Water; Biodiversity; Emissions; Effluents and waste; Environmental compliance	Employment; Labour management relations; Occupational H&S; Training and education; Diversity and equal opportunity; Freedom of association & c.b. Security practices; Rights of indigineous peoples Marketing and labelling
3.1	Is there a common understanding and awareness of sustainability among the employees at all levels of the organization ?	0	0	0
3.1a	Sustainability awareness training conducted periodically for employees at all levels, importance of sustainability and sustainable development articulated	0	0	0
3.1b	Benefits of sustainability improvement projects demonstrated	0	0	0
3.1c	Sustainability mission, vision, policies and objectives articulated to employees at all levels	0	0	0
3.2	Is collaboration promoted for sustainable development throughout the organization ?	0	0	0
3.2a	Organisational sustainability objectives aligned with departmental, team and individual objectives	0	0	0
3.2b	Cross-functional teams and sustainability circles established to facilitate collaboration for sustainability improvement.	0	0	0
3.3	Is sharing of knowledge, experience and information facilitated among employees for sustainable development ?	0	0	0
3.3a	Information, knowledge and experience sharing sessions held periodically for employees at all levels	0	0	0
3.3b	Channels and resources for above identified	0	0	0
3.3c	Channels and resources for above in place and supported	0	0	0
3.4	Is the workforce empowered to determine constraints, challenge current practices, take initiatives and contribute to sustainable development as required ?	0	0	0
3.4a	Key contributions to sustainability improvement and learning activities at individual and team levels identified, recognised and rewarded	0	0	0
3.4b	Self-managing teams established for sustainability performance measurement and improvement	0	0	0
3.4c	Contribution to sustainability improvement encouraged through clear mission, vision, policies and objectives	0	0	0
3.5	Is there an established communication with people to promote understanding of the importance of their individual contribution to sustainable development ?	0	0	0
3.5a	Employees at all levels encouraged to participate in sustainability improvement activities and benefits of sustainability improvement projects demonstrated	0	0	0
3.5b	Sustainability communication sessions are held periodically for employees at all levels, demonstrating the importance and influence of contributions at the individual level	0	0	0
3.5c	Channels and resources for above identified, in place and supported	0	0	0
3.6	Is people's contribution, learning and improvement with reference to sustainable development recognized and acknowledged ?	0	0	0
3.6a	Key contributions to sustainability improvement and learning activities at individual and team levels identified	0	0	0
3.6b	Key contributions to sustainability improvement and learning activities at individual and team levels recognised and rewarded	0	0	0
3.7	Are roles, responsibilities and levels of authority for individuals defined with reference to sustainability ?	0	0	0
3.7a	Roles & responsibilities with reference to sustainability performance measurement and improvement actitivites defined	0	0	0
3.7b	Decision making, monitoring and control mechanisms and authority with reference to sustainability performance measurement and improvement actitivites established	0	0	0
3.8	Do the people of the organization conduct self-evaluation of performance with reference to their contribution to the sustainable development against personal objectives ?	0	0	0
3.8a	Sustainability improvement objectives of the organisation and teams are linked with personal objectives of the employees	0	0	0
3.8b	Employees can self-evaluate their performance in line with their personal objectives that are linked to the sustainability performance of the organisation	0	0	0
3.8c	Sustainability KPIs of the organisation measured and available to all employees	0	0	0
	Unidimensional TBL score	0%	0%	0%
	Principle Maturity		0%	

After

Figure 5.10: Extra level of granularity embedded in the diagnostic tool, as a result of qualitative Delphi feedback

Practical implementation for demonstration purposes was further noted as a noteworthy recommendation, which formed the next step of the research, demonstrating industrial application of the tool and the concept developed in their intended context, and outlining practical and contextual factors important to its application including the enablers and barriers.

Finally, a suggestion revolving around the signification of separate assesments that are required for economic, environmental and social sustainability was captured. Further clarity on this aspect has been provided on the implementation procedure, emphasising the adoption of a balanced view on triple bottom line, as denoted in Table 4.6 with "*" (presented in Chapter 4).

All in all, it was noted that the experts echoed particularly on the following statements with established 100% consensus and agreement levels:

- *"The diagnostics tool enables maturity assessment of prospective sustainability management (SSCQM) principles"*
- *"The application of the tool is feasible"*

The primary purpose of the business diagnostic tool development was to enable maturity assessment and current state analysis with reference to the eight SSCQM principles, which was confirmed by the Delphi panel experts that the developed tool provided a "fit for its purpose".

The feasibility in the business context refers to whether a new opportunity, concept or a solution is "possible, practical, and viable" for application and implementation (Hoagland and Williamson, 2000). The feasibility of the business diagnostic tool was proven as a practical and viable tool to facilitate maturity assessment towards integration and improvement of organisational sustainability.

5.5. Chapter Summary and Conclusions

In this chapter, the verification and initial validation processes undertaken for the conceptual framework of SSCQM, and the associated implementation procedure and diagnostic tool were presented. This was achieved through the feedback of an international Delphi panel, consisting of subject matter experts that brought together diverse industrial, technical and regional backgrounds. As a result, a high level of consensus was established on both the conceptual (relationships between the 8 SSCQM principles and TBL sustainability) and the implementation aspects of the framework (correctness, completeness, clarity, conciseness, supply chain deployment). All the management principles framed under SSCQM received an overall, highly important rating from the subject matter expert Delphi panel (the average of importance scores ranging from 7.15 to 8.10 where 9 is extremely important).

Additionally, the experts favoured certain principles against the others, placing the principles of "leadership" (Ansari and Qureshi, 2015; Aquilani et al., 2016; Nguyen et al., 2018; Reefke and Sundaram, 2016; Zink, 2007); "engagement of people" (Aquilani et al., 2016; Garvare and Isaksson, 2001; Luburić, 2015; Rusinko, 2005; Zink, 2007); and "improvement" (Aquilani et al., 2016; Nguyen et al., 2018; Rusinko, 2005; Zink, 2007); as the three most important principles for organisational sustainable development respectively, resonating with the standpoints of several scholars in the literature.

Although consensus was achieved on all aspects of the implementation procedure, and the business diagnostic tool, a number of improvement opportunities were revealed through the qualitative feedback. This resulted in incorporation of several developments in both the implementation procedure and the business diagnostic tool, including embedding of an extra level of granularity for the SSCQM principle indicators to reduce subjectivity and prescribe specific management mechanisms and processes for each indicator to drive a more robust organisational maturity assessment, management integration and improvement of sustainability.

Ultimately, the summary of the Delphi study findings and the improvements conducted were circulated to the Delphi panel participants, all participants acknowledging the changes made, confirming the outcomes of the study, and obtaining a verified and initially validated managerial framework for the final stage of validation through application at an organisation using the action research method.

CHAPTER 6 – APPLICATION OF THE FRAMEWORK

6.1. Introduction

Advancing knowledge through practical insights that change, guide, influence or shape managerial practice is at the heart of management research (Easterby-Smith et al., 2012; Saunders et al., 2015). This approach formed the central principle of this final research step, that was taken to enhance further the practical contributions of the research through a hands-on, participatory and observatory action research study, where the management solution constructed was deployed in its intended context, i.e. in an organisation, seeking to kick-start its sustainable development journey.

This chapter presents the application of the verified SSCQM framework and expert validated implementation procedure along with the diagnostic tool, in an industrial organisation through the action research method. The objectives of the action research study are formulated, the case selection rationale is discussed, and the key information regarding the participating organisation is provided. The research design, process and data collection methods adopted are outlined.

The application and operationalisation of the implementation procedure (steps 0, 1 and 2) is presented in detail, developing a sustainability integration and improvement strategy for the cooperating organisation. The results achieved, and observations made during the application of the SSCQM framework are provided, discussing the effects and impact of the SSCQM implementation on the organisation and its sustainability. Investigating the key implementation aspects and contextual factors for effective operationalisation of SSCQM, the enablers, barriers and other relevant factors observed are articulated. Finally, the implications of the action research study are discussed.

6.2. Action Research - Design and Methodology

6.2.1. Objectives and Overview

Post verification of the conceptual framework and initial validation of the implementation procedure of the research, that were formulated to support sustainability integration and improvement in the context of organisational management, the synthesised concepts were implemented in a real industrial case with a view to demonstrate their application and investigate the contextual factors for an effective implementation as set out by the research question 7 outlined as following:

RQ7: *What are the key contextual factors for application of such a framework, including the enablers and barriers for implementation?*

As a matter of fact, the process of integrating and systematically developing sustainability is not a straightforward journey, with conflicting agendas and radical cultural changes involved (Machado et al., 2017; Morioka and Carvalho, 2016a; Schrettle et al., 2014; Williams et al., 2017), industrial practitioners highly requiring guidance that is practical, applicable and systematic (Engert et al., 2016; Kiron et al., 2015; Lozano, 2015; Millar et al., 2012; Morioka and Carvalho, 2016a; Rajeev et al., 2017; Schrettle et al., 2014; Williams et al., 2017). Through the application step, such a practical guidance was elaborated, outlining how to apply the solution formulated in an organisational setting, through the step-by-step, roadmap approach.

The implementation of research outcomes further provided the valuable opportunity of investigating the actual effects and influences realised from the organisational operationalisation of SSCQM framework, assessing its impact on the organisation's sustainability management decision making, action deployment, and its overall contribution to the sustainable development of the organisation, acting as the final validation step of the research (validation stage 2).

A platform for establishing the key factors important to a smooth business transition and effective operationalisation of the SSCQM approach was developed, including the establishment of enablers, barriers and other influential, context-specific business factors. The observation, capturing and formulation of such practical insights were identified as of utmost value to managerial practice and to prospective implementors of the proposed SSCQM framework (Easterby-Smith et al., 2012; Saunders et al., 2015), underpinning this key research step.

Stemming from these viewpoints and from the research question 7, the research objectives of the action research study were defined as following:

- *Demonstration of Application:* Demonstrate application of the verified SSCQM framework and the implementation procedure initially validated (stage 1) through expert Delphi panel, in their intended context (organisational management).

- *Observation of Effects and Influences:* Investigate the effects of SSCQM framework on the sustainable management (maturity) and development (integration and improvement strategy formulation) of the implementing organisation.

- *Assessment of Enablers, Barriers and Other Contextual Factors:* Identify enablers, barriers and other context-specific business factors, key to effective and smooth operationalisation of SSCQM framework.

On the other hand, although the highly positive verification / stage 1 validation outcomes and in addition to these research objectives, it was noteworthy that, in line with the principle aim of the research, the key inquiry located at the core of action research study was to evaluate the following fundamental items with reference to the synthesised theories and concepts, in their intended, natural (real organisational) setting of application:

- Does the proposed solution facilitate management integration and improvement of triple bottom line sustainability?

- Does the proposed solution support and/or accelerate organisational transition towards integration and improvement of triple bottom line sustainability?

- Does the proposed solution guide and/or provide a structure for managerial strategy and action formulation for integration and improvement of triple bottom line sustainability?

The SSCQM implementation procedure developed was fully applied for steps 0 (identification of sustainability priorities), 1 (current state analysis / maturity assessment) and 2 (identification of risks, opportunities – improvement strategy formulation) in the action research study. Although this was a partial implementation (in the absence of steps 3 and 4), it was justified that the steps 0, 1 and 2 would not only include the application of the diagnostic tool developed as an important aspect of the research, but also enable addressing of the fundamental inquiries set out above, in line with the principle aim of the research. Moreover, the full four step implementation of the SSCQM implementation procedure was highly dependent on the level of resources invested by the cooperating organisation, including significant budget (high levels of investment) and time (it could take years to implement a full cycle of Steps 0 to 4) implications, which were aspects mainly out of the control of the researcher and outlined feasibility of applying steps 0, 1 and 2 with relatively lower resource requirements.

At the end of step 2, it was envisaged that the participating organisation would possess a comprehensive analysis regarding its current level of sustainability integration, its maturity, and provided with a clear set of strategies and actions, listing the priorities and outlining the path for integrating sustainability through SSCQM principles. The achievement of this as a result of the action research study would mean that the research served for its primary aim: i.e. development of a management solution based on the synthesis of QM and SCM principles that facilitates business integration and improvement of sustainability.

Action research philosophy captures novel knowledge or develops insights through changing systems (Lewin, 1946), researchers being fully immersed in situations to interact and observe the phenomena of interest from within (Checkland and Holwell, 1998). Action research studies possess the key characteristics of problem and change orientation, high level of engagement by the researcher, and close cooperation between the researcher and the group operating under the specific context being investigated (MacDonald, 2012). All of these elements were reflected as highly applicable to this research, enabling capturing of comprehensive level of data necessary for not only demonstrating application of the novel SSCQM solution developed in practice but also observing its influences and factors essential to its operationalisation in the organisational application domain.

As part of the action research process, the change or phenomenon of interest to be studied through application is planned, implemented (or acted) in its original context, and the effects occurring during the change or application are described and evaluated with a view to both advance knowledge and confirm paths for improvement (Tripp, 2006), which are undertaken through a cyclic and systematic structure (Collatto et al., 2018). The cooperative and engaging essence of the action research not only contribute towards building enhanced relationships with the participating organisation, but also towards establishment of an open and transparent environment for application, discussion and observation with a positive association with sustainability research (Hazelton and Haigh, 2010; Hind et al., 2013; Wittmayer et al., 2014; Wittmayer and Schäpke, 2014; Wooltorton et al., 2015).

6.2.2. Case Selection

6.2.2.1. Single Case vs. Multiple Cases

An important research decision entailed the selection of implementing the change on a single case or on multiple cases to address the research inquiries. The single case selection is

particularly suited to research situations where the key objective is testing or applying a "well-formulated framework, with an identified set of propositions for established circumstances" and clearly defined set of concepts, enabling observation of the development in its intended context and developing further explanations regarding the synthesised conceptual frameworks (Yin, 2003). This stance particularly resonated with the path followed in this research, as the SSCQM framed a verified set of propositions, defined for organisational sustainability management context along with a validated and coherent series of concepts for its operationalisation, seeking further understanding in its intended setting through application at a both critical (in-depth) and typical (representative of organisational management practice) case (Yin, 2003).

On the other hand, multiple cases provide the oppportunity of observing situations within each case and observing similarities and differences across cases, contributing to the representativeness investigation of new conceptual developments (Baxter and Jack, 2008; Gustafsson, 2017). However, as the conceptual framework and the implementation procedure were verified and initially validated through subject matter expertise, representing a wide range of industries and regions, the representativeness and cross-case investigation aspects were seen as secondary to the focus enabled in a single case design for an in-depth application, detailed demonstration and comprehensive analyses of the implementation issues (Dyer and Wilkins, 1991; Gustafsson, 2017; Yin, 2003). Undertaking the action research on a single organisation was also reflected as supplementary to the central principle of action research, i.e. establishment of a close, effective and collaborative working relationship with the senior leadership of the participating business.

Following the justification of conducting the action research on a single case, a number of suitable organisations were identified and approached through formal communications. The key criteria for choosing the organisation for the action research study comprised of the following parameters:

- *Interest, commitment and support of the senior management team:* This factor highly influences the levels of cooperation and resources invested by the participating organisation into the research, including the time and access provided to the researcher for a complete application and observation of developed conceptual framework and its associated steps.

- *Desirably operating in more than one business sector with wide operational scope*: This factor enables exposure of the SSCQM approach to a wide range of business processes, stakeholders and sectors, gauging its applicability under various business contexts, and observing its capability of prioritising and directing the business towards addressing the key sustainability issues.

- *Desirably possessing ISO 9001 certification for an established period of time*: This factor demonstrates the level of awareness of the participating organisation with the core principles of SSCQM philosophy, the organisations with an established history of ISO 9001 not requiring an additional training regarding the basics of ISO 9001. This contributes to the implementation pace of the framework, with lower anticipated levels of resistance for accomplishment of action research study objectives. The business to be selected should desirably have been adopting ISO 9001 for at least five years.

Other parameters such as organisational size (or scale), geographical region, specific industry or sector, and level of maturity were evaluated to be entirely contextual factors, affecting the action research study's effectiveness, depth of data collection, ease of implementation and level of resources committed relatively less therefore, were considered as less important in relation to the factors prioritised above for the selection of the participating organisation.

6.2.2.2. Company Introduction

An engineering and distribution organisation in the Cyprus region was selected for the action research study due to the strong interest demonstrated by the management team, the willingness of senior leadership to integrate and improve sustainability, its multi-sectoral exposure (chemical and construction), its wide operational range (service, manufacturing, distribution, retail) and possession of ISO 9001 quality management system certification for a significant period of time. Additionally, the managing director (who is also the founder and owner) of the business, highly committed to take active part in the study, with a view to utilise the developments introduced by the research to integrate and improve sustainability of his business, seeing the action research study as an opportunity and as a "free consulting offer" to drive the organisation towards its sustainable development goals through the facilitation of the researcher.

Due to the research containing sensitive information about the participating organisation, its stakeholders and its sustainability, the name of the organisation was kept confidential, as part

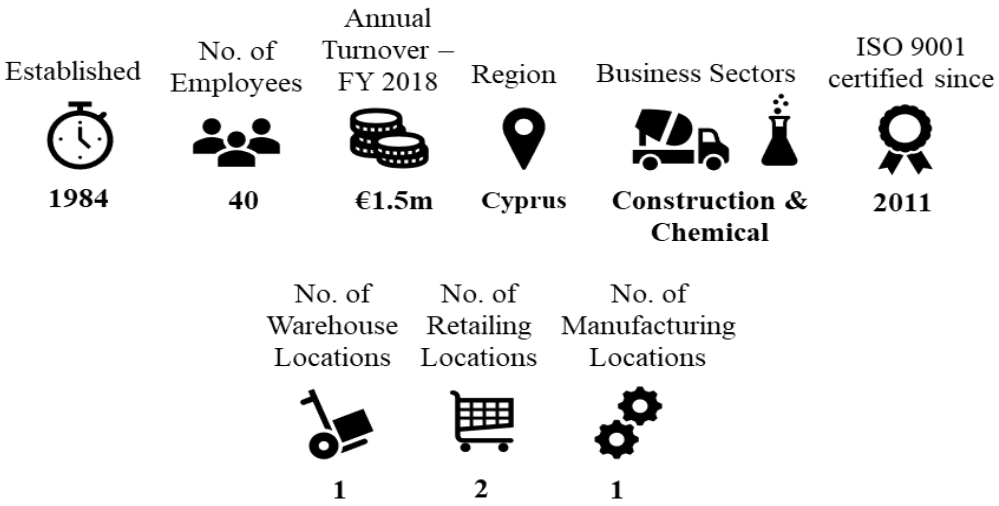
of the research ethics considerations and agreement with the senior management of the organisation. Hence, the participating entity was referred to as “Organisation X”, throughout the research. Established in 1984, the organisation employs around 40 employees, with an annual turnover rate of €1.5 million. The business operates in 2 main business sectors (construction and chemical), across a wide operational scope including distribution, manufacturing, retail, application and service of construction and chemical products.

The organisation has two distribution and retail facilities in major Cypriot settlements (Nicosia and Kyrenia), which act as an interface between the firm and its customers. Additionally, one manufacturing and one warehousing facility strategically located at the industrial zones near the capital Nicosia are part of the assets of the business, which are at the heart of the firm’s operations.

As part of the engineering and manufacturing activities of the firm, construction and chemical products such as paint, concrete making materials and insulation materials are both developed, tested and manufactured as per the customer requirements. Furthermore, the organisation distributes and retails key construction and chemical brands such as “Onduline (roofing), ABS (plastering), Loctite (adhesion), Izocam (insulation) and YDS (safety gear)” in the Northern Cyprus region.

The organisation is certified to the latest ISO 9001:2015 quality management system framework, possessing ISO 9001 certification since 2011, along with management vision to achieve ISO 14001 (environmental management system) and ISO 45001 (occupational health and safety management system) by 2023. These aspirations also played a significant role for agreement of the organisation in taking part in the action research study, the leadership of the business seeing the research as an opportunity to learn and progress towards both their sustainability and management system certification goals.

Furthermore, the organisation is currently going through TSE certification process, which is a significant regional quality assurance certification for a wide range of sectors, having a positive impact on the reputation and customer satisfaction levels of firms (Kocturk and Onurbas Avcioglu, 2006).



FY: Financial Year

Figure 6.1: Key statistics of the participating organisation

6.2.2.3. Business Process Overview

All facilities of the organisation were visited, and key business processes of the organisation were mapped in terms of the process flow, noting the key activities and processes with most influence on the sustainability of the organisation.

The manufacturing and logistics operations were observed as two key processes with the highest impact on the triple bottom line sustainability performance of the organisation due to financial resource requirements, impacts on environment (waste, emissions, compliance), and social considerations such as health and safety, and local community impact.

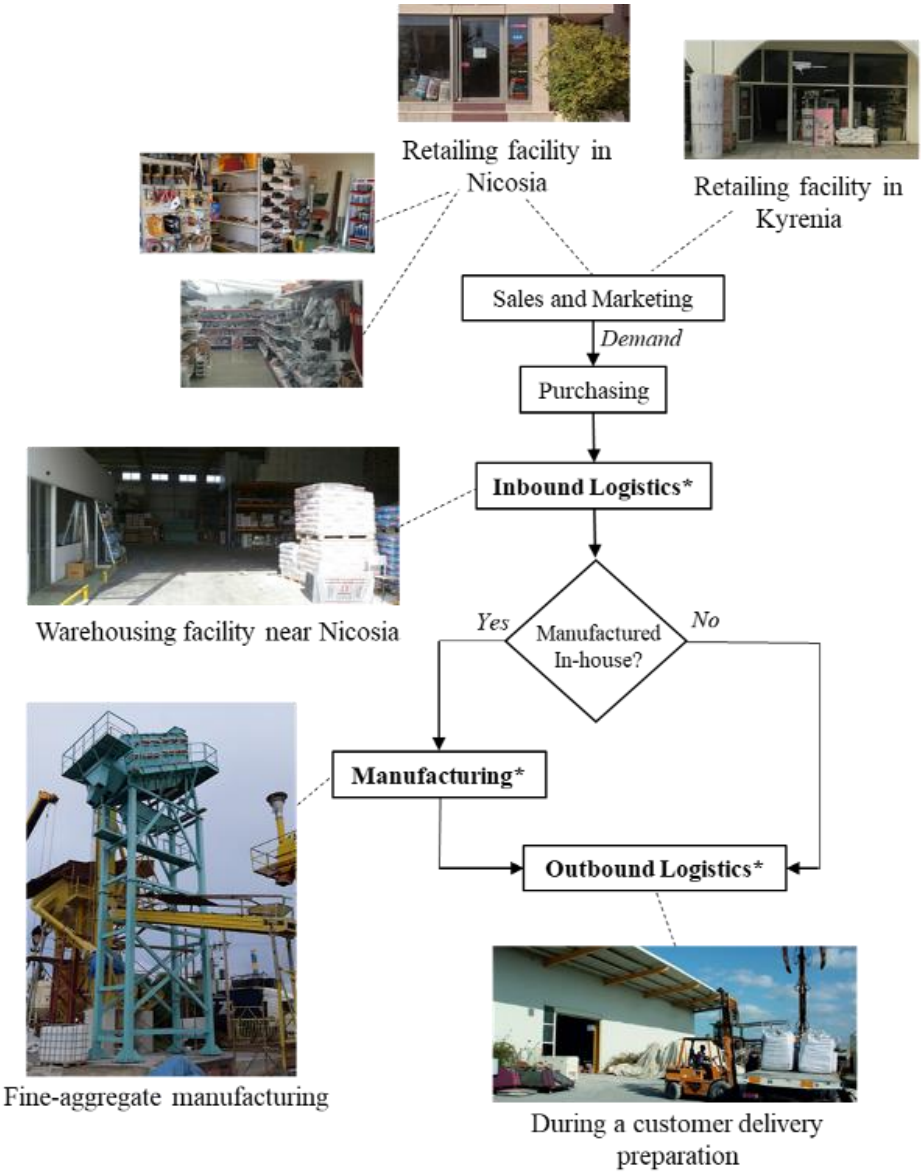


Figure 6.2: Key business processes of the participating organisation (Source: Author – photos taken by the researcher during the action research study)

6.2.2.4. Level of Engagement and Participation Across the Organisation

The researcher adopted a top to bottom approach during the action research study, engaging with organisational members across different layers of the organisation including the director (managing director), middle management, team leaders and operators. The director of the business participated in all the data collection phases of the study. Additionally, the business assigned their continuous improvement manager (management representative) for the activity, who was also present and took active part during the visits conducted, stakeholder analysis, maturity assessment and improvement strategy formulation phases. Other managers such as the R&D manager, operations manager, and sales manager were also consulted

during the maturity assessment step, evaluating the management maturity levels for principles such as customer focus and areas that included new product introduction etc.

Around 12 organisational members across various levels were consulted and took various parts in the study, the age range of interacting members varying between 22 to 55 years old, and their work experience ranging from 2 to 35 years. This included conversations with the relatively younger and inexperienced operators (22 years old with 2 years of experience), and detailed discussions with the managing director (55 years old with 35 years of experience).

The level of engagement adopted during the application study is demonstrated in Figure 6.3, along with the age and work experience statistics of the organisational members engaged.

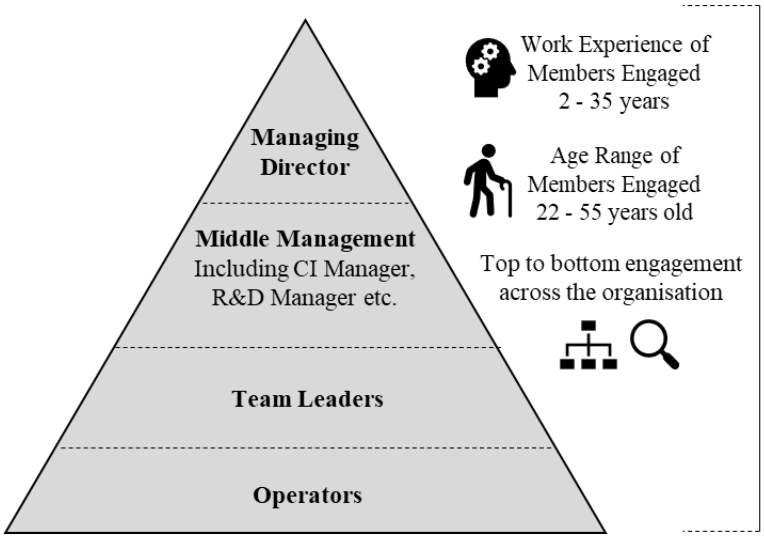


Figure 6.3: Top to bottom approach adopted across the layers of the organisation

6.2.2.5. Business Stakeholder and Sustainability Overview

The key stakeholders of the organisation were established and grouped into three main categories of external, legislative and internal as schematically demonstrated in Figure 6.4.

Following identification of key stakeholders of the participating organisation, the associated triple bottom line sustainability interests and influences were analysed, along with determination of sustainability agendas for each stakeholder group, as listed in Table 6.1. This initial stakeholder analysis mapped the “big picture” regarding the context of the organisation, its key interested parties, and the relevant sustainability issues and requirements of the participating organisation.

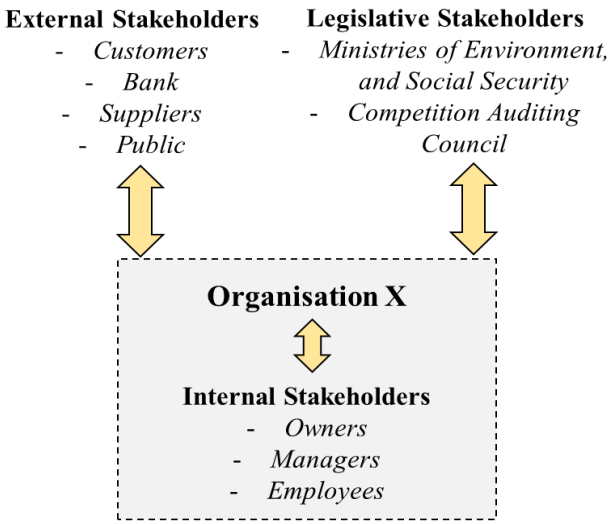


Figure 6.4: Key stakeholders of the organisation

Table 6.1: Key stakeholders of the organisation and associated sustainability agendas

Category	Stakeholder	Sustainability Impact Interest & Influence			Remarks
		Eco-nomic	Eco-logic	Social	
External	Customers	✓	✓	✓	• Highly interested in cost of products and services. • High influence on economic sustainability through direct impact on financial performance. • Interested in environmental and social responsibility and associated business reputation.
	Public		✓	✓	• Interested in the social and environmental impact of the business on the local community. Local neighbours highly interested in environmental impacts.
	Bank	✓			• High influence on the economic sustainability through crediting facilities. • Highly interested in the financial performance of the organisation.
	Suppliers	✓	✓		• Remarkably influence the economic and environmental performance through externally provided products and services.

Internal	Owners	✓	✓	✓	• Highly interested in the economic sustainability and profitability. • Concerned with social and environmental sustainability and associated business reputation due to legislative, societal, internal and market pressures.
	Managers	✓	✓	✓	• Interested in the economic, environmental and social performance of the business. • Have a high influence on managing key organisational processes in line with TBL goals and vision.
	Employees	✓	✓	✓	• Highly interested in the social sustainability of the organisation including health and safety, and human rights. • Have a key role in enabling achievement of TBL goals and organisational embracing of the "sustainable" change.
Legislative (Governmental Institutions)	Ministry of Environment		✓		• Regulatory body for environmental sustainability including compliance with environmental legislation, waste treatment and emissions.
	Ministry of Labour & Social Security			✓	• Regulatory body for social sustainability including organisational health and safety, and human rights issues.
	Competition Auditing Council	✓			• Regulatory body for economic sustainability impacts including anti-corruption and anti-competitive behaviour.

6.2.3. Design, Process and Data Collection

Formulating a useful, clear and feasible solution, easy to be applied by managers in various industrial contexts was the central principle of this research, bringing together a real world practice based approach, and a pragmatic worldview into the addressing of research questions (Ihuah and Eaton, 2013; Khin and Fui, 2012; Saunders et al., 2015). Moreover, a purely qualitative or quantitative design was reflected as not sufficient to address the intricacies and

depths of the implementation and associated contextual observation phase of the research, pointing towards the mixed method design being carried over to this final step of the research (Creswell and Plano Clark, 2011; Ihuah and Eaton, 2013; Johnson et al., 2007).

As a result, similar to the systematic literature review, verification and validation steps of the research, a convergent parallel mixed method design was adopted in the action research study, enabling triangulation of qualitative and quantitative methods for an in-depth assessment to capture practical insights into the application and operationalisation of the management solution developed (Creswell, 2013; Farquhar, 2016; Jick, 1979; Saunders et al., 2015).

For demonstrating the application of the verified SSCQM framework and the validated SSCQM implementation procedure and diagnostic tool, the qualitative method of participative observation was utilised, which is a highly fruitful and rigorous organisational management research approach for "eliciting new information" during occurrence and application of new phenomena under investigation, in their natural settings (Kawulich, 2005; Savage, 2000; Vinten, 1994). This approach enabled the researcher to freely interact, record observations continuously, and transparency between the researcher and the participating organisation, identifying the key issues during the implementation period.

During the application of the SSCQM framework and the associated implementation procedure, formal relevant documentation and data regarding sustainability and stakeholders of the participating organisation were reviewed to confirm the implementation stages such as definition of the sustainability priorities of the organisation based on the GRI framework, establishment of the key stakeholder requirements, and assessing the SSCQM maturity levels of the organisation. The participation of the researcher as part of the action research study, was conducted in a professional, collaborative and constructive manner, holding open discussions with the leadership of the organisation and taking observatory notes regarding the application of the framework. The participative observation and discussion method was also applied during the investigation of effects realised by the SSCQM phenomenon and assessment of enablers, barriers and other contextual factors important to its operationalisation. For consistency, and due to its established strengths in analysis of qualitative information collected and structured generation of key themes, the thematic synthesis method was adopted for establishment of key information within the qualitative data captured (Barnett-Page and Thomas, 2009).

For determination of the effects that arise from the implementation of SSCQM approach, including its impact on the triple bottom line sustainability integration levels and SSCQM principle maturity levels, quantitative methods were justified to be utilised for tangible and objective measurements of the associated levels, before and after the application activity. The levels of sustainable management maturity (i.e. SSCQM principle maturity) and sustainability integration were quantitatively evaluated, using the business diagnostic tool developed, to draw a clear picture regarding the current state of the participating business with reference to management sustainability integration, as a fundamental step of the implementation procedure. The quantitative findings of the maturity diagnostic tool assessments were analysed through a comparative, before and after analysis approach, laying out the situation before and after the application (Gravelle et al., 2007), and outlining the improvements, contributions and impacts realised post the implementation of the SSCQM philosophy. The qualitative and quantitative data collection and analysis methods utilised against the relevant action research study objectives are shown in Table 6.2.

Table 6.2: Action research objectives, associated data collection and analysis methods

Research Objective	Data Collection Method	Analysis Method
Demonstrate application of SSCQM framework	Participative observation / discussion and documentation review (Qual.)	Thematic Synthesis (Qual.)
Observe the effects and influences of SSCQM framework	Maturity Assessment Tool (Quan.) Participative observation / discussion (Qual.)	Comparative, before and after analysis (Quan.) Thematic Synthesis (Qual.)
Establish the enablers, barriers and other contextual factors for operationalisation of SSCQM framework	Participative observation / discussion (Qual.)	Thematic Synthesis (Qual.)

The key stages of the action research approach were applied in the study as articulated by Tripp (2006), including the structured action and inquiry cycle of "plan, act, describe and evaluate". The planning stage included the identification of the research design, associated data collection methods along with the selection of the participating organisation as per defined criteria in line with the research objectives. As part of the planning stage, a preliminary visit was conducted to the selected organisation, detailing the aim and objectives of the research, the scope and potential benefits of the action research study for the

organisation, elaborating on the ethical considerations, and confirming voluntary consent. The commitment, resources required (e.g. time dedicated periodically by the organisation's leadership to apply the SSCQM conceptual framework, provision of access to operations and meeting rooms as required etc.) and the plan of implementation were confirmed during this initial visit.

Following the planning of the study and the preliminary engagement visit to the organisation, the implementation of the SSCQM conceptual framework was kicked off as part of the "act" stage, systematically applying the steps 0 (i.e. identification of sustainability priorities), 1 (i.e. current state analysis and application of the diagnostic tool) and 2 (i.e. identification of risks and opportunities). As a result of these steps, a number of key improvement actions were formulated with the leadership of the participating organisation, providing the organisation with a clear direction, strategy and an established set of actions for integration and improvement of sustainability, concluding the facilitating and positive effect of the SSCQM approach on the organisation's sustainable development journey.

During the implementation of the SSCQM framework, both quantitative and qualitative data was collected in line with the research design and objectives, "describing" how to apply this new framework, its effects on the participating organisation and the factors remarkable to its effective operationalisation. Finally, the observations noted, and data collected were analysed and "evaluated", framing the learnings acquired and drawing conclusions in relation to the aforementioned action research study inquiries and associated objectives.

The process adopted in the study is schematically demonstrated in Figure 6.5, including the key application stages.

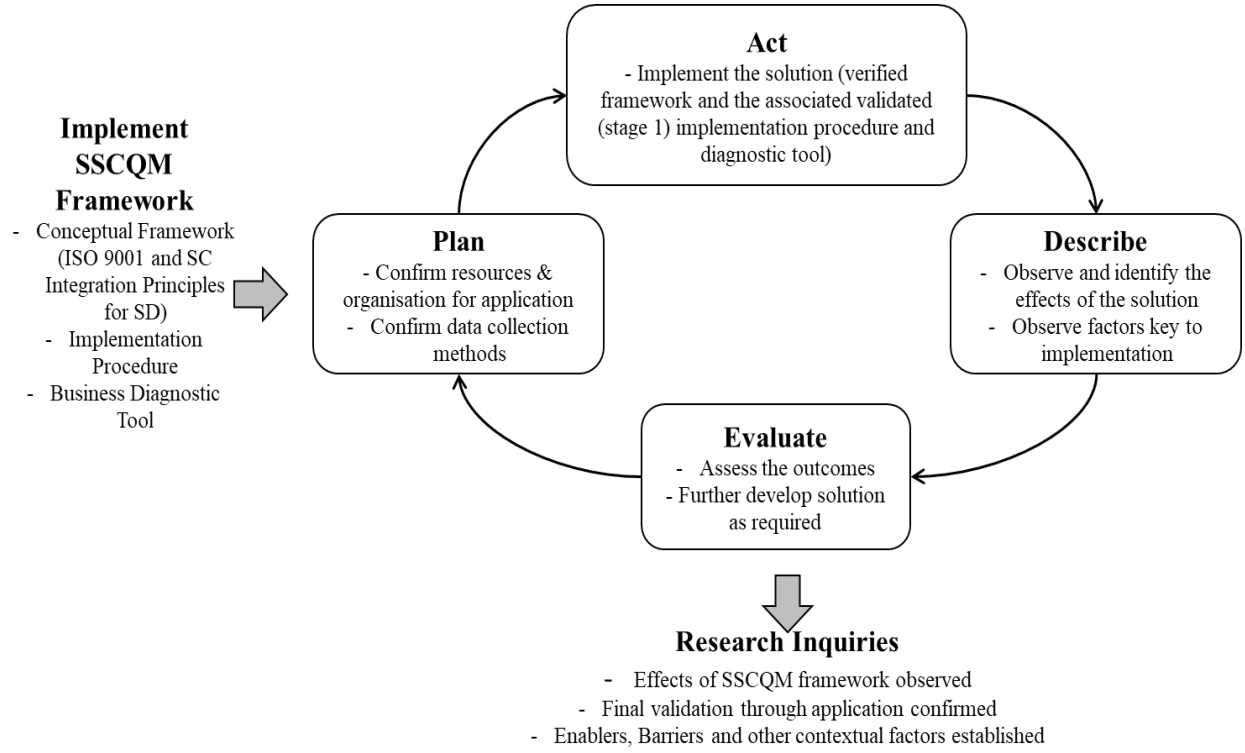


Figure 6.5: Action research process utilised in the study
(Adapted from: Tripp (2006))

6.3. Implementation of SSCQM Framework

6.3.1. Step 0 – Identification of Sustainability Priorities

Establishment of economic, environmental and social sustainability parameters important for the stakeholders of the organisation for concentrating and directing the sustainability integration and improvement efforts, formed the basis of the initial step (step 0) of SSCQM implementation procedure. To achieve this, as discussed in Section 6.2.2.5, the stakeholders of the participating organisation were identified along with the determination of their sustainability agendas (voice of the stakeholders – VOS). For deriving the sustainability priorities of the organisation, the stakeholders and their sustainability agendas were analysed with a view to generate the key issues for the organisation and to enable such prioritisation.

A highly recognised tool for prioritising stakeholders and their associated agendas is the mapping of stakeholders based on their influence / power and interest, categorising the stakeholders into the four quadrants of "key players, meet their needs, show consideration and least important" (Ackermann and Eden, 2011; Brugha and Varvasovszky, 2000; Bryson, 2011; Newcombe, 2003). Following a similar approach, the stakeholders of the participating

organisation were categorised through analysing its context and participative input from the leadership of the organisation as shown in Figure 6.6.

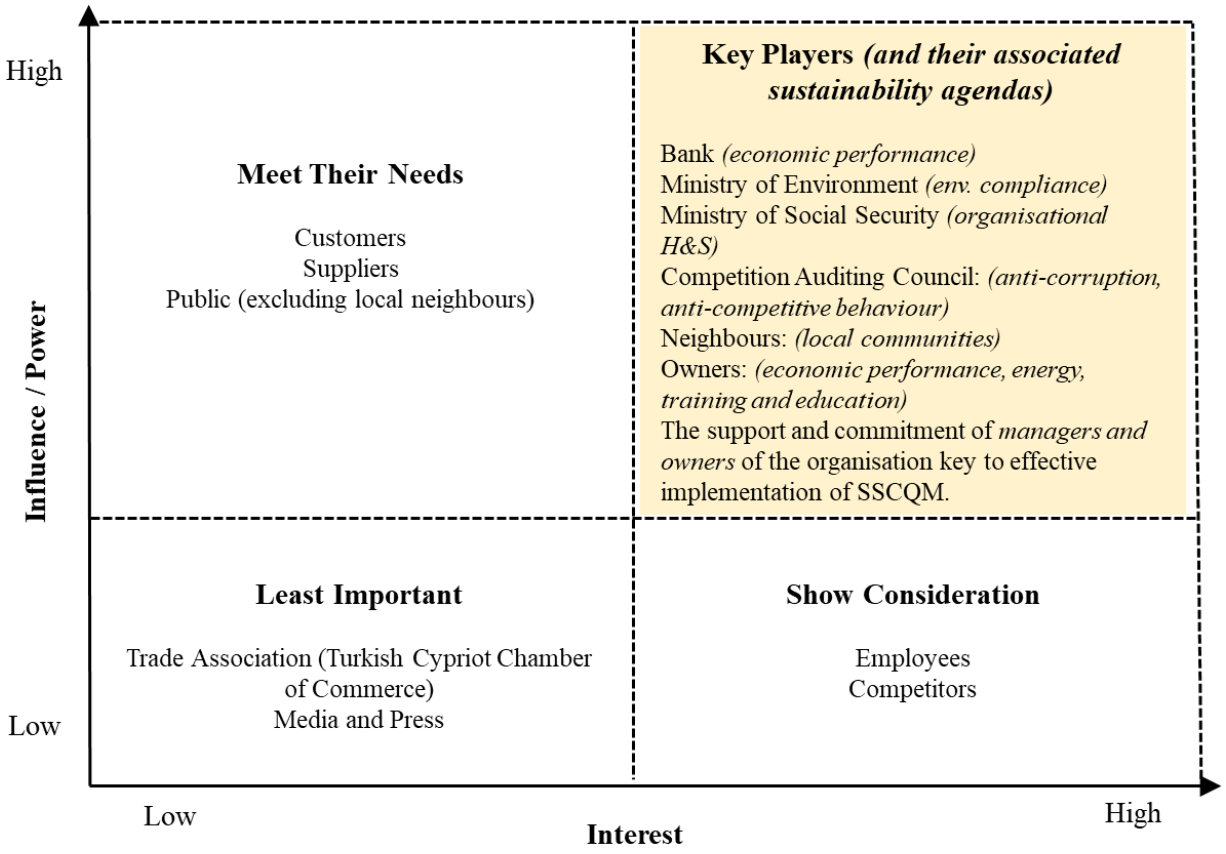


Figure 6.6: Stakeholder impact and influence matrix analysis

The bank, legislative bodies (ministries of environment, social security and competition auditing council) and local neighbours of the facilities were identified as key external players for the organisation. These stakeholders were perceived as major actors for the sustainability of the business due to reliance on the bank's crediting facilities for economic sustainability, along with the sanction power of legislative bodies and local neighbours for economic, environmental and social sustainability issues. The owners and managers were further established as key internal players, due to their high levels of influence and interest in the sustainability of the organisation.

Considering the markets and customer bases that the organisation operates in, a relatively lower level of interest into sustainability issues was currently noted with the customers, placing the customers of the organisation into the "meet their needs" section with a high potential influence but low level of current interest in the sustainability of the organisation. A similar situation applied to the stakeholder groups of public and suppliers, with high levels of

potential influence on the sustainability of the organisation, but low levels of current interest in the sustainability issues. This was explained due to the currently low general public awareness levels in the Northern Cyprus region (Vehbi and Hoskara, 2010), and low customer awareness levels in the construction and chemical sectors that the business operates in (Elmualim and Alp, 2016; Yitmen, 2005).

It was agreed with the leadership of the participating organisation that prioritisation of stakeholders categorised as "key players" and their relevant sustainability agendas would be more "value-added" for the business, particularly in the short-term. The discussions held also resulted in the conclusion that this approach would provide an initial platform for the business to direct sustainability integration and improvement efforts, as these stakeholder groups would influence the sustainability of the organisation the most, in relation to the other stakeholder groups with lower levels of interest and/or power.

Subsequent to establishment of key stakeholders, their sustainability agendas were analysed, and the GRI framework consulted to select the associated indicators for integration, performance measurement and reporting (GRI, 2018; Vigneau et al., 2015). As a result, the specific triple bottom line sustainability indicators to be prioritised were determined using the GRI framework as listed in Table 6.3 and Figure 6.7, taking into account the voice of the key players (stakeholder groups of most significance to the sustainability of the organisation).

Table 6.3: Sustainability priorities of the organisation established from GRI framework

TBL Dimension	GRI Indicators	Level 2 indicators
Economic	Economic performance	Direct economic value generated and distributed; Financial implications and other risks and opportunities due to climate change; Defined benefit plan obligations and other retirement plans; Financial assistance received from government
Economic	Anti-corruption	Operations assessed for risks related to corruption; Communication and training about anti-corruption policies and procedures; Confirmed incidents of corruption and actions taken
Economic	Anti-competitive behaviour	Legal actions for anti-competitive behaviour, anti-trust, and monopoly practices
Environmental	Energy	Energy consumption within the organization; Energy consumption outside of the organization; Energy intensity;

		Reduction of energy consumption; Reductions in energy requirements of products and services
Environmental	Environmental compliance	Non-compliance with environmental laws and regulations
Social	Occupational Health & Safety (H&S)	Occupational health and safety management system, Hazard identification, risk assessment, and incident investigation, Occupational health services, Worker participation, consultation, and communication on occupational health and safety, Worker training on occupational health and safety, Promotion of worker health, Prevention and mitigation of occupational health and safety impacts directly linked by business relationships, Workers covered by an occupational health and safety management system, Work-related injuries, Work-related ill health
Social	Training and education	Average hours of training per year per employee; Programs for upgrading employee skills and transition assistance program; Percentage of employees receiving regular performance and career development reviews
Social	Local communities	Operations with local community engagement, impact assessments, and development programs; Operations with significant actual and potential negative impacts on local communities

Voice of the Stakeholders (VOS) GRI Sustainability Indicators Summary

Economic		Environmental		Social					
Economic performance	Y	Materials	N	Employment	N	Forced or compulsory labour	N	Marketing and labelling	N
Market presence	N	Energy	Y	Labour management relations	N	Security practices	N	Customer privacy	N
Indirect economic impacts	N	Water	N	Occupational H&S	Y	Rights of indigineous peoples	N	Socioeconomic compliance	N
Procurement practices	N	Biodiversity	N	Training and education	Y	Human rights assessment	N		
Anti-corruption	Y	Emissions	N	Diversity and equal opportunity	N	Local communities	Y		
Anti-competitive behaviour	Y	Effluents and waste	N	Non-discrimination	N	Supplier social assessment	N		
		Environmental compliance	Y	Freedom of association & c.b.	N	Public policy	N		
		Supplier environmental assessment	N	Child labour	N	Customer H&S	N		
No. of GRI indicators included for Economic (out of 6)	3	No. of GRI indicators included for Ecologic (out of 8)	2	No. of GRI indicators included for Social (out of 19)					3

Figure 6.7: Sustainability priorities summary as per voice of the stakeholders analysis

6.3.2. Step 1 – Current State Analysis and Application of Diagnostic Tool

Following the identification of the voice of the stakeholders of the organisation and associated triple bottom line sustainability priorities, the initial management maturity and sustainability integration levels were evaluated using the business diagnostic tool developed. Several visits were conducted to the participating organisation, and a series of meetings held with the senior and middle management across various functions, allowing for detailed assessments to be carried out with reference to each SSCQM principle and their indicators. The assessment was conducted by the researcher in close collaboration with the management representative (continuous improvement manager) of the participating organisation, as part of the cooperative, participative and open manner introduced by the action research approach.

The management practices, processes and mechanisms currently in place, specified by the indicators for each SSCQM principle (e.g. customer focus, leadership etc.) were reviewed against the sustainability priorities established in step 0 (e.g. energy and environmental compliance for the environmental dimension). This review involved appraising each SSCQM principle sub-indicator (e.g. 1.1a, 1.1b etc.) against each prioritised sustainability indicator (e.g. energy, local communities etc.). For instance, for the review and scoring of leadership principle's sub indicator 2.2b outlined below, it was assessed whether there were objectives in place, and at what implementation level, for the economic, environmental and social sustainability priorities of the organisation:

> ***Indicator 2.2b:*** *"Sustainability objectives for economic, social and environmental sustainability in place, in line with the voice of the stakeholders analysis of the organisation"*

In the case of indicator 2.2b, there were some objectives in place for some of the sustainability priorities of the business, in the absence of a formal process for documentation and periodic review, leading to an evaluation of "informal/inadequate processes in place" hence, the business was awarded a score of "1" for all the sustainability dimensions of economic, environmental and social. In accordance with this approach, scores were awarded as per the assessment criteria below, enabling generation of an evidence based, quantitative current state map of the participating organisation with reference to SSCQM principles and associated sustainability integration levels (Please refer to Chapter 4, Section 4.5.2 for detailed descriptions of the scoring criteria):

"0"- No evidence of implementation;

"1"- Informal/inadequate processes in place;

"2"- Partially implemented (All VOS TBL indicators not included or implemented);

"3" - Formal process in place, inclusive of all VOS TBL sustainability parameters;

"4"- "3" plus evidence of continuous improvement;

"5"- Fully implemented, inclusive of all GRI sustainability indicators.

The individual, principle level maturity scoring assessments conducted and associated screens produced from the business diagnostic tool for the participating organisation are presented as following:

- Figure 6.8 – Customer focus
- Figure 6.9 – Leadership
- Figure 6.10 – Engagement of people
- Figure 6.11 – Process Approach
- Figure 6.12 – Improvement
- Figure 6.13 – Evidence based decision making
- Figure 6.14 – Relationship management
- Figure 6.15 – Supply chain integration

As discussed in Chapter 4 – Section 4.5.2, the assessments of the sub-indicators at the process / mechanism level (e.g. 1.1a, 1.1b etc.) as per the scoring criteria (0 to 5), resulted in the principle indicator scores (e.g. 1.1, 1.2 etc.), the aggregation of the indicator scores providing the principle maturity levels (e.g. customer focus, leadership etc.) for each sustainability dimension. Ultimately, the outcome of maturity assessment undertaken using the business diagnostic tool is shown in Figure 6.16, demonstrating the maturity levels gauged for each SSCQM principle, corresponding sustainability dimension integration levels, and the overall organisational SSCQM maturity score generated.

SSCQM Principle 1 - Customer Focus				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic	Envir.	Social
		Economic performance; Anti-corruption; Anti-competitive behaviour	Energy; Environmental compliance	Occupational H&S; Training and education; Local communities
1.1*	Are the current and future sustainability needs and requirements of current and potential customers identified and risk analysis conducted ?	1	0	0
1.1a	Sustainability awareness and expectations feedback sought from key markets and customers	1	0	0
1.1b	Current and future TBL sustainability requirements of key customers identified	1	0	0
1.1c	Risk analyses with reference to customer sustainability needs and requirements carried out	1	0	0
1.2	Is there engagement with the customers with regards to their sustainability awareness and expectations ?	1	0	0
1.2a	Customer and market sustainability awareness and expectations questionnaires/interviews conducted	1	0	0
1.2b	Customer sustainability awareness training conducted periodically with key customers of the business	0	0	0
1.2c	Sustainability improvement projects and outcomes communicated periodically to key customers	1	1	0
1.3	Are the sustainability needs and requirements of customers aligned with the objectives of the organization ?	1	0	0
1.3a	Sustainability needs and requirements of key customers/markets identified	1	0	0
1.3b	Sustainability KPIs established as per GRI framework, aligned with customer/market needs and requirements	0	0	0
1.3c	Customer sustainability KPIs are embedded into organisational objectives for monitoring and improvement	1	0	0
1.4	Is the customer satisfaction with reference to sustainability performance of the organization measured and monitored along with implementation of actions as required ?	1	0	0
1.4a	Customer and market sustainability satisfaction feedback captured, evaluated and actioned via questionnaires/interviews or similar	1	0	0
1.4b	Customer satisfaction feedback capturing process includes sustainability	1	0	0
1.5	Are the sustainability needs and requirements of customers communicated throughout the organization ?	1	1	1
1.5a	Sustainability needs and requirements of customers communicated to employees at all levels periodically	1	1	1
1.5b	Sustainability communication channels identified	1	1	1
1.5c	Sustainability communication channels supported and in place	1	1	1
1.6	Are the organizational members at all levels aware of customer sustainability needs and requirements ?	1	1	1
1.6a	Employee awareness feedback with reference to customer sustainability requirements captured	1	1	1
1.6b	Employee awareness feedback with reference to customer sustainability requirements evaluated	1	1	1
1.6c	Employee awareness feedback with reference to customer sustainability requirements actioned and effects monitored	0	0	0
1.7	Are the needs and appropriate expectations of the interested parties** that can affect customer satisfaction with reference to sustainability performance identified and actioned ?	1	0	0
1.7a	Needs and expectations of key stakeholders(interested parties) that can affect customer satisfaction with reference to sustainability performance identified	1	0	0
1.7b	Risk analysis conducted regarding needs and expectations of key interested parties that can affect customer satisfaction with reference to sustainability performance	1	0	0
1.7c	Risk mitigation actions with ref. to above are taken and effects monitored	1	0	0
1.8	Are the products, services and processes of the organization aligned with the sustainability needs and requirements of the customers and the market ?	2	1	1
1.8a	Current product/services/processes sustainability performance monitored and controlled in line with customer sustainability performance expectations	2	1	1
1.8b	Customer sustainability needs/requirements reviewed and implemented as part of New Product/Service/Process Introduction processes.	2	1	1
	Unidimensional TBL score	20%	8%	7%
	Principle Maturity	11%		

Figure 6.8: Maturity assessment conducted on the customer focus principle

SSCQM Principle 2 - Leadership				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic	Envir.	Social
		Economic performance; Anti-corruption; Anti-competitive behaviour	Energy; Environmental compliance	Occupational H&S; Training and education; Local communities
2.1	Are the leaders of the organization committed to sustainable development through clear mission, vision, policies and objectives ?	**1**	**1**	**1**
2.1a	Sustainability mission, vision and policies for environmental, social and economic sustainability in place and reviewed periodically	1	1	1
2.1b	Sustainability objectives for economic, social and ecologic sustainability in place in line with the voice of the stakeholders analysis of the organisation	1	1	1
2.1c	Performance against the sustainability objectives monitored by senior management and controlled	1	1	1
2.2	Are the sustainable development mission, vision, policies and objectives articulated throughout the organization ?	**1**	**1**	**1**
2.2a	Sustainability mission, vision, policies and objectives for environmental, social and economic sustainability communicated periodically at all levels of the organisation	1	1	1
2.2b	Communication channels for above identified	1	1	1
2.2c	Communication channels for above supported and in place	1	1	1
2.3	Is the organization-wide commitment to sustainable development encouraged ?	**1**	**0**	**0**
2.3a	Organisational sustainability values in place and part of the recruitment processes with reference to sustainable development	1	0	0
2.3b	Organisational commitment statement in place and communicated to key stakeholders (employees, suppliers, public etc.)	0	0	0
2.3c	Contribution to sustainability improvement activities encouraged, recognised and rewarded	1	1	0
2.4	Is the workforce provided with the necessary resources, training and authority to drive sustainability improvement activities ?	**1**	**0**	**0**
2.4a	Sustainability awareness and performance measurement training conducted	1	0	0
2.4b	Resources required for key sustainability KPI monitoring and improvement identified and supported	1	0	0
2.4c	Roles & responsibilities with reference to sustainability improvement actitivites defined and authority established.	1	0	0
2.5	Are people in the organization inspired and encouraged to engage in sustainability improvement activities, being recognized both at individual and team levels ?	**1**	**0**	**0**
2.5a	Key contributors (teams and individuals) to sustainability improvement activities at individual and team levels identified	1	0	0
2.5b	Key contributors (teams and individuals) to sustainability improvement activities at individual and team levels recognised and rewarded	1	0	0
2.6	Is benchmarking analysis conducted with similar operations and organisations ?	**0**	**0**	**0**
2.6a	Benchmarking analysis conducted with similar organisations and operations identified in the market for key sustainability KPIs of the organisation	1	0	0
2.6b	Sustainability information transferred between similar organisations for benchmarking, cooperation and improvement	0	0	0
2.6c	Improvement actions deployed and monitored as per benchmarking analysis outcomes	0	0	0
2.7	Are the leaders of the organization at all levels positive examples to people in the organization with reference to sustainable development ?	**1**	**0**	**0**
2.7a	Sustainability values of the organisation are part of the leadership recruitment process	1	0	0
2.7b	Sustainable development values of the organisation reinforced by the leaders	1	0	0
2.8	Does the organisation review the effectiveness of its sustainability leadership policies ? Is feedback collected and actioned ?	**1**	**1**	**1**
2.8a	The effectiveness and adherence to sustainability policies evaluated and controlled	1	1	1
2.8b	Feedback is captured from employees at all levels for evaluation, control and development	0	0	0
	Unidimensional TBL score	**16%**	**7%**	**6%**
	Principle Maturity	**10%**		

Figure 6.9: Maturity assessment conducted on the leadership principle

SSCQM Principle 3 - Engagement of people					
Principle Maturity Indicators		GRI Indicators (as per VOS)			
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic	Envir.	Social	
		Economic performance; Anti-corruption; Anti-competitive behaviour	Energy; Environmental compliance	Occupational H&S; Training and education Local communities	
3.1	Is there a common understanding and awareness of sustainability among the employees at all levels of the organization ?	**1**	**0**	**0**	
3.1a	Sustainability awareness training conducted periodically for employees at all levels, importance of sustainability and sustainable development articulated	1	0	0	
3.1b	Benefits of sustainability improvement projects demonstrated	1	0	0	
3.1c	Sustainability mission, vision, policies and objectives articulated to employees at all levels	1	1	1	
3.2	Is collaboration promoted for sustainable development throughout the organization ?	**0**	**0**	**0**	
3.2a	Organisational sustainability objectives aligned with departmental, team and individual objectives	0	0	0	
3.2b	Cross-functional teams and sustainability circles established to facilitate collaboration for sustainability improvement.	0	0	0	
3.3	Is sharing of knowledge, experience and information facilitated among employees for sustainable development ?	**1**	**0**	**0**	
3.3a	Information, knowledge and experience sharing sessions held periodically for employees at all levels	1	0	0	
3.3b	Channels and resources for above identified	1	0	0	
3.3c	Channels and resources for above in place and supported	1	0	0	
3.4	Is the workforce empowered to determine constraints, challenge current practices, take initiatives and contribute to sustainable development as required ?	**0**	**0**	**0**	
3.4a	Key contributions to sustainability improvement and learning activities at individual and team levels identified, recognised and rewarded	1	1	0	
3.4b	Self-managing teams established for sustainability performance measurement and improvement	0	0	0	
3.4c	Contribution to sustainability improvement encouraged through clear mission, vision, policies and objectives	0	0	0	
3.5	Is there an established communication with people to promote understanding of the importance of their individual contribution to sustainable development ?	**1**	**1**	**0**	
3.5a	Employees at all levels encouraged to participate in sustainability improvement activities and benefits of sustainability improvement projects demonstrated	1	1	0	
3.5b	Sustainability communication sessions are held periodically for employees at all levels, demonstrating the importance and influence of contributions at the individual level	1	1	0	
3.5c	Channels and resources for above identified, in place and supported	0	0	0	
3.6	Is people's contribution, learning and improvement with reference to sustainable development recognized and acknowledged ?	**1**	**1**	**0**	
3.6a	Key contributions to sustainability improvement and learning activities at individual and team levels identified	1	1	0	
3.6b	Key contributions to sustainability improvement and learning activities at individual and team levels recognised and rewarded	0	0	0	
3.7	Are roles, responsibilities and levels of authority for individuals defined with reference to sustainability ?	**1**	**1**	**1**	
3.7a	Roles & responsibilities with reference to sustainability performance measurement and improvement actitivites defined	1	1	1	
3.7b	Decision making, monitoring and control mechanisms and authority with reference to sustainability performance measurement and improvement actitivites established	0	0	0	
3.8	Do the people of the organization conduct self-evaluation of performance with reference to their contribution to the sustainable development against personal objectives ?	**1**	**0**	**0**	
3.8a	Sustainability improvement objectives of the organisation and teams are linked with personal objectives of the employees	1	0	0	
3.8b	Employees can self-evaluate their performance in line with their personal objectives that are linked to the sustainability performance of the organisation	0	0	0	
3.8c	Sustainability KPIs of the organisation measured and available to all employees	1	1	1	
	Unidimensional TBL score	**12%**	**7%**	**3%**	
	Principle Maturity	**7%**			

Figure 6.10: Maturity assessment conducted on the engagement of people principle

SSCQM Principle 4 - Process approach				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic	Envir.	Social
		Economic performance; Anti-corruption; Anti-competitive behaviour	Energy; Environmental compliance	Occupational H&S; Training and education Local communities
4.1	Are the sustainability objectives of the organisation defined along with the processes necessary to achieve them ?	1	1	1
4.1a	Sustainability objectives for economic, social and ecologic sustainability are in place in line with the voice of the stakeholders analysis of the organisation	1	1	1
4.1b	Sustainability KPI monitoring and improvement processes are established and in place	1	1	1
4.2	Are the high risk activities and processes determined for organizational sustainability performance (sustainability risk-based thinking) ?	1	1	1
4.2a	Risk analyses conducted for organisational sustainability performance	1	1	1
4.2b	High risk activities and processes for organisational sustainability performance determined	1	1	1
4.3	Are the high risk processes and their interrelations managed effectively and efficiently as a coherent system in line with sustainability objectives ?	0	0	0
4.3a	Sustainability performance of high risk activities and processes measured, evaluated and controlled	0	0	0
4.3b	Effectiveness of sustainability improvement projects on high risk processes evaluated periodically	0	0	0
4.4	Are the organisational capabilities understood and resource constraints established and actioned with reference to sustainable development ?	0	0	0
4.4a	Organisational capabilities, processes and resources required to achieve organizational sustainability objectives identified	0	0	0
4.4b	Organisational capabilities, processes and resources required to achieve organizational sustainability objectives supported and in place	0	0	0
4.5	Is the necessary information available to monitor, analyse and improve the sustainability performance of the overall system ?	1	0	0
4.5a	Sustainability KPI information and data of key processes and the overall system is captured periodically	1	0	0
4.5b	Sustainability KPI information and data of key processes and the overall system is reviewed periodically and actioned	1	0	0
4.6	Is there an established process to capture organisational learning with reference to sustainable development ?	0	0	0
4.6a	Process in place for sustainability information, knowledge, learnings and experiences to be documented and shared periodically among the employees at all levels of the organisation	0	0	0
4.6b	Sustainability improvement projects status and their benefits to key stakeholders documented and communicated periodically	0	0	0
4.7	Is the authority, responsibility and accountability established for managing processes in line with sustainability objectives ?	1	1	1
4.7a	Owners of sustainability objectives identified for key processes including the authority, responsibility and accountability	1	1	1
4.7b	Monitoring and control mechanisms identified and in place for management of key processes in line with sustainability objectives	1	1	1
	Unidimensional TBL score	11%	9%	9%
	Principle Maturity	10%		

Figure 6.11: Maturity assessment conducted on the process approach principle

SSCQM Principle 5 - Improvement				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic	Envir.	Social
		Economic performance; Anti-corruption; Anti-competitive behaviour	Energy; Environmental compliance	Occupational H&S; Training and education Local communities
5.1	Are the sustainability improvement objectives implemented at all levels of the organization ?	1	1	1
5.1a	Sustainability objectives for economic, social and ecologic sustainability are in place in line with the voice of the stakeholders analysis of the organisation	1	0	0
5.1b	The sustainability objectives are communicated at all levels and are aligned with departmental and personal objectives	1	1	1
5.2	Are sustainability performance KPIs implemented along with defined measurement and improvement processes, in line with the sustainability priorities of the organisation (Step 0) ?	0	0	0
5.2a	Economic, social and ecologic sustainability KPIs for measurement, reporting and improvement established as per the GRI framework in line with the VOS analysis	0	0	0
5.2b	Improvement objectives for each KPI in place along with timescales and review mechanisms	0	0	0
5.3	Is the workforce trained and competent in promoting, tracking and completing sustainability improvement projects in line with the objectives ?	1	1	1
5.3a	Workforce trained in improvement project management tools and techniques	1	1	1
5.3b	Workforce fully aware of sustainability KPIs and objectives of the organisation	1	1	1
5.3c	Roles, responsibilities and authority for sustainability improvement projects established	0	0	0
5.4	Are the sustainability improvement considerations incorporated into the new product, process and service introduction processes ?	1	1	1
5.4a	New Product/Service/Process Introduction processes include sustainability performance considerations and improvement, in line with the organisational mission, vision, policies and objectives	1	1	1
5.4b	Sustainability aspects and impacts reviewed and actioned as part of New Product/Process/Service Introduction processes	1	1	1
5.5	Does the organisation promote innovation with regards to sustainability when developing and introducing new products and services?	1	0	0
5.5a	Key contributions and innovations for sustainable product and service development identified	1	0	0
5.5b	Key contributions and innovations for sustainable product and service development recognised and rewarded	1	0	0
5.6	Are the sustainability improvement projects' planning, implementation, completion and results tracked, reviewed and audited ?	1	0	0
5.6a	Sustainability improvement project tracking process in place	0	0	0
5.6b	Project management resources in place for sustainability improvement projects	2	0	0
5.6c	Sustainability improvement projects status formally reviewed by senior management and issues logged and actioned appropriately	2	0	0
5.7	Is organisational sustainability improvement recognized and acknowledged ?	0	0	0
5.7a	Key contributions to organizational sustainability performance improvement recognised and rewarded	0	0	0
5.7b	Organizational sustainability improvement scheme in place	0	0	0
5.8	Is there a process to implement sustainability improvement projects throughout the organization ?	2	1	0
5.8a	Sustainability improvement projects developed, evaluated, prioritised and supported based on risk analysis	2	1	0
5.8b	Resources required for each improvement project identified and supported	2	1	0
	Unidimensional TBL score	18%	8%	5%
	Principle Maturity	10%		

Figure 6.12: Maturity assessment conducted on the improvement principle

SSCQM Principle 6 - Evidence based decision making				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic	Envir.	Social
		Economic performance; Anti-corruption; Anti-competitive behaviour	Energy; Environmental compliance	Occupational H&S; Training and education; Local communities
6.1	Are the key performance indicators (KPI)s for organizational sustainability improvement objectives identified, monitored and controlled ?	0	0	0
6.1a	Voice of the stakeholders anaylsis conducted, identifying the TBL sustainability priorities of the organisation	1	1	1
6.1b	Economic, social and ecologic sustainability KPIs for measurement, reporting and improvement established as per the GRI framework	0	0	0
6.1c	Improvement objectives for each KPI in place along with timescales and review mechanisms	0	0	0
6.2	Is the workforce trained and competent in sustainability performance data capturing, evaluation and analysis methods ?	1	1	1
6.2a	Sustainability KPIs are communicated to employees at all levels along with defined roles & responsibilities	1	1	1
6.2b	Sustainability awareness training conducted to all personnel periodically	1	1	1
6.2c	Sustainability performance measurement tools & techniques training conducted to all relevant personnel	0	0	0
6.3	Is accurate and reliable data and information measured and evaluated for organizational decision making and sustainability improvement action deployment ?	0	0	0
6.3a	Sustainability performance data and information captured as per GRI framework guidelines	0	0	0
6.3b	Sustainability performance data reported periodically to senior management for monitoring and control purposes	1	1	0
6.3c	Sustainability performance improvement actions documented and tracked	0	0	0
6.4	Is employee feedback on sustainability within the organization captured and evaluated ?	1	1	0
6.4a	Feedback captured periodically from employees at all levels with reference to sustainability performance and improvement	1	0	0
6.4b	Employee sustainability improvement scheme in place	1	1	0
6.4c	Employee sustainability feedback analysis and improvement process in place	1	1	0
6.5	Is all data and information with reference to sustainability improvement available to the relevant people throughout the organization ?	1	1	1
6.5a	Roles & responsibilities with reference to sustainability KPI monitoring and improvement defined throughout the organisation	1	1	0
6.5b	Sustainability performance data and information captured and presented to process owners at all levels and performance reviewed by senior management	1	1	1
	Unidimensional TBL score	13%	12%	6%
	Principle Maturity	10%		

Figure 6.13: Maturity assessment conducted on the evidence based decision making principle

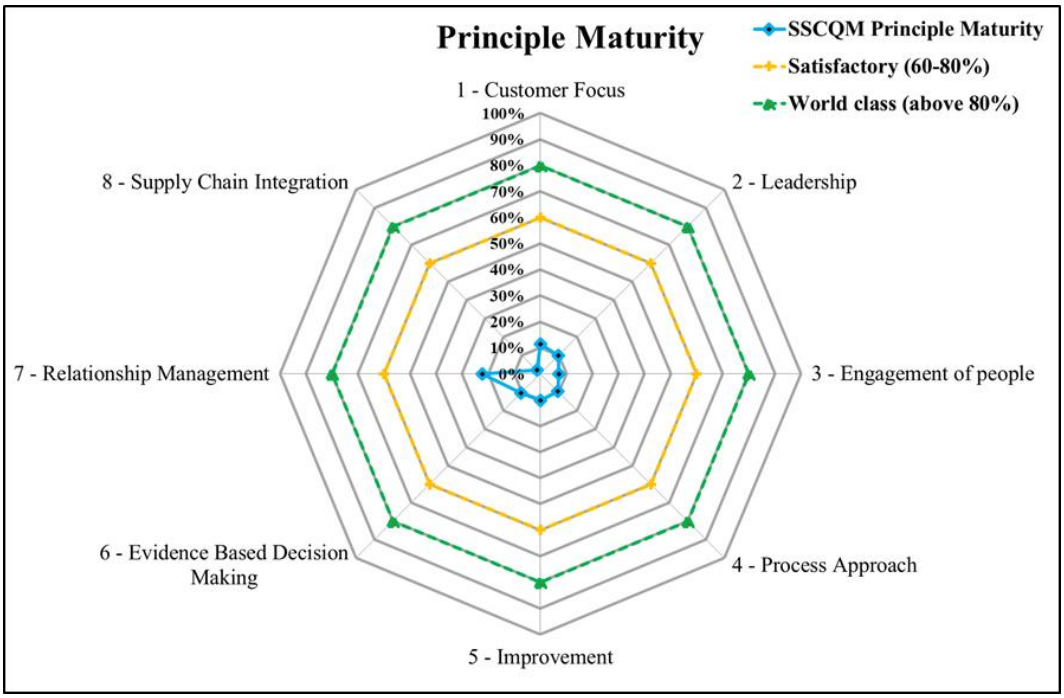
SSCQM Principle 7 - Relationship management				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic	Envir.	Social
		Economic performance; Anti-corruption; Anti-competitive behaviour	Energy; Environmental compliance	Occupational H&S; Training and education; Local communities
*7.1	Are the current and future sustainability needs and requirements of **interested parties identified and risk analysis conducted ?	3	3	3
7.1a	Key stakeholders identified, sustainability awareness and feedback sought from key stakeholders	3	3	3
7.1b	Current and future TBL sustainability requirements of key stakeholders identified	3	3	3
7.1c	Risk analyses with reference to stakeholder sustainability needs and requirements carried out	2	2	2
7.2	Are relationships with employees managed for sustainable development ?	1	1	1
7.2a	Employee relationship management process in place	1	1	1
7.2b	Feedback sought from employees with reference to TBL sustainability performance and improvement	1	1	1
7.2c	Employees at all levels encouraged to participate in sustainability improvement projects and benefits of sustainability improvement projects demonstrated	1	1	1
7.3	Are relationships with customers managed for sustainable development ?	1	0	0
7.3a	Customer relationship management process in place	2	1	0
7.3b	Feedback obtained from customers with reference to their sustainability needs and requirements, market analysis conducted	1	0	0
7.3c	Customers included in sustainability improvement projects, benefits of sustainability improvement projects communicated to key customers	1	0	0
7.4	Is the information, feedback, expertise and resources being exchanged with other interested parties for sustainable development ?	1	1	0
7.4a	Key information and resources required for TBL sustainability performance / priorities identified	1	1	0
7.4b	Key stakeholders identified along with their information needs and categorisation of resources possessed / availability	1	1	1
7.4c	Process in place for periodical exchange of information, expertise and resources with key stakeholders	0	0	0
7.5	Are collaborative sustainability improvement activities established with suppliers, partners and other interested parties ?	2	2	2
7.5a	Current and future TBL sustainability requirements of key stakeholders identified	3	3	3
7.5b	Risk analyses with reference to stakeholder sustainability needs and requirements carried out	2	2	2
7.5c	Sustainability improvement projects established for high risk areas with key stakeholders.	1	1	0
7.6	Are sustainability improvements and achievements by external providers and partners recognized and encouraged ?	0	0	0
7.6a	Sustainability performance and improvement part of long term business deals and contractual agreements with suppliers	0	0	0
7.6b	Improvement targets of cross-enterpise sustainability projects agreed and in place	0	0	0
7.6c	Process in place for supply chain members that take part in sustainability improvement projects to be recognised and awarded., benefits sought communicated and mutually-shared.	0	0	0
	Unidimensional TBL score	26%	22%	19%
	Principle Maturity	22%		

Figure 6.14: Maturity assessment conducted on the relationship management principle

SSCQM Principle 8 - Supply chain integration				
Principle Maturity Indicators		GRI Indicators (as per VOS)		
Assessment Scoring Criteria 0 to 5 (Please refer to the "Guidelines" tab for full description of each scoring category): "0"- No evidence of implementation; "1"- Informal/inadequate processes in place; "2"- Partially implemented (All VOS TBL indicators not included or implemented); "3" - Formal process in place inclusive of all VOS TBL sustainability parameters; "4"- "3" plus evidence of continuous improvement; "5"- Fully implemented inclusive of all GRI sustainability indicators. 0 Not Implemented — 5 Fully Implemented		Economic Economic performance; Anti-corruption; Anti-competitive behaviour	Envir. Energy; Environmental compliance	Social Occupational H&S; Training and education Local communities
8.1	Is sustainability a shared value across the supply chain network ?	**0**	**0**	**0**
8.1a	Sustainability training and awareness sessions held with key supply chain members	0	0	0
8.1b	Sustainability communicated as a core value of the business	0	0	0
8.1c	Sustainability forms part of contractual supply chain agreements	0	0	0
8.2	Is information being shared between supply chain members with reference to sustainable development ?	**1**	**0**	**0**
8.2a	IT Support for sustainability information sharing in place	1	1	0
8.2b	Key communication channels for sustainability performance monitoring and improvement identified and in place between supply chain members	1	0	0
8.2c	Accuracy and reliability of the information periodically verified between all parties	1	0	0
8.3	Are joint cooperation activities being held across the supply chain including cross-enterprise participation for sustainable development ?	**0**	**0**	**0**
8.3a	Team members identified from each participating organisation in the supply chain	0	0	0
8.3b	Joint sustainability improvement projects in place	0	0	0
8.3c	Participation in joint cooperation activities agreed contractually	0	0	0
8.4	Is supply chain integration for sustainable development encouraged, rewarded and benefits mutually shared ?	**0**	**0**	**0**
8.4a	Suppliers / customers that actively take part in sustainability improvement projects identified	0	0	0
8.4b	Rewarding process in place for key contributors	0	0	0
8.4c	Sustainability benefits sought as a result of joint activities mutually shared	0	0	0
8.5	Is future business linked to supply chain integration for sustainable development ?	**1**	**0**	**0**
8.5a	Sustainability performance is part of supplier selection process	1	0	0
8.5b	Sourcing decisions include sustainability performance and engagement of the suppliers / supply chain	1	0	0
8.5c	Suppliers / customers that actively take part in joint sustainability improvement projects recognised and awarded future business	0	0	0
8.6	Is risk analysis conducted, identifying high risk supply chains and suppliers for prioritisation of supply chain integration for sustainable development ?	**0**	**0**	**0**
8.6a	Risk analyses for environmental, social and economic sustainability conducted periodically	0	0	0
8.6b	High risk supply chains and suppliers for sustainability identified and prioritised	1	0	0
8.6c	Sustainability improvement projects coordinated across the supply chain based on risk	0	0	0
8.7	Is there an association among supply chain members based on commitment, long term orientation and trust with ref. to sustainable development ?	**0**	**0**	**0**
8.7a	Sustainability performance and improvement is part of long term business deals and contractual agreements with suppliers	0	0	0
8.7b	Improvement targets of cross-enterpise sustainability projects agreed and in place	0	0	0
8.7c	Process in place for supply chain members that take part in sustainability improvement projects to be recognised and awarded	0	0	0
8.8	Is a supply chain integration statement in place with appropriate KPIs to monitor effectiveness and drive improvement?	**0**	**0**	**0**
8.8a	Declaration of commitment to sustainable development objectives in place between all parties	0	0	0
8.8b	Improvement targets of cross-enterpise sustainability projects agreed and in place	0	0	0
8.8c	KPIs with reference to TBL sustainability are identified, monitored and controlled by all parties	0	0	0
	Unidimensional TBL score	**5%**	**1%**	**0%**
	Principle Maturity	**2%**		

Figure 6.15: Maturity assessment conducted on the supply chain integration principle

SSCQM Principle	Maturity	Economic	Envir.	Social
1 - Customer Focus	11%	20%	8%	7%
2 - Leadership	10%	16%	7%	6%
3 - Engagement of people	7%	12%	7%	3%
4 - Process Approach	10%	11%	9%	9%
5 - Improvement	10%	18%	8%	5%
6 - Evidence Based Decision Making	10%	13%	12%	6%
7 - Relationship Management	22%	26%	22%	19%
8 - Supply Chain Integration	2%	5%	1%	0%
Unidimensional TBL score		**15%**	**9%**	**7%**
Organisational SSCQM Score				**10%**



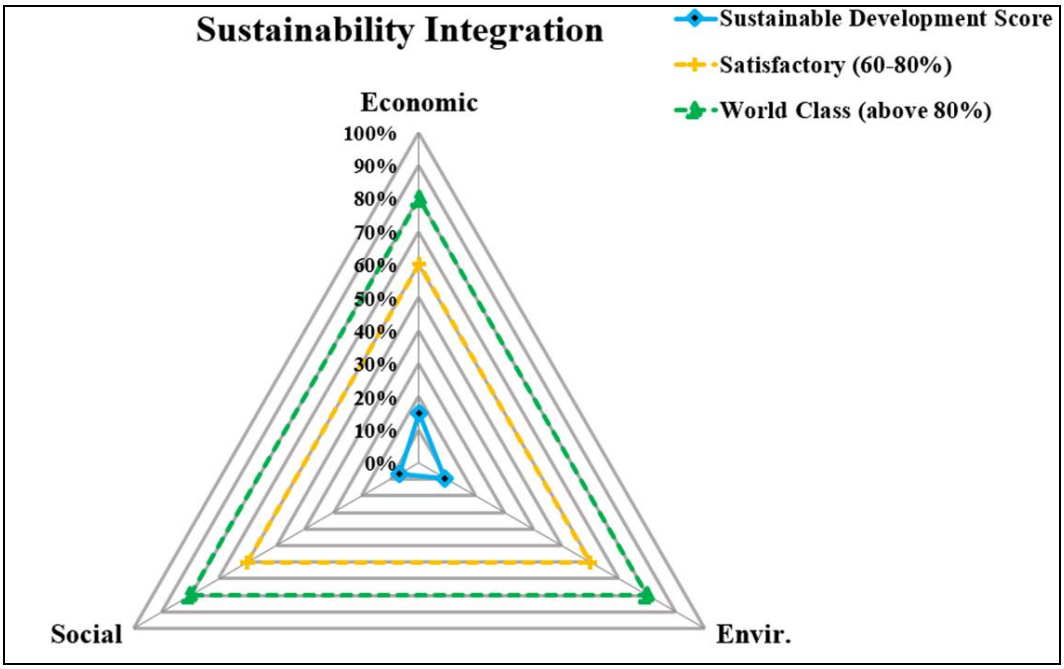


Figure 6.16: Maturity and sustainability integration levels diagnostics summary

The initial scores for economic, environmental and social sustainability integration levels were noted as 15%, 9% and 7% respectively, resulting in an overall organisational SSCQM maturity score of 10%, mainly due to informal and/or inadequate management processes and mechanisms in place. These assessment results pointed towards a significant organisational improvement potential through adoption of sustainability synergistic SSCQM principles.

6.3.3. Step 2 – Identification of Risks and Opportunities

Following on from step 1, the outcome and findings of the current state analysis and maturity assessment conducted were discussed with the key internal stakeholders including the business ownership (managing director) and middle management, with a view to determine the organisational risks and opportunities with reference to the firm's sustainability integration and improvement. The strengths, weaknesses, opportunities and threats (SWOT) established during the assessment, and exchange of information between the management and the researcher were presented as part of the discussion and review process, Figure 6.17 illustrating the summary of SWOT analysis undertaken.

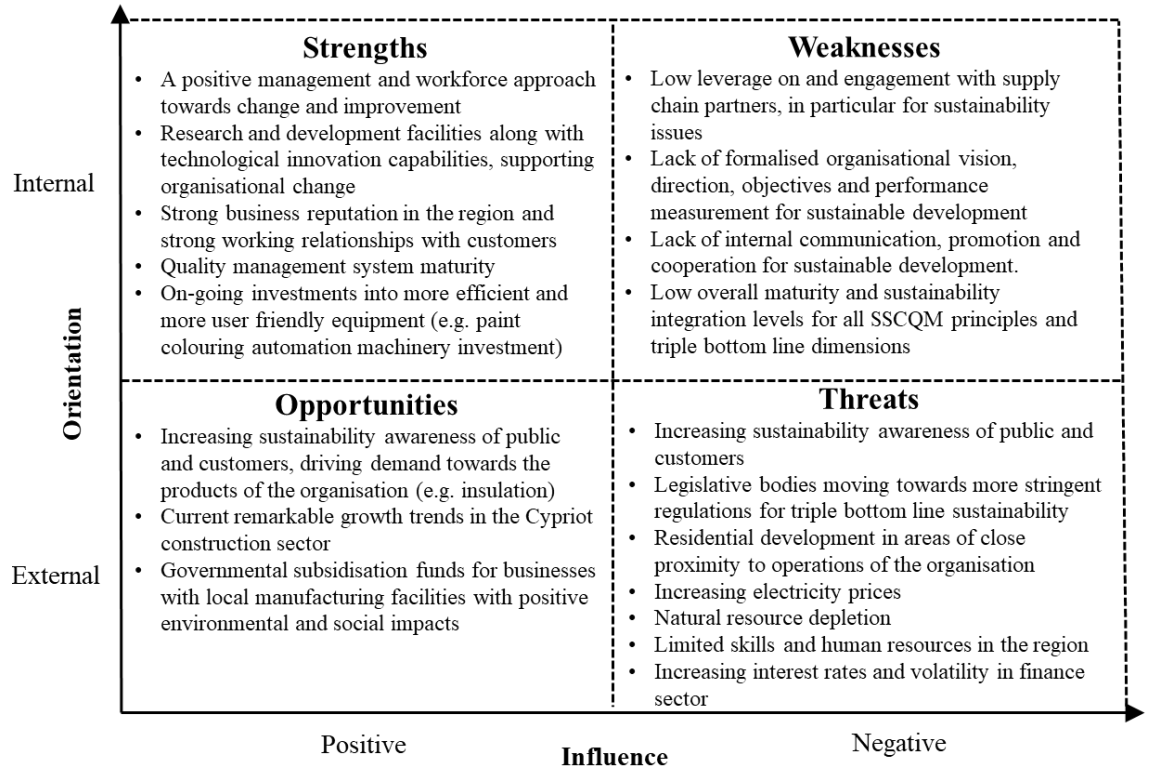


Figure 6.17: SWOT analysis for SSCQM maturity and sustainability integration

The key strengths of the business were noted as its positive culture towards organisational change, its research, development and innovation capabilities for improvement, its proactive investments, strong reputation in the region and adoption of a quality management system for

a significant period of time with mature systems and processes for quality management. Moreover, the growing construction sector in the region, the increasing sustainability awareness of the customers and public with potential positive effects on the demand, and governmental subsidisation opportunities were further established as opportunities regarding the sustainable development of the organisation.

On the other hand, in addition to the overall low maturity scores for each SSCQM principle and triple bottom line sustainability dimension, the topic of sustainability was observed to be a highly new area for the organisation, along with mainly reactive sustainability practices in the absence of a formalised vision, objectives, ownership, and processes for integration, performance measurement and improvement. Such a lack of formalised organisational processes and structure is not uncommon for businesses in SME and SMB categories (Jansson et al., 2017). For this reason, maturity assessments equating to scores of "0 – no evidence of implementation" and "1 – informal / inadequate processes in place" were generally awarded, resulting in an overall organisational SSCQM maturity score of 10%. This score was noted as requiring immediate actions for achievement of a minimum satisfactory level of 60%, which equates to an overall, average assessment of "3 – formal processes in place for all sustainability priorities" for all SSCQM principles. An unbalanced approach to sustainability was observed, economic sustainability being relatively more mature (15%) than environmental (9%) and social (7%), which is a highly common industrial case (Neri et al., 2018).

Furthermore, taking into account the increasing public and customer sustainability awareness, shift towards more stringent economic, environmental and social legislations in the region, increasing electricity prices, increasing interest rates, increasing local community pressures due to residential developments in the neighbourhood areas, natural resource depletion and skills shortage in the region were all noted as remarkable risks for the business, necessitating a more formal, structured, systematic approach going forward, across the business for sustainability integration and development. Nevertheless, the initial maturity assessment resulting in significantly low scores pointed towards a high number of opportunities, along with the implication that all SSCQM principles, organisational management areas and triple bottom line sustainability dimensions required improvement, necessitating a risk and prioritisation based approach. With a view to facilitate prioritisation and focus improvement efforts, the sustainability risk analysis was elaborated, reviewing in further detail the operations of the organisation and listing high risk processes (hot spots) with the most impact on the organisation's overall sustainability (Peace et al., 2018), as presented in Table 6.4.

Table 6.4: The high risk operations of the organisation and associated sustainability influences (Source: Author - photos taken by the researcher during the action research study)

High risk processes (Hot spots)	Visual	Sustainability Impact		
		Economic	**Environmental**	**Social**
Fine-aggregate manufacturing		Impacts economic performance through direct relationship with product quality, customer satisfaction and energy consumption levels (energy bill)	High energy consumption Environmental regulation on noise and dust	High impact on local community, and health and safety due to noise and dust generated
Paint manufacturing		Impacts economic performance through direct relationship with product quality, customer satisfaction and energy consumption levels (energy bill)	High energy consumption Environmental regulation on control of substances hazardous to health	High potential impact on health and safety due to hazardous chemicals involved
In-bound and out-bound logistics (Truck transportation of materials)		Highly impacts economic performance as logistics constitute circa. 40% of the overall business expenditure. Also impacts economic performance through influencing delivery performance and customer satisfaction levels	Impacts overall environmental impact of the business and its supply chain through influencing emissions, waste, packaging materials used, energy consumption etc.	High impact on local community (high lorry activity near facilities) Requires skills (training and education)
Loading and off-loading of materials		Impacts economic performance through influencing delivery performance and customer satisfaction levels	Impacts energy consumption, emissions and environmental legislation (in-house emissions)	High impact on health and safety (high forklift and crane activity in manufacturing and warehousing areas) Requires skills (training and education)

6.4. Sustainability Improvement Strategy Formulation through SSCQM

6.4.1. Sustainability Integration and Improvement Strategy

Given the importance of risk based prioritisation approaches for effective business sustainability integration (Asif and Searcy, 2014; Garcia et al., 2016; Nawaz and Koç, 2018; Peace et al., 2018; Perrott, 2015; Witjes et al., 2017), and limited organisational resources that can be dedicated or invested into the sustainability integration and improvement initiatives (Kelliher and Reinl, 2009), the following improvement strategies were employed in mutual agreement with the leadership of the participating organisation:

- The Delphi study feedback identified the most important SSCQM principles to integration of sustainability as "leadership, engagement of people, improvement and evidence based decision making". At the first cycle of improvement, these principles and their associated mechanisms / processes were determined to be prioritised for implementation, due to higher anticipated impact on overall sustainability performance of the organisation.

- The four high risk processes itemised in Table 6.4 with most impact on the organisation's sustainability were further identified to be prioritised from an implementation perspective, SSCQM principle maturity improvement actions to be first applied to these processes.

- Strategies outlined above still resulted in a significant, initial number of actions. Impact-effort analysis was justified for adoption, sequencing the next steps and channelling the highly limited resources based on impact - effort rankings agreed among the key internal stakeholders for highest impact on the sustainability in the short term and for building momentum towards sustainable change.

Based on these strategies, the maturity of the "leadership, engagement of people, improvement and evidence based decision making" were targeted to be developed to an assessment score of "3 – formal processes in place, inclusive of all sustainability priorities" and associated maturity level of 60% - satisfactory. The actions suggested by these SSCQM principles were decided to be deployed, and prioritised based on their applicability to the high risk processes of the organisation and outcomes of the impact - effort analysis, setting the way for a structured, effective and risk based approach to integration and improvement of the organisation's sustainability.

6.4.2. Action Plan Formulation

Based on the prioritisation and improvement approach (or " the plan of attack" as referred by the managing director) established with the business leadership, the strategy was translated into a clear and specific set of actions to improve maturity of the SSCQM principles that will be first targeted. Indicators (e.g. 1.1, 1.2) and sub indicators (e.g. 1.1a, 1.2b) of each principle were reviewed, gaps in the organisational processes established (as per diagnostic tool maturity assessment results), and actions identified for integration of sustainability and maturity improvement of each principle. The actions were formulated in a congruent and complementary way that the mechanism / process intended to be introduced covered multiple areas and principles where applicable (e.g. implementation of employee contribution and recognition scheme – covering aspects of leadership, improvement, engagement of people and evidence based decision making).

With a view to direct the organisational resources in the best possible way towards the actions that will provide the highest impact in the short term, the actions were prioritised according to their anticipated impact to sustainability integration / improvement and effort of implementation, resulting in the assignment of relative priority ratings denoted as "very high, high, medium and low priority" (Nawaz and Koç, 2018; Todnem By, 2005). The impact – effort analysis undertaken on the improvement actions is presented in Figure 6.18, each number corresponding to the action item number in Table 6.5, which demonstrates the action plan formulated for the first cycle of SSCQM principle maturity improvement for sustainability integration and development of the organisation.

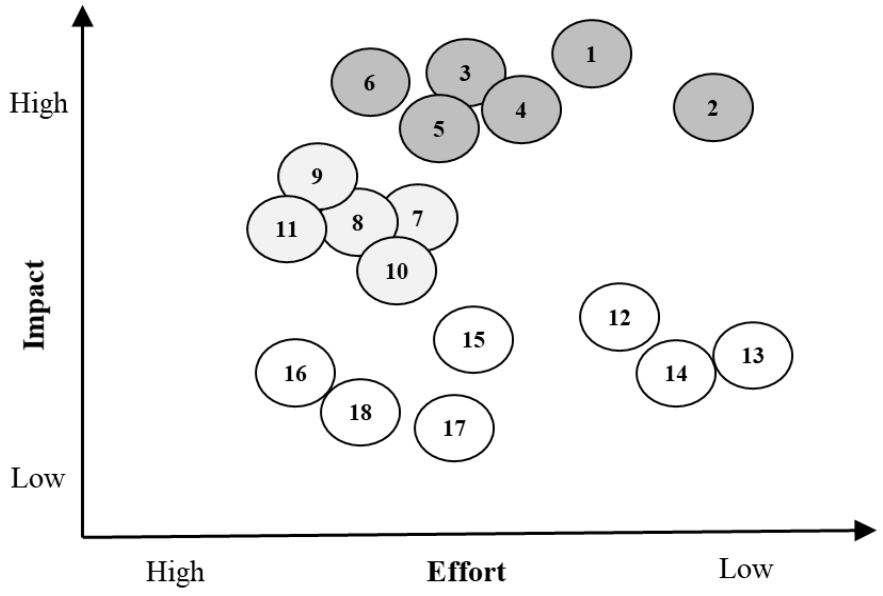


Figure 6.18: Impact - effort analysis for improvement action prioritisation

Table 6.5: Sustainability integration and improvement action plan formulated

No.	Priority Ranking	Principle	Principle Indicator	Action	Completion Status (RAG)		
					Economic	Envir.	Social
1	Very High	Leadership, EOP, Improvement, EBDM	2.1, 3.4c, 5.1a, 5.2b, 6.1	Implement sustainability mission, vision, policies, objectives and KPIs for the prioritised parameters (as per GRI) and processes (hot spots)	R	R	R
2	Very High	Leadership, EOP, Improvement, EBDM	2.2, 3.1c, 5.1b, 5.3b, 6.2a	Articulate the sustainability mission, vision, policies and objectives across the organisation through staff meetings	R	R	R
3	Very High	Leadership, EOP, Improvement	2.4b, 3.8b, 3.8c, 5.2a	Establish and support the key resources required for sustainability KPI monitoring and improvement, making the same available to all employees and enabling self-performance evaluation at individual level	R	R	R
4	Very High	Leadership, EOP, Improvement, EBDM	2.4c, 3.4b, 3.7, 5.3c, 6.5a	Define the roles and responsibilities for the sustainability performance measurement and improvement activities with a view to achieve autonomy regarding sustainability management, monitoring and control at team level	R	R	R
5	Very High	EOP	3.2a, 3.8a	Align sustainability objectives with objectives at departmental, team and individual levels	R	R	R
6	Very High	EOP	3.2b	Establish a cross functional team to execute the sustainability improvement action plan and to foster cooperation across the departments	R	R	R
7	High	Leadership	2.3a, 2.7a	Define sustainability values and embed them into the recruitment process	R	R	R
8	High	Leadership, EOP, Improvement, EBDM	2.3c, 2.5, 3.4a, 3.5a, 3.6, 5.5, 5.7, 6.4b	Implement an employee recognition and rewarding scheme for contributions and innovations to sustainability (the most contributing individual and team to economic, environmental and social sustainability to be identified and awarded every quarter)	R	R	R
9	High	Leadership, EOP, EBDM	2.4a, 3.1a, 3.1b, 3.5b, 6.2b, 6.2c	Conduct sustainability awareness and performance measurement training, reinforcing the sustainability culture, and demonstrating the importance and benefits of sustainable development (putting across what is in it for the	R	R	R

				employees)			
10	High	Leadership	2.7b	Conduct sustainability values training for all leaders, ensuring leaders "lead by example", and reinforce the sustainable change and associated values across the business	R	R	R
11	High	EBDM	6.3, 6.5b	Implement a formal sustainability performance data and information capturing process including periodic reporting to high risk process owners and senior management, and formal improvement action tracking	R	R	R
12	Medium	Leadership, EBDM	2.8, 6.4a, 6.4c	Effectiveness of and adherence to the sustainability policies to be periodically reviewed by management, capturing employee feedback for review and improvement	R	R	R
13	Medium	Leadership	2.3b	Formulate organisational sustainability commitment statement and communicate it to all key stakeholders	R	R	R
14	Medium	Improvement	5.3a	Conduct improvement project management tools and techniques training for the cross functional improvement team	R	R	R
15	Medium	Improvement	5.6, 5.8	Implement a formal sustainability improvement project development and tracking process including senior management review	R	R	R
16	Low	Leadership	2.6	Identify similar organisations for benchmarking, information sharing and cooperation for sustainability improvement	R	R	R
17	Low	EOP	3.3	Implement periodic information, knowledge and experience sharing sessions through staff meetings	R	R	R
18	Low	Improvement	5.4	Review New Product/Service/Process introduction process and embed sustainability considerations	R	R	R

EOP: Engagement of people; EBDM: Evidence based decision making; RAG: Red, Amber, Green. Envir.:Environmental.

The red, amber, green (RAG) status monitoring was incorporated into the action plan, which is regarded as a highly effective visual management practice for management of improvement project statuses, risks and timelines (Burgess et al., 2001; Pellegrinelli et al., 2007; Sabato, 2009). In this context, red stands for "requiring management action", amber represents "work-in progress" and green means "completed". The status for each sustainability dimension and its prioritised indicators were agreed to be monitored against each action, with a view to confirm completion for all triple bottom line dimensions (achievement of green status for all economic, environmental and social sustainability priorities), contributing to a balanced organisational sustainable development.

6.4.3. Next Steps

The next steps of SSCQM framework implementation (steps 3 and 4) include the actual execution of the actions detailed on the action plan, review of their effects, and taking countermeasure actions as required, revisiting the steps 0, 1 etc. periodically for a continual cycle of self-assessment and improvement, gliding the business to its sustainability vision and goals over time. The action plan formulated was handed over to the leadership of the organisation through a formal closure meeting, outlining the organisation's path towards integrating sustainability in line with its context, key stakeholder requirements, strengths, weaknesses, risks and opportunities for a continual improvement journey towards sustainable development.

From the perspective of the fundamental research questions of the action research study, it was reflected that the structured, systematic, risk based, and step-by-step approach introduced by the synthesised SSCQM theories and concepts:

- Facilitated the organisation's management integration and improvement of triple bottom line sustainability;
- Supported and accelerated organisation's transition towards integration and improvement of triple bottom line sustainability;
- Guided and provided a structure for managerial strategy and action formulation for integration and improvement of triple bottom line sustainability.

The implementation of steps 0, 1 and 2 provided a comprehensive assessment regarding the SSCQM framework, both demonstrating its application and paving the way for an organisation to achieve its sustainability integration and improvement goals. The implementation of the actions detailed as part of the improvement strategy and action plan

was reflected as out of the researcher's control in terms of the resources invested and timelines therefore, the action research study was concluded post formulation of the action plan and completion of the formal handover process.

As part of the action research study conclusion process, the leadership of the organisation was provided with the detailed reports generated during the study including the voice of the stakeholders sustainability business definition and prioritisation analysis (step 0), the business diagnostic maturity assessment report (step 1), SWOT analysis (step 2), high risk process hot spot analysis (step 2), and the improvement strategy and action plan (step 2).

6.5. Action Research - Results and Observations

6.5.1. Influence on Sustainability Integration

The influence of the SSCQM implementation on the sustainability integration level of the organisation was measured through two key parameters:

- Level of GRI framework adoption (i.e. number of GRI sustainability indicators adopted for each sustainability dimension);
- Level of sustainability integration through SSCQM principles (SSCQM principle maturity associated with each sustainability dimension).

The level of GRI framework adoption by the organisation before and after the SSCQM implementation is demonstrated in Figure 6.19. Prior to the application of SSCQM approach, the organisation was not aware of GRI framework, in the absence of utilisation of any sustainability indicators for performance measurement, reporting and improvement.

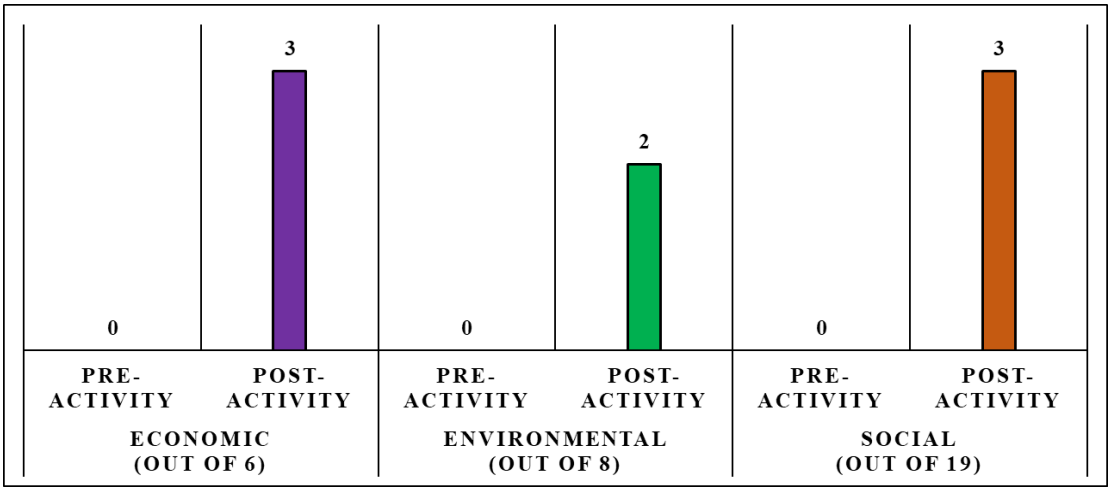


Figure 6.19: Influence of SSCQM on adoption of GRI at the participating organisation

Through the SSCQM framework, the key GRI sustainability indicators as per the key stakeholders and contextual risks of the organisation were established and prioritised for implementation. The economic sustainability indicators prioritised for adoption and improvement were identified as “economic performance, anti-corruption and anti-competitive behaviour”, the same for environmental comprised of “energy and environmental compliance” and the same for social included “occupational health and safety, training and education and local communities”. As the organisation was not aware of the GRI framework prior to the action research study activity, the initial level of GRI framework adoption for the organisation was taken as “0” for all sustainability dimensions. These levels were increased to “3” for economic, “2” for environmental and “3” for social, post the SSCQM framework implementation through adoption of the prioritised GRI indicators, forming the basis of the calculations presented in Figure 6.19

Furthermore, the SSCQM framework enabled measuring the sustainability integration levels for each dimension, assessing the maturity levels of the indicators, mechanisms and processes for the eight SSCQM principles. The sustainability integration levels were initially measured as “15%” for economic, “9%” for environmental and “7%” for the social dimension. The SSCQM implementation provided the organisation with a clear set of prioritised actions, after the implementation of which, the integration levels are anticipated to both increase and the gap between the sustainability dimensions to shrink as represented in Figure 6.20. Post implementation of the first set of actions detailed in Table 6.5, the sustainability integration levels were measured to be increased to “38%” for economic, “35%” for environmental and “34%” for the social dimension.

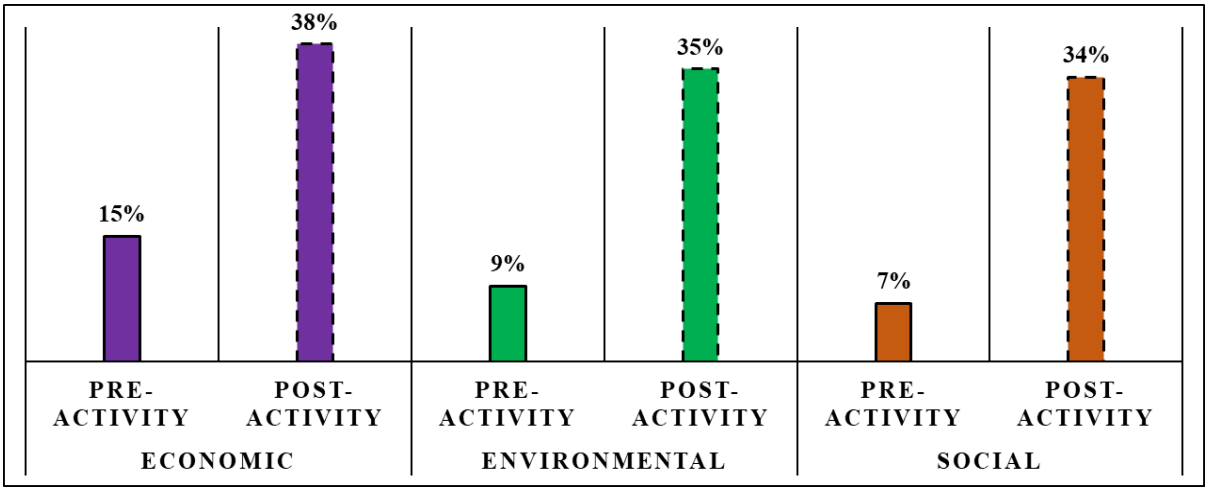


Figure 6.20: Influence of SSCQM on the sustainability integration levels of the participating organisation

6.5.2. Influence on SSCQM Maturity and Sustainable Development

The SSCQM framework provided the organisation not only with a comprehensive analysis and current state map with reference to sustainability integration but also shed light into its short, medium and long-term journey towards sustainable development through a continual PDCA, self-assessment, risk-based prioritisation, and improvement cycle.

Short-term target: Through this approach, the participating business is envisaged to progress in its sustainability integration path, represented in the form of a business glide path (Mackay et al., 2008), the implementation of the first set of actions (18 actions outlined in Table 6.5), providing an overall maturity progression from the initial level of 10%, into 36% in the short-term (this timeframe was established as 6 to 12 months for the participating organisation) (Mettler, 2011; Röglinger et al., 2012). The first maturity improvement initiative and associated 18 actions will develop the maturity in the prioritised principles of leadership, engagement of people, improvement and evidence based decision making to 60% level, that represents the satisfactory level of maturity (3 out of 5 scores for each principle indicator).

Medium-term target: Subsequent to completion of the first improvement cycle and achievement of 36% overall maturity level, the potential progression path of the organisation includes using the business diagnostic tool, re-deploying the prioritisation approach (impact/effort matrix) and developing an action plan for the remaining principles (i.e. customer focus, process approach, relationship management and supply chain integration). This sets the organisation on its glide path to sustainable development, driving the business towards its medium-term, satisfactory maturity level target of 60% (anticipated as 12-24 months) (Mettler, 2011; Röglinger et al., 2012).

Long-term target: In the long-term (anticipated as 2-4 years), the continuous improvement of triple bottom line sustainability priorities (equating to a scoring level of 4 out of 5 in the diagnostic tool), and adoption of the outstanding GRI indicators not considered as part of the initial sustainability prioritisation process (corresponding to a scoring level of 5 out of 5) will enable the organisation to completely integrate triple bottom line sustainability through the GRI framework from the management perspective, under the facilitation of SSCQM. This will confirm the organisation's sustainable development progression into the world-class maturity level target of 80% and above.

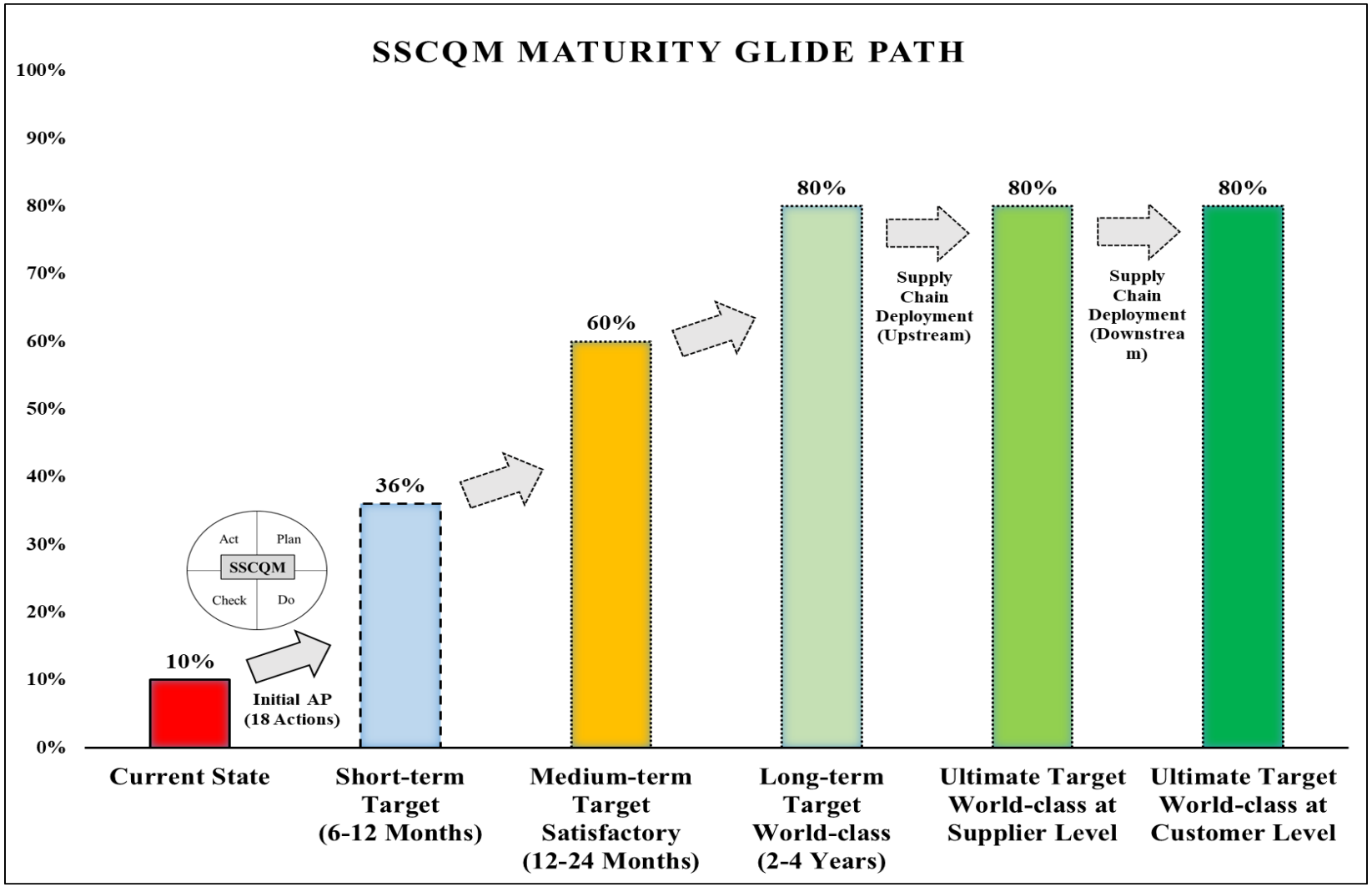
Ultimate target – deployment at supply chain level: Once the world-class level is achieved at the focal organisation level, further opportunities lie with employment of upstream

(suppliers) and downstream (customers) supply chain deployment strategies. The accomplishment of world-class SSCQM maturity levels and a complete integration of GRI framework at the organisational level, in isolation, fall short, particularly from the point of view of addressing the radical and immediate changes demanded by our planet (e.g. natural resource depletion rates, global warming) and the society (e.g. increasing negative impacts of industrial sectors on people) for sustainable development (Dunphy et al., 2000; Engert et al., 2016; Rajeev et al., 2017; Reefke and Sundaram, 2016). Furthermore, as outlined by Rajeev et al. (2017), due to increasing stakeholder pressures, organisations are following the trend of outsourcing the processes with the higher sustainability impacts into other locations and businesses, which are currently under relatively less stakeholder pressure regarding sustainability, resulting in improvements from the perspective of the relative organisation, but in reality, such a sustainability improvement from the true, global perspective is non-existent.

On the basis of these arguments, as conceptualised in Figure 4.17 (Chapter 4), development of the overall supply chain to a world-class level was defined as important for holistic sustainable development with higher collective environmental, economic and social impacts, being set as the ultimate target of the organisation and its supply chain network. As part of the supply chain deployment strategy, a potential improvement approach includes the following key activities:

- Identification of high risk supply chains (e.g. supply, manufacture, distribution and application of chemicals such as paint, in the case of the participating organisation);
- Establishing partnerships for collaboration, exchange of information and integration with high risk supply chain members (i.e. high risk suppliers and customers for sustainability);
- Conducting SSCQM maturity assessments at upstream and downstream members, identification of supply chain sustainability hot spots, and working together to collectively improve the SSCQM maturity levels of the overall supply chain.

The maturity glide path of the organisation and its supply chain is illustrated in Figure 6.21, demonstrating the progressive journey in the short, medium, long and ultimate terms to sustainable development through the intermediary stages of 36% (first improvement cycle), 60% (satisfactory), 80% (world-class) at focal organisation, and 80% (world-class) at supply chain level.



AP: Action Plan

Figure 6.21: Maturity glide path of the participating organisation and its supply chain towards sustainable development

6.6. Enablers, Barriers and Other Contextual Factors of SSCQM

The barriers, enablers and other implementation factors observed during the participative implementation of SSCQM approach were noted and analysed with a view to generate the key themes experienced in the particular context of the action research study. The qualitative observation notes taken during the meetings and application steps were recorded and analysed through the thematic synthesis method (Barnett-Page and Thomas, 2009). The thematic synthesis process, similar to the Delphi study qualitative feedback analysis, comprised of the five key stages (compiling, disassembling, reassembling, interpreting and concluding) as outlined below (Castleberry and Nolen, 2018):

- *Compiling:* All observations and associated notes were first put together and compiled in the form of a list (validity confirmation was not applicable in this case, as all notes were taken by the researcher specifically towards establishment of barriers, enablers and other factors to SSCQM implementation).
- *Disassembling & Reassembling:* The observation notes were disassembled into codes and themes, and reassembled in the form of key topics and themes.
- *Interpreting & Concluding:* The findings were interpreted and conclusions made for identifying the barriers, enablers and other contextual factors experienced during the action research study.

6.6.1. Enablers, Barriers and Challenges Observed

Barriers in the context of implementing an organisational phenomenon are identified by Giunipero et al. (2012) as "factors that hinder a firm's effort to adopt the change and associated new practice". Enablers in the business management practice context, which are also referred to as "drivers", are articulated as following by Neri et al. (2018):

> ***Enabler:*** *"The opposite of a barrier or a mean to overcome barriers, that can be both internal and external in origin, with reference to the organisation, promoted by one or more stakeholders with impact on the business and managerial decision making processes."*

Each factor observed and noted during application were not classified specifically as an enabler or a barrier as this would depend on the absence/presence of each parameter in the specific context of application e.g. the presence of management system maturity in the specific context of application being classed as an enabler, and the absence of the same being

classed as a barrier or challenge for implementation of the framework. The observations made were categorised into the following main themes:

Integration to existing management systems and processes: One of the primary challenges observed during the implementation of SSCQM approach was the issue of changing, updating, revising and rebuilding the existing management processes including the quality management system for incorporation of sustainability parameters. It was noted that the participating business did already invest a high level of resources into their quality management system and the adoption of SSCQM philosophy implied further changes, which was initially faced with reluctance. However, the flexible IT system in place, the continuous improvement culture, research and development capabilities, and the accommodating approach of most team members in the organisation were observed as remarkable factors for managing and mitigating the effect of this barrier.

Familiarity and awareness level of sustainability concepts and terminology: Sustainability being a relatively new concept, especially in the Cyprus region, brought together a low level of familiarity, awareness and competence in the organisational leadership and team members regarding the sustainability concepts, indicators, the GRI framework and associated terminology, which was experienced as another remarkable challenge during the application phase. A number of brief training sessions were held by the researcher among various internal stakeholder groups of the organisation for establishment of effective communications, clarification of expectations, articulation of standard definitions and alignment of perceptions regarding the key sustainability concepts, main terminologies and the GRI framework.

Absence of a minimum starter package for GRI: During the stakeholder analysis and identification of sustainability priorities, a comprehensive review was undertaken, studying in detail, each and every GRI indicator, which consumed a remarkable time and effort of both the researcher and more importantly the organisational strategic leadership. Due to the high level of new terminology involved as outlined in the previous point, and the high number of GRI sustainability indicators involved (e.g. 19 indicators for social dimension) led to a significant resistance and acted as a fear factor at the leadership of the participating organisation. On the other hand, the determination of key stakeholders, risks, future threats and priorities, termed as “bare minimums” by the director of the participating business, worked particularly well in managing this initial resistance, earning buy-in from all key stakeholders and interested parties in the organisation. The absence of a minimum, starter

package based on organisational scale (Large, SME, SMB) and/or business sector (Construction, Chemical, Medical, Automotive etc.) was noted, which would have eliminated or at least minimised the effect of this challenge, prioritising, unticking or removing the indicators that are typically not applicable to each sector (e.g. biodiversity / rights of indigenous peoples unticked as a default for the finance sector).

Resource constraints: Although the positive approach, support and intentions of the organisational leadership and ownership, the funds, manpower, management time and team availability that the business could spare for the SSCQM implementation and sustainable development was limited, negatively affecting the pace and depth of implementation and further highlighting the importance of prioritisation and risk-based approaches. The organisation was also going through other major changes at the time of the action research study including the management restructuring, relocation of the construction material packaging processes and expansion of the manufacturing facilities, further limiting the resources that could be dedicated to the SSCQM application and acting as a barrier to its complete operationalisation.

Leverage over supply base: The organisation's undeveloped relationship management practices with its suppliers and low levels of leverage over its supply chain partners was observed as a roadblock for adoption of the supply chain integration principle and dissemination of sustainability practices implemented across the supply chain. The organisation was noted in the position of a distribution hub for key players in the construction and chemical sectors, and as a minor customer of manufacturing raw material suppliers such as resin and sand suppliers, limiting its influence and power over its supply chain partners and its leverage over driving sustainability improvements across its supply chain. However, through structured relationship and portfolio management regarding its suppliers, and through exchange of valuable sustainability improvement know-how information anticipated to be captured in its journey towards sustainable development, the organisation was reflected to possess remarkable opportunities to overcome this barrier.

Culture and human resource limitations: The culture embedded in the organisation was noted as another fundamental factor to implementation of SSCQM. Particularly, a business culture that embraces continual improvement and proactiveness was noted as complimentary, assistive and promotive to SSCQM adoption. The sense of urgency, appetite for learning and willingness for improvement as shared values, resonating with a significant level of members across the organisation was noted as a major driver to application of a new management

approach such as SSCQM. On the other hand, this would not apply to every member of the organisation, certain members resisting or choosing not to embrace this change, which is arguably a barrier to SSCQM. However, this would not be specific to SSCQM and would generally apply to most new management approaches and associated changes in most organisational settings. Due to the skills and human resource limitations in the specific region and business sectors, the difficulties associated with radical changes involving the cultural changes around the workforce and recruitment were noted as another remarkable challenge for the participating organisation.

Willingness to learn, commitment, support and engagement of leadership: Although a certain level of initial scepticism and resistance observed at the organisational leadership, which was reflected as "natural" to any new management philosophy, the open and interested approach of the leadership was paramount to the application of the synthesised SSCQM concepts and theories. The transparency, appetite and willingness of the leadership to learn, brought together a significant commitment, support and engagement both at the senior management and across the organisation to the research activity, and its associated changes towards sustainability. As the awareness level of the director and middle management increased during the course of the implementation, the level of support within the organisation to the change increased, resulting in the implementation process being embedded in the organisation and the change starting to drive itself without much input from the researcher.

Management system maturity: The organisation not only operating under the ISO 9001 management system for an established period of time but also embracing its philosophy was seen to be highly synergistic and as a catalysing factor to application of the SSCQM approach. The SSCQM approach, mainly stemming from the ISO 9001 principles was well received across the organisation and although the low levels of familiarity with the sustainability concepts being investigated for integration, the approach of how to integrate, measure and improve such concepts was highly familiar to the organisational members at all levels. Furthermore, the future aspirations of the business to fully implement and earn certification to the environmental (ISO 14001), and occupational health and safety (ISO 45001) systems were observed as motivating and driving factors for adoption of SSCQM framework, underpinned by the leadership's belief that such certification will be accelerated and/or eased by application of SSCQM.

Change facilitation and championing: Throughout the application of key steps and concepts of the SSCQM approach, the researcher acted as a "change-agent", facilitating, coordinating and structuring the implementation together with the management of the participating organisation for formulation of a systematic and clear set of actions for improvement. According to the leadership of the organisation, the presence of an academic and participative researcher highly catalysed the learning curve of the organisation, translating the GRI framework to the organisation in a way that it is meaningful, practical and interpretable by the organisation and its workforce. The director of the business named the presence of such a change facilitator and champion as "an adaptor", adapting the fairly unfamiliar sustainability concepts and associated contents to the specific business context, using the SSCQM as a medium to achieve it. It was noted that, in the business contexts of low sustainability awareness, a change facilitator and champion would positively contribute to calibration, implementation and effective operationalisation of SSCQM, that utilises the relatively new approaches of sustainability and GRI framework.

Governmental subsidisation and support: It was noticeably voiced by the leadership and ownership of the organisation a number of times during the action research study that, formal recognition and support from governmental and municipal institutions would highly motivate the business further in the adoption of SSCQM and any related organisational sustainability improvement initiative. It was captured that this could be in the form of both monetary (e.g. tax reduction, allocation of support funds, preferred option for governmental projects linked to sustainability improvement, subsidisation of other governmental fees payable by the firm as a result of improved sustainability performance etc.) and non-monetary terms (e.g. positive media and press, governmental award certificates etc.).

Sustainability awareness of public and market: The current sustainability awareness levels of the environment and business climate that the organisation operated in was remarkably low, resulting in a wide range of customers demanding products that are cost competitive and delivered on time, with limited or no expectations on the product sustainability and/or supplying organisation's sustainability. This naturally and historically resulted in the economic parameters being prioritised in the organisation, with relatively much less emphasis on environmental and social issues. On the other hand, this situation, which can be seen as a barrier, was identified by the organisation as "bound to change", sustainability as an imperative concept starting to receive a growing attention from both the public and the media in the region. Accordingly, the increasing public and customer sustainability awareness was recognised by the participating organisation as both a near future threat and opportunity along

with emerging demand on both sustainable products and enterprises, fuelling the adoption of SSCQM and associated organisational transition towards sustainable development.

6.6.2. Other Contextual Factors for Implementation and Opportunities

In addition to the observations regarding the enablers and challenges to implementation of SSCQM, several factors and opportunities deserved further discussion. Firstly, elaborating on the earlier point regarding "the absence of a minimum GRI starter package", it was noted that there is considerable scope for further research and optimisation work with reference to the GRI framework. At the target of such an optimisation and improvement would be development of starter, medium and advanced GRI packages, tailored towards the maturity levels and sectors of the organisations.

Potential introduction of such packages would enable the organisation's to initially kick off their sustainable development journey through the GRI sustainability indicators that are the most relevant to their sector and businesses. This would highly reduce the initial resistance to change and "fear factor" that is envisaged to be experienced in many firms, guiding the organisations from the basic (starter) level of integration with a relatively limited scope into a medium level and progressively into a final level of integration, where all GRI indicators are integrated and mechanisms in place for improvement (as indicated with "world class" level of maturity in the SSCQM approach). A similar observation was noted by Fonseca (2010), that outlined the "demanding" nature of the GRI framework, discussing that "setting the bar too high with too many indicators possesses the risk of inhibiting the voluntary uptake of the framework and adding more requirements on 'what' and 'how' to report is delicate".

An anticipated additional impact of this could also be the steering of business sectors towards sectoral sustainability norms, driving all sectors towards a collective improvement environment. Through this resolution, the implementation pace of all sustainability initiatives incorporating GRI including the SSCQM would be arguably accelerated. This implies a widespread and comprehensive sectoral and organisational scale-based data collection towards both capturing business sector and organisation scale specific indicators, determining bare minimum indicators for the same, and revealing other sustainability indicators that might be context-specific and not yet incorporated into the GRI framework.

Ultimately, prior to implementation, a structured training and exchange of information session with the key stakeholders on sustainability (basic concepts and terminology) and GRI

framework was noted as highly beneficial, clarifying any misperceptions, setting out a common understanding ground and highly contributing to the effective communication of SSCQM philosophy, which were established as key to a smooth business transition towards the "sustainable" change.

6.7. Discussion of Action Research Study Findings

Resonating with the viewpoints of a wide and established base of scholars (Cherrafi et al., 2017; Engert et al., 2016; Garvare and Isaksson, 2001; Morioka and Carvalho, 2016a; Peace et al., 2018; Perrott, 2015; Witjes et al., 2017; Zink, 2007), identification of sustainability priorities based on the key stakeholder requirements of the organisation was observed as a remarkable part of the implementation, directing the business and its limited resources towards the sustainability issues of utmost importance. The stakeholder influence – interest matrix tool, as suggested by several contributions (Ackermann and Eden, 2011; Brugha and Varvasovszky, 2000; Bryson, 2011; Newcombe, 2003), was successfully utilised as a facilitating tool, supporting effective execution of identifying the key stakeholders, from which the sustainability priorities of the organisation were generated.

Moreover, due to the participating organisation, being located in a region with low sustainability awareness level and being positioned at the beginning of its sustainable development journey, sustainability was initially observed as an informal practice, with low levels of managerial integration and associated maturity levels. This resulted in generation of many improvement actions for sustainable development however, like in the case of many firms, limited organisational resources were available that could be fully dedicated or invested into the sustainability integration and improvement initiatives (Kelliher and Reinl, 2009). This further placed a paramount emphasis on the organisational stakeholder and sustainability risks based prioritisation approach to improvement strategy formulation and execution, for an effective and successful implementation, which echoes and provides further explanation into why the risk based approach was defined as a fundamental step in the extant conceptual frameworks (Asif and Searcy, 2014; Garcia et al., 2016; Nawaz and Koç, 2018; Peace et al., 2018; Perrott, 2015; Witjes et al., 2017). The facilitating role of the impact – effort matrix tool was concluded similar to Nawaz and Koç (2018), and Todnem By (2005), sequencing and ranking the improvement actions based on their impact and ease of implementation to contribute towards such prioritisation.

Echoing with several authors in the literature (Machado et al., 2017; Mettler, 2011; Meza-

Ruiz et al., 2017; Röglinger et al., 2012), a maturity development based framework was set, guiding the organisation through a progressive journey towards sustainable development.

The barriers, enablers and other key application factors observed during the implementation were supported and resonated with a number of authors in the literature that studied sustainability integration in the organisational context as presented in Table 6.6.

Table 6.6: Implementation factors observed during the action research study and supporting authors in the literature

Factor	**Supporting References**
Integration to existing management systems and processes	(Blanco-Portela et al., 2017; Neri et al., 2018; Trianni et al., 2017)
Familiarity and awareness level of sustainability concepts and terminology	(Bhanot et al., 2015; Blanco-Portela et al., 2017; George et al., 2016; Neri et al., 2018; Trianni et al., 2017; Al Zaabi et al., 2013)
Absence of a minimum starter package for GRI	(Fonseca, 2010)
Resource constraints	(Bhanot et al., 2015; Blanco-Portela et al., 2017; Seuring and Müller, 2008; Trianni et al., 2017; Al Zaabi et al., 2013)
Leverage over supply base	(Seuring et al., 2008; Al Zaabi et al., 2013)
Culture and human resource limitations	(Blanco-Portela et al., 2017; George et al., 2016; Neri et al., 2018; Trianni et al., 2017; Al Zaabi et al., 2013)
Willingness to learn, commitment, support and engagement of leadership	(Blanco-Portela et al., 2017; George et al., 2016; Neri et al., 2018; Seidel et al., 2010; Trianni et al., 2017; Al Zaabi et al., 2013)
Management system maturity	(Blanco-Portela et al., 2017; Engert et al., 2016; George et al., 2016; Neri et al., 2018; Trianni et al., 2017; Witjes et al., 2017)
Change facilitation and championing	(Blanco-Portela et al., 2017; Witjes et al., 2017)
Governmental subsidisation and support	(Bhanot et al., 2015; Blanco-Portela et al., 2017; Neri et al., 2018)
Sustainability awareness of public and market	(Blanco-Portela et al., 2017; George et al., 2016; Neri et al., 2018; Trianni et al., 2017)

6.8. Summary and Conclusions

With a view to advance the practical understanding of the SSCQM framework developed for a more meaningful contribution to the management research (Easterby-Smith et al., 2012; Saunders et al., 2015), this chapter presented a participatory and observatory action research study, implementing the framework synthesised in a construction and chemical organisation in the Cyprus region. The key objectives of this research step and chapter was to demonstrate the application of the SSCQM framework, to observe its effects and influences on the organisation, and investigate its contextual factors including the enablers and barriers to its implementation in line with the research question 7, as part of the final stage of the validation research step. Furthermore, it was assessed whether the formulated framework met its objectives through investigating the level of facilitation, support, guidance and acceleration provided to management integration and improvement of triple bottom line sustainability, as a result of the industrial implementation.

The key stakeholders of the participating organisation along with their sustainability agendas were first established, defining the sustainability priorities using the GRI framework, as part of step 0 of the SSCQM implementation procedure. The business diagnostic tool developed was then deployed (step 1), developing a quantitative current state map of the organisation with reference to its SSCQM principle maturity and sustainability integration levels, indicating low maturity levels and an unbalanced scenario regarding sustainability integration (economic dimension was observed as more mature than the environmental and social dimensions). This step was followed by the identification of high-risk areas and processes, providing a comprehensive picture regarding the organisation's sustainability risks and a platform for improvement strategy formulation (step 2).

The improvement strategy constructed included a risk and prioritisation-based approach to channel the organisational resources in the best possible way towards jump starting the organisation's sustainable development journey and facilitating building of momentum towards the change, early on in the journey. Stemming from their relatively higher importance, the principles of "leadership, engagement of people, improvement and evidence based decision making" were prioritised and the impact – effort analysis conducted with the leadership of the organisation to further assign priority ratings to each action. As a result, a clear set of actions were formulated, both towards improving the SSCQM principle maturity of the organisation and balancing the sustainability integration levels.

Positive and noteworthy contributions were noted from the implementation of the SSCQM framework including the increase realised in the level of GRI framework adoption for triple bottom line sustainability. The execution and implementation of the actions are further anticipated to deliver improvements in both the sustainability integration levels of the organisation and its overall SSCQM maturity.

From the perspective of contextual factors experienced during application, the key parameters observed included; integration to existing management systems and processes, familiarity and awareness level of sustainability concepts and terminology, absence of a minimum starter package for GRI, resource constraints, leverage over supply base, culture and human resource limitations, willingness to learn, commitment, support and engagement of leadership, management system maturity, change facilitation and championing, governmental subsidisation and support, and sustainability awareness of public and market. Finally, an improvement opportunity regarding accelerating the pace of implementation of GRI framework was outlined, based on the contextual observations made and learnings captured during the application of the SSCQM framework.

Ultimately, it was concluded through the action research study that the SSCQM framework enabled a glide path for the participating organisation to start and progress in its sustainable development journey through identification of sustainability priorities, comprehensive current state management diagnostics and risk analyses, and an improvement strategy comprised of a detailed and specific set of actions. Further opportunities were outlined for the deployment of the SSCQM at the supply chain level as the ultimate target, contributing to sustainability integration, maturity development and improvement at the overall supply chain level, contributing towards the radical business sustainability changes demanded by our society.

CHAPTER 7 – SUMMARY AND CONCLUSIONS

7.1. Introduction

The summary of the thesis is provided in this chapter, demonstrating the achievement of research aim and objectives. The contributions of the research to the body of knowledge are outlined, limitations and future research directions are discussed, and the thesis is concluded with the presentation of final remarks.

7.2. Research Summary and Evaluation Against Aim, Objectives and Questions

7.2.1. The Research Problem Addressed and The Research Aim

The research followed the path of first establishing a remarkable and current industrial and societal problem; i.e. integration and improvement of sustainability in the organisational management context. This was identified as a particularly significant research problem due to the pressure applied on both our planet and the society through the increasing global demand for products, services and processes, and the economic business conditions continuously toughening in parallel, necessitating new management approaches and frameworks for sustainable development (Engert et al., 2016; Kiron et al., 2015; Lozano, 2015; Millar et al., 2012; Morioka and Carvalho, 2016a; Rajeev et al., 2017; Schrettle et al., 2014; Williams et al., 2017).

The organisations, as one of the main actors of the society, were defined as strategically located towards addressing our global sustainability challenge however, integrating and improving triple bottom line sustainability in a balanced manner offered several challenges to the industrial managers due to the complexities and conflicts introduced from the multiple agendas (economic, environmental and social) (Engert et al., 2016; Morioka and Carvalho, 2016b; Williams et al., 2017), and lack of a clear, systematic and holistic framework to organisational integration (Hahn, 2013; Keskin et al., 2013; Machado et al., 2017). Stemming from the integrated lens of "sustainable operations management" (Kleindorfer et al., 2005), QM and SCM approaches were established as highly fruitful management avenues to guide and support such an integration, due to their wide managerial scope (both internal external to firms), well recognised principles due to their high diffusion level and rich history, and integration synergies indicated in the extant body of knowledge (Engert et al., 2016; Lozano, 2015; Rajeev et al., 2017; Seuring et al., 2008; Siva et al., 2016).

On the basis of the articulated management research problem and the evident literature gap,

design and development of a management framework integrating QM, SCM and TBL sustainability to facilitate organisational sustainability integration and improvement was established as the principle aim of this research.

7.2.2. Research Objective 1 – Review of Extant Body of Knowledge (RQs 1 & 2)

The first research objective comprised of the systematic literature review step, critically reviewing the extant body of knowledge from the collective lens of QM, SCM and sustainability integration. This critical review included both quantitative (descriptive statistics) and qualitative (thematic synthesis) analyses, assessing relationships, synergies, complications and gaps in the literature (Chapter 2). A noteworthy outcome of this research step was the emergence of a novel, holistic approach from the perspective of the three philosophies (QM, SCM and sustainability), framed under the umbrella of sustainable supply chain quality management (SSCQM).

7.2.3. Research Objectives 2, 3 & 4 – Conceptual Framework, Implementation Procedure and the Diagnostic Tool (RQs 3, 4 & 5)

This critical review was extended to further analysis of the gaps in the literature, from the point of view of conceptual development, identifying a key opportunity with the integration of ISO 9001:2015 principles, supply chain integration principle of SCM and triple bottom line sustainability. The synthesis of synergistic and compatible relationships identified between these management principles and organisational TBL sustainability integration led to construction of the conceptual framework of SSCQM, addressing the second objective of the research (Chapter 4).

With a view to guide the practical implementation and operationalisation of the conceptual framework developed, the existing management frameworks identified in the literature were critically analysed, and the associated strengths and weaknesses were noted. Capitalising on the strengths and addressing the weaknesses, an implementation procedure was formulated, adopting a step-by-step, cyclic, roadmap approach for the effective operationalisation of the synthesised set of concepts, framed under the umbrella of SSCQM.

Additionally, in order to facilitate the industrial implementation of a fundamental step in the implementation procedure, a maturity assessment tool was designed, enabling deployment of the maturity development approach to organisational sustainable development through the aid provided in the managerial current state analysis, decision making and improvement action deployment processes. The implementation procedure and diagnostic tool developments

resulted in the accomplishment of the third and fourth objectives of the research (Chapter 4).

7.2.4. Research Objectives 5 & 6 – Verification, Validation and Application (RQs 6 & 7)

The conceptual framework and the associated propositions were verified, along with validation of the implementation procedure and diagnostic tool developments, using the Delphi study method that engaged subject matter experts from a diverse pool of academic and industrial specialists. The expert Delphi panel further pointed towards a number of improvement opportunities regarding the implementation procedure and the diagnostic tool, captured through the qualitative feedback, contributing to the further development of the management solution formulated in the research. The remarkably high consensus levels achieved on the conceptual and practical implementation aspects of the SSCQM framework led to successful verification and initial validation (stage 1) of the developments, confirming the fifth objective of the research (Chapter 5).

Finally, the framework was implemented in a chemical and construction organisation in Cyprus, demonstrating its application, observing its effects, and outlining the key implementation factors experienced in the specific managerial context of application, as part of the final validation (stage 2) step. The implementation of the SSCQM framework contributed to the development of an improvement strategy and a clear set of actions, directed towards integrating TBL sustainability priorities of the participating organisation based on its key stakeholders, using the maturity assessment and GRI framework approaches for the sustainable development of the organisation. This resulted in the accomplishment of the final objective of the research, the formulated SSCQM framework being concluded to facilitate, structure and guide organisational management integration of TBL sustainability for improvement (Chapter 6). The research was concluded, with the demonstration of achieving its principle aim and the associated research objectives.

7.3. Research Contributions

7.3.1. Contributions to the Body of Knowledge

This research provided a number of contributions and advancements to the existing body of knowledge in the areas of quality management, supply chain management and sustainability including the following:

1. The systematic literature review contribution adopted an authentic research approach through the unique, collective lens of QM, SCM and sustainability

integration, developing the novel and fruitful integrated framework of sustainable supply chain quality management (SSCQM). The new SSCQM perspective and framework introduced, provided a new research avenue for future sustainability management integration research, building on the synergies established, and directions provided on the state-of-the-art QM, SCM and sustainability integration literature.

2. The well-recognised principles of ISO 9001 (QM) and supply chain integration (SCM) were refined / redefined under a new conceptual construct, built upon the holistic view and associated synergies established between QM, SCM and sustainability, tailored towards addressing a current managerial problem: organisational sustainability integration and improvement.

3. The novel developments of implementation procedure and maturity assessment diagnostic tool were introduced, offering a systematic implementation solution towards catalysing organisational transformation into sustainable development. The ISO 9001:2015 and supply chain integration principles were adapted from the lens of managerial sustainability integration including formulation of associated organisational indicators, processes and mechanisms for sustainability management and improvement.

4. A new supply chain sustainability measurement and improvement strategy was proposed, introducing a gateway to establishment of a holistic supply chain sustainability view through maturity assessment and collective sustainability improvement across the supply chain network (SSCQM measurements at supplier, focal organisation and customer levels for sustainable development of supply chains).

5. New empirical insights developed into the fields of QM, SCM and sustainability integration through the verification, validation and application studies conducted (based on subject matter expert panel input and implementation of research outcomes in a small to medium scale business (SMB)).

5a. These insights included advancements of the existing knowledge such as the verification of relationships between the ISO 9001:2015, supply chain integration principles and organisational TBL sustainability integration, and establishment of relative importance among the principles for sustainability. This research can be

denoted as one of the very first research studies to rank QM and SCM principles into a hierarchy of importance from the fashioned lens of sustainability integration and improvement.

5b. Practical insights were developed through the expert validation of a conceptual roadmap and a supplementary diagnostic tool, and through demonstration of applying the new approach developed in an organisational management context along with the establishment of organisational factors observed as key to its implementation.

7.3.2. Contributions to Managerial Practice

Several contributions were implied to organisational managerial practice including the following:

1. The conceptual contribution of SSCQM framework introduced "a revised thinking" to the core organisational management concepts of ISO 9001 and supply chain management, addressing a contemporary, organisational sustainability research problem, which can be utilised by organisational leaders and decision makers towards adapting and/or expanding their existing QM and SCM practices to accommodate sustainability agendas.

2. Taking into account over a million organisations currently certified to ISO 9001 methodology and many more that are actively pursuing ISO 9001 certification and supply chain integration, the synthesised set of concepts associated with these deeply rooted management principles offer a significant deployment potential at a global and multisectoral level, implying a remarkable managerial impact for integration of sustainability through QM and SCM.

3. The conceptual framework, implementation procedure and maturity assessment tool developed provide the industrial managers and practitioners with a defined, verified, validated and applied set of steps, tools, quantitative measurement aids, and techniques key to integration and continual improvement of sustainability in organisations, presented in an adapted form of the well-known management principles such as PDCA, leadership and engagement of people.

7.3.3. Contributions - Concluding Remarks

The outlined contributions to the body of knowledge and managerial practice were disseminated, harnessed and acknowledged through extensive peer-review processes with positive outcomes, leading to three publication contributions in high impact journals including the Journal of Cleaner Production (Elsevier), Sustainable Production and Consumption (Elsevier), and Sustainability (MDPI), that already achieved significant citation rates (28 citations according to Google Scholar statistics as of June 2019) from recent articles published in high impact journals such as International Journal of Production Economics (Elsevier). The research was further disseminated at an international conference (ICES), shared with and subjected to critical review of academic and industrial peers in the related subject areas.

As a result of these research contributions of remarkable significance to industry and academia, the researcher has been invited academic reviewer positions in high impact journals including the Journal of Cleaner Production (Elsevier) and International Journal of Production Research (Taylor & Francis), along with editorial board member position at a newly founded journal (Journal of Business Administration), further contributing to the management and sustainability research process.

7.4. Research Limitations

The research entails a number of limitations associated with the complexities of the sustainability integration topic, and with the systematic literature review phase, conceptual development and empirical (Delphi and action research) phases.

Peer reviewed articles from main aggregator and publisher databases (e.g. EBSCO, Web of Science, Scopus, Emerald, Taylor and Francis), identified as central to QM, SCM and sustainability literature were considered in the systematic literature review and the subsequent literature gap analysis, which may have limited the number of articles included, and the scope to a certain extent. On the other hand, this measure was arguably taken to ensure the rigour and quality of the publications included in these critical reviews. The large sample size of papers considered (93 articles) arguably brought together a holistic view, and an acceptable level of reliability for the findings and associated deductions.

Moreover, the adoption of higher-level searching protocols during the establishment of SQM, SSCM and SCQM research themes can also be reflected as a limitation of the systematic literature review undertaken although, the searching protocols identified articles covering a

wide range of sustainability integration issues not limited to but including GSCM, quality management-based eco-design, planning of sustainable supply chains, enablers of SSCM and performance measurement of SSCM. On the other hand, all keywords fundamental to QM, SCM and sustainability were included in the SSCQM search (search 4), in line with the research scope and objectives, addressing the remarkable gap in the literature i.e. development of a holistic and collective view of SSCQM.

The conceptual framework and implementation procedure contributions in this paper also entail certain research limitations. Every conceptual 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 generalisability and range of the propositions formulated (Whetten, 1989). Despite the conceptual framework established in this research incorporates propositions and concepts adopted from quantitative and qualitative evidence in the literature supported by a range of scholars, it was inevitably designed with the researcher's "familiar surroundings" in the subconscious mind (manufacturing and related sectors) in this current climate of sustainability integration challenge that the organisations are facing (Whetten, 1989). This can be reflected upon as a contextual limitation for the conceptual phenomenon of SSCQM, which was aimed to be overcome or mitigated through the data collection phases deployed.

In spite of the wide utilisation base and clear benefits offered by the Delphi study approach in verification and validation of novel concepts (Fernández-Llamazares et al., 2013; McMillan et al., 2016), a number of limitations are associated to it including: the opinion (not fact) based outcomes due to representation of perceptions of a group of experts (Goodman, 1987); bias introduced by researcher during the selection of experts (von der Gracht, 2008); selection of which elements to include in feedback (Skulmoski et al., 2007); and potential Delphi participant fatigue due to high levels of respondent time and commitment associated (Powell, 2003). Several measures were taken to reduce impact of these shortfalls such as selection of experts with high levels of interest to take part in the study from various backgrounds, sectors and geographical regions, designing the Delphi feedback survey as brief as possible, fully directed towards the research inquiries, and adoption of a systematic quantitative and qualitative data analysis and feedback process. On the other hand, the industrial practitioners that took part in the Delphi study were mainly from the manufacturing and related sectoral backgrounds, which was acknowledged as a limitation from the point of sectoral applicability of the Delphi study findings (e.g. experts from sectors such as medical or hospitality were not included).

In addition to verification and initial validation through subject matter expertise, the developed approach was taken forward to a final validation and contextual investigation study, conducted through the participative action research methodology. Although the participative action research approach's suitability to the social sustainability research inquiries (Hind et al., 2013), and its highly contributory essence to the practical aspects of the research (Checkland and Holwell, 1998), certain limitations are entailed such as its sensitivity to the needs of the stakeholders involved in the research (as opposed to the needs of the research), its resource intensive nature (lack of commitment and resources delimiting the research), and its dependence on the facilitation of the researcher (requiring the researcher to possess both research and facilitation / coordination skills for an effective application) (Mackenzie et al., 2012).

These limitations were managed through clear communication of the benefits to the participating organisation, and through establishment of strong working relationships with the leadership and ownership of the organisation, securing their commitment and resources for achievement of research objectives. The previous organisational change management and improvement experience of the researcher further contributed to the facilitation and coordination of the action research activity. The stakeholder sensitivity essence of action research was arguably an asset to the research, as the management framework developed for integration of sustainability seeks to prioritise a path towards sustainable development based on the stakeholder requirements and associated risks existent in the implementation context.

Additionally, the action research study was undertaken on a single case (an organisation), in a particular region (Cyprus), operating in specific business sectors (construction and chemical), which point towards a contextual limitation. However, despite this limitation, such concentration on a single case led to a comprehensive and detailed analysis on the particular case of investigation, and when evaluated together with the highly positive Delphi panel opinions, comprised of critical viewpoints from a wide base of regions and sectors, resulted in a synthesised set of concepts and a framework arguably reliable with acceptable validity and generalisability levels for managerial practice.

7.5. Future Research Directions

Although the highly positive verification, validation and application of the synthesised theories and concepts, a key future research direction revolves around further investigation of the SSCQM framework developed in applications under qualitatively different conditions of who (different business cultures and leadership styles), where (different geographical regions and business sectors) and when (different time periods, business climates and market conditions) (Whetten, 1989). Such future research studies would not only contribute towards fortification and/or refinement of the conceptual formulations set out in this thesis but may also reveal new management tools that are synergistic or catalytic with the effective implementation and operationalisation of SSCQM philosophy, especially in specific business sectors or contexts.

Taking into account that QM and SCM approaches are well recognised and diffused across various sectors including medical, education and hospitality, it would be a fruitful research avenue to investigate implementation of the SSCQM approach in these sectors, which is bound to provide new insights to potential practitioners in these business areas that were not included in the empirical phases of this research.

Another future research path is suggested for studying the effects of SSCQM on the sustainability of supply chains. A strategy to guide such a supply chain level deployment was outlined in Chapter 4 (Fig. 4.17) and in Chapter 6 (Fig. 6.21), which offers a platform for future research, implementing SSCQM at supplier, focal organisation and customer levels with a view to generate supply chain SSCQM maturity scores, and a holistic view for sustainable development. This contribution, which is subject to further empirical evaluation, may provide a gateway to realise overall supply chain sustainability integration measurement, engagement and collective improvement, supporting the drastic transformation desired at the supply chain level for sustainability.

Despite the maturity assessment diagnostic tool and its indicators were validated by the Delphi specialists representing various geographical and sectoral backgrounds, future research possess the potential to reveal further indicators, mechanisms and processes for definition and implementation of the framed SSCQM principles, especially for specific sectors.

Moreover, as outlined in Chapter 6, a significant future research and refinement opportunity was established regarding the GRI framework through identification of organisational scale

and sector specific packages, along with incorporation of a maturity based approach, guiding organisations through a basic, medium and advanced levels of adoption, as opposed to exposing the framework to industrial resistance due to the remarkable learning curve associated, and the long list of indicators included.

The eight management principles framed in the SSCQM approach were assigned hierarchy ratings (e.g. leadership ranked as the most important principle for sustainability integration), based on the relative importance judgements of the Delphi panel. A noteworthy future research avenue is further assessment of this relativity suggested in the Delphi feedback with a view to elaborate on which principle impacts which sustainability dimension in what way, moving towards identifying principle hierarchy rankings for each sustainability dimension and assessing applicability of such claim under various organisational settings.

Finally, taking into account the fruitful nature and remarkable potential identified between SCM, QM and sustainability integration, future research is advisable into further exploration of relationships between these approaches, revealing potential synergies between other QM, SCM or SCQM principles (e.g. supplier quality management) with organisational sustainable development.

7.6. Thesis Conclusions and Final Remarks

In conclusion, as outlined in Section 8.2, all the research objectives formulated in Section 1.5 (Chapter 1) were achieved through; a critical systematic literature review (Chapter 2), effective and comprehensive deployment of research methods (Chapter 3), development of the conceptual framework, implementation procedure and diagnostic tool (Chapter 4) verification of the conceptual framework, and initial validation of the implementation procedure and diagnostic tool (Chapter 5), and application at an organisation for final validation (Chapter 6).

The contributions of the research to the existing body of knowledge and to managerial practice were outlined in Section 7.3 (Chapter 7), including synthesis of relationships between QM, SCM and TBL sustainability, and refinement of existing theories, concepts and approaches under a novel framework (SSCQM), addressing the principle research aim of setting a framework for organisational sustainability integration, and improvement through the catalytic principles of QM and SCM.

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APPENDIX ONE

List of Articles included in the Systematic Literature Review

The list of articles included in the systematic literature review are provided in Table A1 below:

Table A1. Articles included in the literature review.

(SCQM – Blue (40 Papers), SSCM – Red (37 Papers), SQM – Green (11 Papers), SSCQM – Gold (5 Papers))

Author(s)	Title	Publisher
Azizi et al. (2016)	The impact of knowledge management practices on supply chain quality management and competitive advantages	Degruyter
Carmignani (2009)	Supply chain and quality management: The definition of a standard to implement a process management system in a supply chain	Emerald
Casadesús and de Castro (2005)	How improving quality improves supply chain management: empirical study	Emerald
Chadha and Gagandeep (2013)	Empowering Quality Management Systems Through Supply Chain Management Integration: A Survey of Select Hospitals in Chandigarh, Mohali and Panchkula	IUP
Chen et al. (2014)	Quality control in food supply chain management: An analytical model and case study of the adulterated milk incident in China	Elsevier
Fernandes et al. (2017)	Supply chain management and quality management integration: A conceptual model proposal	Emerald
Flynn and Flynn (2005)	Synergies between supply chain management and quality management: emerging implications	T & F
Foster (2008)	Towards an understanding of supply chain quality management	Elsevier
Foster and Ogden (2008)	On differences in how operations and supply chain managers approach quality management	T & F
Fynes et al. (2005)	The impact of supply chain relationship quality on quality performance	Elsevier
Gu et al. (2017)	Management Practice of Supply Chain Quality Management in Service-oriented Manufacturing Industry	Matec
Jiang et al. (2010)	Research on Quality Management System for Supply Chain Based-Customer Satisfaction	IEEE
Jraisat and Sawalha (2013)	Quality control and supply chain management: a contextual perspective and a case study	Emerald
Azar et al. (2010)	Relationship between supply chain quality management practices and their effects on organisational performance	Gale
Kannan and Tan (2005)	Just in time, total qualitymanagement, and supply chain management: understanding their linkages and impact on business performance	Elsevier
Kaynak and Hartley (2008)	A replication and extension of quality management into the supply chain	Elsevier
Kuei et al. (2008)	Implementing supply chain quality management	T & F
Kuei et al. (2011)	Developing global supply chain quality management systems	T & F
Lin et al. (2005)	A structural equation model of supply chain quality management and organizational performance	Elsevier
Lin et al. (2013)	Identifying critical enablers and pathways to high performance supply chain quality management	Emerald
Lou et al. (2009)	Production-Outsourcing Supply Chain Quality Management Based on Multi-Agent System	IEEE
Mahdiraji et al. (2012)	Supply chain quality management	Gro. Sci.
Mellat-Parast (2013)	Supply chain quality management: An inter-organizational learning perspective	Emerald
Sun and Li (2010)	Study on Supply Chain Quality Management Model Based on Immune Theory	IEEE
Quang et al. (2016)	An extensive structural model of supply chain quality management and firm performance	Emerald
Robinson and Malhotra (2005)	Defining the concept of supply chain quality management and its relevance to academic and industrial practice	Elsevier
Sarrico and Rosa (2016)	Supply chain quality management in education	Emerald
Shalij et al. (2009)	Design of ISO 9001:2000 based Supply Chain Quality Management Systems	Indersci.

Sharma and Modgil (2015)	Supply chain and total quality management framework design for business performance-case study evidence	Emerald
Sharma et al. (2012)	Quality Management in Supply Chains: The Literature Review	Res. Gate
Sheikhy and Hamzeie (2015)	The relationship between total quality management and supply chain development of automotive companies listed in Tehran stock exchange	AENSI
Siddiqui et al. (2012)	The Impact of Supply Chain Management Practices in Total Quality Management Practices and Flexible System Practices Context: An Empirical Study in Oil and Gas Industry	Springer
Talib et al. (2010)	Integrating Total Quality Management and Supply Chain Management: Similarities and Benefits	IUP
Talib et al. (2011)	A study of total quality management and supply chain management practices	Emerald
Terziovski and Hermel (2011)	The Role of Quality Management Practice in the Performance of Integrated Supply Chains: A Multiple Cross-Case Analysis	Proquest
Vanichchinchai and Igel (2009)	Total quality management and supply chain management: similarities and differences	Emerald
Vanichchinchai and Igel (2010)	The impact of total quality management on supply chain management and firm's supply performance	T & F
Wang et al. (2010)	A Conceptual Modeling Approach to Quality Management in The Context of Diary Supply Chain	IEEE
Zeng et al. (2013)	Supply chain quality management practices and performance: An empirical study	Springer
Zhong et al. (2016)	Supply chain quality management: an empirical study	Emerald
Wan Ahmad et al. (2016)	Sustainable supply chain management in the oil and gas industry: A review of corporate sustainability reporting practices	Emerald
Ansari and Qureshi (2015)	Sustainability in Supply Chain Management: An Overview	IUP
Ashby et al. (2012)	Making connections: a review of supply chain management and sustainability literature	Emerald
Awudu and Zhang (2012)	Uncertainties and sustainability concepts in biofuel supply chain management: A review	Elsevier
Beske and Seuring (2014)	Putting sustainability into supply chain management	Emerald
De Brito and Van der Laan (2010)	Supply Chain Management and Sustainability: Procrastinating Integration in Mainstream Research	MDPI
Chardine-Baumann and Botta-Genoulaz (2014)	A framework for sustainable performance assessment of supply chain management practices	Elsevier
Genovese et al. (2015)	Sustainable supply chain management and the transition towards a circular economy: Evidence and some applications	Elsevier
Gold and Schleper (2017)	A pathway towards true sustainability: A recognition foundation of sustainable supply chain management	Elsevier
Grosvold et al. (2014)	Squaring the circle: Management, measurement and performance of sustainability in supply chains	Emerald
Halldórsson et al. (2009)	Supply chain management on the crossroad to sustainability: a blessing or a curse?	Springer
Jabbour et al. (2015)	Green supply chain management and firms' performance: Understanding potential relationships and the role of green sourcing and some other green practices	Elsevier
Khodakarami et al. (2015)	Developing distinctive two-stage data envelopment analysis models: An application in evaluating the sustainability of supply chain management	Elsevier
Liebetruth (2017)	Sustainability in performance measurement and management systems for supply chains	Elsevier
Lin (2013)	Using fuzzy DEMATEL to evaluate the green supply chain management practices	Elsevier
Luthra et al. (2015)	Critical success factors of green supply chain management for achieving sustainability in Indian automobile industry	T & F
Luthra et al. (2016)	The impacts of critical success factors for implementing green supply chain management towards sustainability: an empirical investigation of Indian automobile industry	Elsevier
Agrawal and Sharma (2015)	Supply Chain Social Sustainability: A Comparative Case Analysis in Indian Manufacturing Industries	Elsevier
Marshall et al. (2015)	Environmental and social supply chain management sustainability practices: construct development and measurement	T & F
Quarshie et al. (2016)	Sustainability and corporate social responsibility in supply chains: The state of research in supply chain management and business ethics journals	Elsevier
Rajeev et al. (2017)	Evolution of sustainability in supply chain management: A literature review	Elsevier
Reefke and Sundaram (2016)	Key themes and research opportunities in sustainable supply chain management – identification and evaluation	Elsevier

Schaltegger and Burritt (2014)	Measuring and managing sustainability performance of supply chains: Review and sustainability supply chain management framework	Emerald
Schmidt and Schwegler (2008)	A recursive ecological indicator system for the supply chain of a company	Elsevier
Seuring (2013)	A review of modeling approaches for sustainable supply chain management	Elsevier
Seuring and Müller (2008)	From a literature review to a conceptual framework for sustainable supply chain management	Elsevier
Seuring et al. (2008)	Sustainability and supply chain management – an introduction to the special issue	Elsevier
Silvestre (2015)	Sustainable supply chain management in emerging economies: Environmental turbulence, institutional voids and sustainability trajectories	Elsevier
Somsuk and Laosirihongthong (2016)	Prioritization of applicable drivers for green supply chain management implementation toward sustainability in Thailand	T & F
Stindt (2017)	A generic planning approach for sustainable supply chain management - How to integrate concepts and methods to address the issues of sustainability?	Elsevier
Sueyoshi and Wang (2014)	Sustainability development for supply chain management in U.S. petroleum industry by DEA environmental assessment	Elsevier
Tseng and Chiu (2013)	Evaluating firm's green supply chain management in linguistic preferences	Elsevier
Tsoulfas and Pappis (2008)	A model for supply chains environmental performance analysis and decision making	Elsevier
Türkay et al. (2016)	Sustainability in Supply Chain Management: Aggregate Planning from Sustainability Perspective	Plos
Winter and Knemeyer (2013)	Exploring the integration of sustainability and supply chain management: current state and opportunities for future inquiry	Emerald
Yu Xia (2011)	Sustainability in supply chain management: suggestions for the auto industry	Emerald
Zhu et al. (2006)	Green supply chain management: pressures, practices and performance within the Chinese automobile industry	Elsevier
Alemam and Li (2016)	Matrix-based quality tools for concept generation in eco-design	Sage
Aquilani et al. (2016)	Sustainability, TQM and Value Co-Creation Processes: The Role of Critical Success Factors	MDPI
Asif et al. (2011)	Including sustainability in business excellence models	T & F
Francis (2009)	Total Quality Management – A Tool for Design for Environment	IEEE
Siva et al. (2016)	The support of Quality Management to sustainable development: a literature review	Elsevier
Kuei and Lu (2012)	Integrating quality management principles into sustainability management	T & F
Maletic et al. (2011)	Can sustainable quality management contribute to the organizational performance?	Academic Journals
Rusinko (2005)	Using Quality Management as a Bridge to Environmental Sustainability in Organizations	SAM
Srdic and Selih (2011)	Integrated quality and sustainability assessment in construction: a conceptual model	T & F
Utne (2009)	Improving the environmental performance of the fishing fleet by use of Quality Function Deployment (QFD)	Elsevier
Zink (2007)	From total quality management to corporate sustainability based on a stakeholder management	Emerald
Agi and Nishant (2016)	Understanding influential factors on implementing green supply chain management practices: An interpretive structural modelling analysis	Elsevier
Dubey et al. (2015)	Exploring the relationship between leadership, operational practices, institutional pressures and environmental performance: A framework for green supply chain	Elsevier
Govindan et al. (2014)	Impact of supply chain management practices on sustainability	Elsevier
Jabbour et al. (2014)	Quality management, environmental management maturity, green supply chain practices and green performance of Brazilian companies with ISO 14001 certification: Direct and indirect effects	Elsevier
Fassoula (2005)	Reverse logistics as a means of reducing the cost of quality	T & F

APPENDIX TWO

Copy of the Ethical Approval Confirmation Letter

The ethical approval confirmation letter received from the College of Engineering and Technology Research Ethics Committee is provided below:

UNIVERSITY of DERBY

Approval Letter: College of Engineering and Technology Research Ethics Committee (Chair's action)

University of Derby

Date : 13 April 2018
Chair : Prof Fatih Kurugollu

Dear Mr. Ali Bastas,

Re: your request for ethical approval of your Research Project

Thank you for submitting your application to the College of Engineering and Technology Research Ethics Committee. The application has now been reviewed on a chair's action basis. I have reviewed the documents and consulted colleagues.

I am happy to approve the application on a chair's action basis. If any changes to the procedures etc. described in the application or supporting documentation is necessary, you must notify the committee and may be required to make a resubmission of the application.

We will look forward to receiving an application for the full study in due course.

Good luck with the research.

Yours sincerely

Prof Fatih KURUGOLLU
Chair, CREC for Engineering and Technology

APPENDIX THREE

Delphi Study - Research Ethics Information Sheet and Consent Confirmation

All 20 participants of the Delphi study were provided with the information sheet below, outlining key research ethics issues including the purpose and benefits of the study, confidentiality, voluntary participation and their consent obtained as demonstrated:

Delphi study for sustainable supply chain quality management framework

PURPOSE OF STUDY AND BENEFITS
The purpose of this research study is to develop a conceptual framework that utilises quality management and supply chain management principles to support sustainable development of organisations and their supply chains. Questions included in this survey are in relation to this, aiming to gauge your opinions on the relationships between quality, supply chain and sustainability management. Thus, your feedback as an expert will enable formulation of a correct, concise, clear and complete management framework that is expected to contribute to sustainability of supply chains and our society.

At the end of the data collection process, the summary of key acquired learning points and research outcomes will be available to participants on request.

CONFIDENTIALITY
All responses to this research will be anonymous. Your confidentiality as a participant will be maintained in all circumstances. Care will be taken during the reporting stages of information to eliminate and/or minimise the readers' ability to identify the role and hence identity of the source of information. The answers and information that you provide will be used for research purposes only and destrroyed after analysis.

TIME TO COMPLETE SURVEY
This survey will take approximately 25 minutes to complete.

CONTACT INFORMATION
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Derby, United Kingdom
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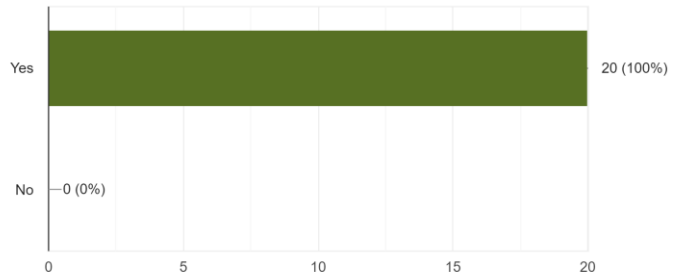
Phone: +44 (0)7412016279

Voluntary Participation and Consent

Your participation in this study is voluntary. If you decide to take part in this study, you will be required to click "Yes" in the the consent form below. Post confirmation of your consent, you are still free to withdraw at any time and providing a reason is not compulsory. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

I have read and understood the information provided and I agree to take part in this study.
20 responses



APPENDIX FOUR

Delphi Study - Survey

The Delphi study survey is provided below including the survey questions and the introduction/background information provided for each section:

Introduction

Delivering the current needs of the society while conserving the same ability of future generations lies at the heart of Sustainability Management. This includes management of organisational 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. Sustainability research is growing to provide integrated management approaches and synergistic strategies for holistic sustainable development of organisations and supply chains.

This research aims to develop an integrated conceptual framework through integration of Quality Management (QM) i.e. ISO9001:2015 principles and Supply Chain Management (SCM) i.e. supply chain integration principle with a view to facilitate:

- Measurement of sustainability management maturity of organisations
- Organisational sustainability performance evaluation, decision making and improvement
- Supply chain sustainability improvement through supply chain integration and cooperation

This survey consists of 3 sections:

Section 1 includes the questions with reference to relationships between the 7 QM principles, 1 SCM principle and the three sustainability dimensions under investigation.
Section 2 includes the questions with reference to the organisational diagnostic tool developed.
Section 3 includes the questions regarding the conceptual framework for sustainable development of organisations and supply chains.

Section 1 - Theoretical Framework

The aim of this section is to verify the relationships between the quality management principles, supply chain integration principle of supply chain management and triple bottom line sustainability i.e. economic, ecologic and social.

The management principles under investigation with reference to economic, ecologic and social sustainability are:

1 - Customer Focus
2 - Leadership
3 - Engagement of People
4 - Process Approach
5 - Improvement
6 - Evidence based decision making
7 - Relationship management
8 - Supply chain integration

Customer Focus

Customer focus management principle is defined as "meeting customer requirements and striving to exceed customer expectations". Sustained success is achieved through identification and delivery of current and future needs of the customers and other interested parties (ISO, 2015).

The sustainability management literature identifies "customer requirements and pressures" as a key driving factor for implementation of sustainability improvement practices in organisations and supply chains (Aquilani et al., 2016; Garvare and Isaksson, 2001; Lin, 2013; Seuring and Müller, 2008; Somsuk and Laosirihongthong, 2016).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Customer Focus" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Leadership

Leadership management principle is defined as "leaders at all levels establish unity of purpose and direction and create conditions in which people are engaged in achieving the objectives of the organization" (ISO, 2015).

Several authors proposed that QM Leadership has a positive impact on sustainability performance of organizations (Aquilani et al., 2016; Nguyen et al., 2018; Zink, 2007). Top management support and commitment is also identified as a critical success factor for organizational sustainable development (Agi and Nishant, 2016; Ansari and Qureshi, 2015; Luthra et al., 2015; Reefke and Sundaram, 2016; Somsuk and Laosirihongthong, 2016).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Leadership" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Engagement of People

Engagement of people management principle is defined as "recognition, empowerment and enhancement of skills and knowledge to facilitate the engagement of people in achieving the objectives of the organization". It is essential for organizations that all people are competent, empowered and engaged in delivering value (ISO, 2015).

Several authors proposed that people are at the heart of every organisation and only through their support, commitment and involvement, positioning 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; Zink, 2007).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Engagement of People" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Evidence Based Decision Making

Evidence based decision making management principle is defined as "making decisions based on the analysis and evaluation of data and information, which increases likelihood of achievement of desired results". Decision-making can be a complex process, and it always involves some uncertainty. It often involves multiple types and sources of inputs, as well as their interpretation, which can be subjective. It is important to understand cause and effect relationships and potential unintended consequences. Facts, evidence and data analysis lead to greater objectivity and confidence in decisions made. (ISO, 2015).

Tactical and strategic management decision making based on relevant data, information, facts and evidences is set out as a fundamental element of an integrated quality principles-based sustainability management system (Aquilani et al., 2016; Kuei and Lu, 2012).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Evidence Based Decision Making" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Process Approach

Process approach management principle is defined as "understanding how results are produced by the organizational systems, including all processes, resources, controls and interactions, with a view to optimize performance". Consistent and predictable results are achieved more effectively and efficiently when activities are understood and managed as interrelated processes that function as a coherent system (ISO, 2015).

Several authors proposed that process management positively contributes to describing and improving sustainability of organizations through incorporation of TBL indicators and facilitation of sustainability performance measurement, monitoring, reporting and improvement (Aquilani et al., 2016; Isaksson, 2006; Nguyen et al., 2018).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Process Approach" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Improvement

Improvement management principle is defined as "essential for an organization to maintain current levels of performance, to react to changes in its internal and external conditions and to create new opportunities through an ongoing focus on its products, services and processes" (ISO, 2015).

Several authors proposed that continuous improvement principle has a positive impact on sustainability performance of organizations (Aquilani et al., 2016; Nguyen et al., 2018; Zink, 2007). The QM practices of Deming's PDCA methodology and continuous improvement is identified as a bridge to environmental sustainable development of organizations (Rusinko, 2005).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Improvement" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Relationship Management

Relationship management principle refers to "management of their relationships with interested parties, such as suppliers". Interested parties influence the performance of an organization. Sustained success is more likely to be achieved when an organization manages relationships with its interested parties to optimize their impact on its performance. Relationship management with its supplier and partner network is often of particular importance (ISO, 2015).

Several authors proposed that relationship management of key stakeholders and relationship quality between supply chain members is a critical enabler of ecologic sustainable development of organizations and supply chains (Ansari and Qureshi, 2015; Aquilani et al., 2016; Xia and Li-Ping Tang, 2011). Establishment of effective relationships between supply chain members is also set out as a highly influential factor for green performance of organizations and supply chains (Agi and Nishant, 2016; Tseng and Chiu, 2013).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Relationship Management" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Supply Chain Integration

Supply chain integration principle stems from the close alignment, open communication, coordination and cooperation on the basis of continuous information flow internally and externally among the supply chain network members, which is defined as central to coherent execution of SCM activities and maximized value generation (Chang et al., 2016; Quang et al., 2016; Soares et al., 2017).

Several authors proposed that Information flow, coordination, collaboration and connection (integration) between the supply chain partners is key to achieve higher levels of organizational and overall supply chain sustainability performance (Beske and Seuring, 2014; Liebetruth, 2017; Rajeev et al., 2017; Xia and Li-Ping Tang, 2011).

Using the scale from 1 to 4, please indicate (X) if in your opinion "Supply Chain Integration" principle can be used towards improvement of: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
Economic sustainability	○	○	○	○
Environmental sustainability	○	○	○	○
Social sustainability	○	○	○	○

Please provide your reasons below, if you disagree with any of the above:

Your answer

Principle Hierarchy Assessment

Please rank the following management principles according to their relative importance to integration and improvement of sustainability: *

	Not Important 1	2	3	4	Moderately Important 5	6	7	8	Extremely Important 9
Customer focus	○	○	○	○	○	○	○	○	○
Leadership	○	○	○	○	○	○	○	○	○
Engagement of people	○	○	○	○	○	○	○	○	○
Process approach	○	○	○	○	○	○	○	○	○
Improvement	○	○	○	○	○	○	○	○	○
Evidence based decision making	○	○	○	○	○	○	○	○	○
Relationship management	○	○	○	○	○	○	○	○	○
Supply chain integration	○	○	○	○	○	○	○	○	○

Please provide any further comments that you may have in the space provided below:

Your answer

Section 2 - Business Sustainability Integration Diagnostics Tool

This MS Excel based sustainable supply chain quality management (SSCQM) diagnostic tool aims to facilitate:

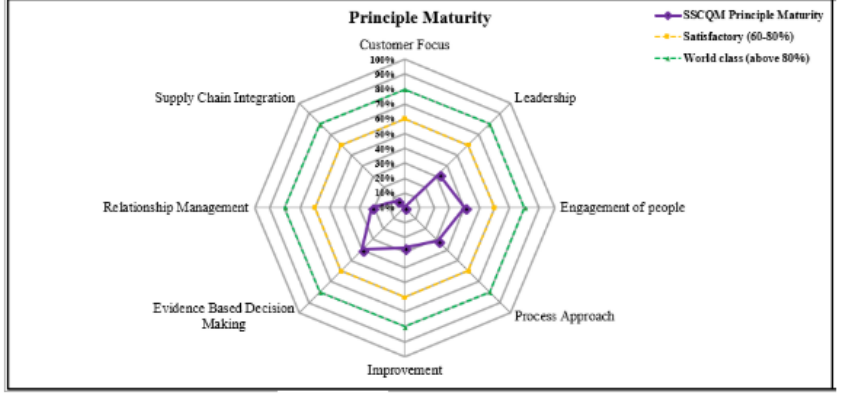
- Maturity assessment of prospective sustainability management principles (Diagnostics summary part 1)
- Gauging alignment of organizational mechanisms, structures and processes with TBL i.e. econ, env and social sustainability (Diagnostics summary part 2)

This is achieved through assessment (self or 3rd party) of maturity (awarding scores as per set criteria) against the indicators of each principle with reference to economic, environmental and social sustainability parameters (e.g. Maturity assessment of "Engagement of People" principle indicators)

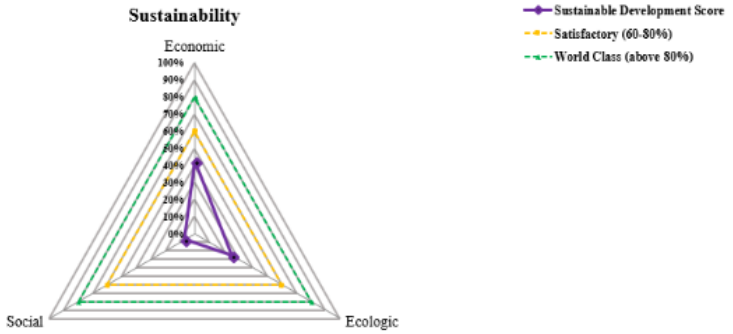
The aim of this section is to verify the indicators for these 8 principles (derived from ISO9001:2015 and Supply Chain Management) and verify the usability of this diagnostic tool.

Diagnostics summary part 1 (sample)

Organisation: Sustainable Solutions Ltd.	**Assessment date:** 04/03/2018			**Project champion:** Ali Bastas
SSCQM Principle	**Maturity**	**Economic**	**Ecologic**	**Social**	**Assessment Scoring Criteria (0 - 5)**
Customer Focus	0%	0%	0%	0%	**0: No evidence of implementation** **1: Informal/inadequate processes in place** **2: Partially implemented** **3: Formal process in place inclusive of all YOS TBL parameters** **4: Formal process in place along with evidence of Cont Impr.** **5: Fully implemented inclusive of all GRI sustainability indicators**
Leadership	32%	60%	33%	3%	
Engagement of people	40%	73%	40%	7%	
Process Approach	31%	60%	30%	3%	
Improvement	27%	40%	20%	20%	
Evidence Based Decision Making	40%	75%	25%	20%	
Relationship Management	22%	30%	35%	0%	
Supply Chain Integration	7%	0%	20%	0%	
		42%	25%	7%	**Unidimensional TBL score**
				25%	**Organizational SSCQM Score**



Diagnostics summary part 2 (sample)



Maturity assessment of "Engagement of People" principle indicators (sample)

SSCQM Principle 3 - Engagement of People				
	Indicators	**Economic**	**Ecologic**	**Social**
3.1	Is collaboration promoted for sustainable development throughout the organization ?	4	2	0
3.2	Is sharing of knowledge, experience and information facilitated among employees for sustainable development ?	3	2	1
3.3	Is the workforce empowered to determine constraints, take initiatives and contribute to sustainable development as required ?	5	2	0
3.4	Is there an established communication with people to promote understanding of the importance of their individual contribution to sustainable development ?	3	3	0
3.5	Is people's contribution, learning and improvement with reference to sustainable development recognized and acknowledged ?	4	2	0
3.6	Do the people of the organization conduct self-evaluation of performance with reference to their contribution to the sustainable development against personal objectives ?	3	1	1
	Unidimensional TBL score	73%	40%	7%
	Principle Maturity		40%	

Principle 1 - Customer focus indicators

1.1 Are the current and future sustainability needs and requirements of current and potential customers identified and risk analysis conducted ?

1.2 Are the sustainability needs and requirements of customers aligned with the objectives of the organization ?

1.3 Is the customer satisfaction with reference to sustainability performance of the organization measured and monitored along with implementation of actions as appropriate ?

1.4 Are the sustainability needs and requirements of customers communicated throughout the organization ?

1.5 Are the organizational members at all levels aware of customer sustainability needs and requirements ?

1.6 Are the relationships actively managed with customers along with established communication and cooperation on sustainability issues ?

1.7 Are the needs and appropriate expectations of the interested parties that can affect customer satisfaction with reference to sustainability performance identified and actioned ?

1.8 Are the products, services and processes of the organization aligned with the sustainability needs and requirements of the customers and the market ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

Principle 2 - Leadership indicators

2.1 Are the leaders of the organization committed to sustainable development through clear mission, vision, policies and objectives ?

2.2 Are the sustainable development mission, vision, policies and objectives articulated throughout the organization ?

2.3 Is the organization-wide commitment to sustainable development encouraged ?

2.4 Is the workforce provided with the necessary resources, training and authority to drive sustainability improvement activities ?

2.5 Are people in the organization inspired and encouraged to engage in sustainability improvement activities, being recognized both at individual and team levels ?

2.6 Are the leaders of the organization at all levels positive examples to people in the organization with reference to sustainable development ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

Principle 3 - Engagement of people indicators

3.1 Is collaboration promoted for sustainable development throughout the organization ?

3.2 Is sharing of knowledge, experience and information facilitated among employees for sustainable development ?

3.3 Is the workforce empowered to determine constraints, take initiatives and contribute to sustainable development as required ?

3.4 Is there an established communication with people to promote understanding of the importance of their individual contribution to sustainable development ?

3.5 Is people's contribution, learning and improvement with reference to sustainable development recognized and acknowledged ?

3.6 Do the people of the organization conduct self-evaluation of performance with reference to their contribution to the sustainable development against personal objectives ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

Principle 4 - Process approach indicators

4.1 Are the sustainability objectives of the organization defined along with the processes necessary to achieve them ?

4.2 Are the high risk activities and processes determined for organizational sustainability performance (sustainability risk-based thinking) ?

4.3 Are the high risk processes and their interrelations managed effectively and efficiently as a coherent system in line with sustainability objectives ?

4.4 Are the organizational capabilities understood and resource constraints established and actioned with reference to sustainable development ?

4.5 Is the necessary information available to monitor, analyse and improve the sustainability performance of the overall system (organisation) ?

4.6 Is the authority, responsibility and accountability established for managing processes in line with sustainability objectives ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

Principle 5 - Improvement indicators

5.1 Are the sustainability improvement objectives implemented at all levels of the organization ?

5.2 Is the workforce trained and competent in promoting, tracking and completing sustainability improvement projects in line with the objectives ?

5.3 Are the sustainability improvement considerations incorporated into the new product, process and service introduction processes ?

5.4 Are the sustainability improvement projects' planning, implementation, completion and results tracked, reviewed and audited ?

5.5 Is organizational sustainability improvement recognized and acknowledged ?

5.6 Are processes developed and deployed to implement sustainability improvement projects throughout the organization ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

Principle 6 - Evidence based decision making indicators

6.1 Are the key performance indicators for organizational sustainability improvement objectives identified, monitored and controlled ?

6.2 Is the workforce trained and competent in sustainability performance data capturing, evaluation and analysis methods ?

6.3 Is accurate and reliable data and information measured and evaluated for organizational decision making and sustainability improvement action deployment ?

6.4 Is all data and information with reference to sustainability improvement available to the relevant people throughout the organization ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

Principle 7 - Relationship management indicators

7.1 Are the current and future sustainability needs and requirements of interested parties (e.g. Public, Regulatory etc.) identified and risk analysis conducted ?

7.2 Is the information, feedback, expertise and resources being exchanged with key interested parties for sustainable development ?

7.3 Are collaborative sustainability improvement activities established with suppliers, partners and other interested parties ?

7.4 Are sustainability improvements and achievements by providers and partners recognized and encouraged ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

Principle 8 - Supply chain integration indicators

8.1 Is information being shared between supply chain members including IT support with reference to sustainable development ?

8.2 Are joint cooperation activities being held across the supply chain including cross-enterprise participation for sustainable development ?

8.3 Is there an association among supply chain members based on commitment, long term orientation and trust with ref. to sustainable development ?

In your opinion, do these indicators accurately represent this principle for maturity level assessment with reference to economic, ecologic and social sustainability ? *

- ◯ Yes
- ◯ No
- ◯ I am not an expert in this area.

Please indicate below if you disagree with any of the above indicators:

Your answer

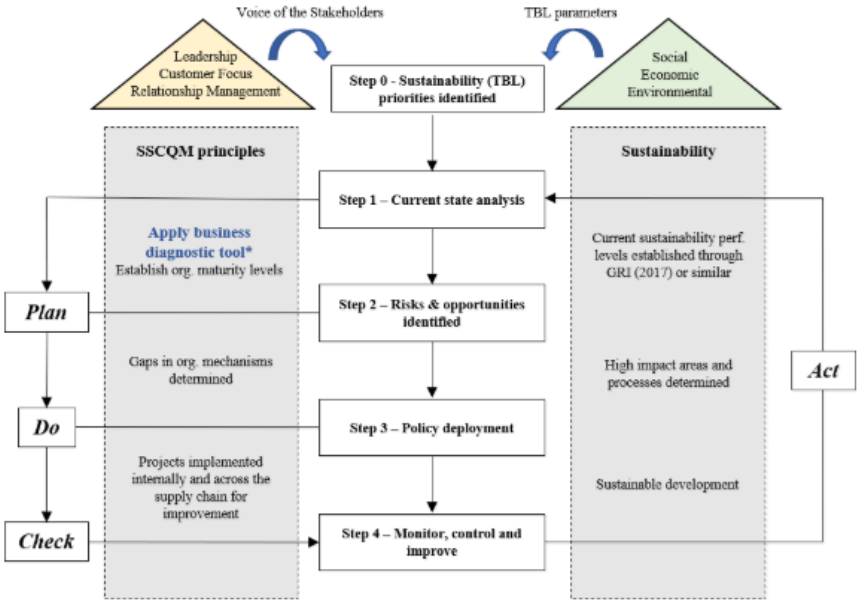
Using the scale from 1 to 4, please indicate (X) your level of agreement with the following statements with reference to business diagnostics tool developed: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
The diagnostics tool enables maturity assessment of prospective sustainability management principles	◯	◯	◯	◯
The diagnostics tool enables gauging alignment of organizational mechanisms, structures and processes with sustainability parameters	◯	◯	◯	◯
The application of the tool is feasible	◯	◯	◯	◯
The tool is of practical use to industry.	◯	◯	◯	◯

Section 3 - Conceptual Framework for Sustainable Development

The aim of this section is to verify the correctness, completeness, conciseness and clarity of the proposed sustainable supply chain quality framework (SSCQM) presented below, as a conceptual framework developed to facilitate sustainable development of organisations and supply chains through sustainability management (SSCQM) principles maturity assessment and improvement.

Conceptual framework of SSCQM



Brief description of each step of the conceptual framework

PDCA Step	Description	Output
Plan - Step 0	Identify the key economic, ecologic and social sustainability requirements of the stakeholders of your organisation. Consider sustainability requirements of your customers and other interested parties (e.g. Public, Legislative Bodies).	Sustainability priorities of the organisation identified
Plan - Step 1	Using the business diagnostic tool, assess your organisation against the indicators of each principle versus economic, ecologic and social sustainability parameters identified in Step 0, as per the assessment criteria below, awarding scores from 0 - 5 as appropriate: 0: No evidence of implementation 1: Informal/inadequate processes in place 2: Partially implemented 3: Formal process in place inclusive of all VOS TBL parameters 4: Formal process in place along with evidence of Cont Impr. 5: Fully implemented inclusive of all GRI sustainability indicators	SSCQM principles maturity with reference to triple bottom line sustainability established
Plan - Step 2	Analyse the findings, establishing the organisational strenghts, weaknesses, risks and opportunities with reference to the SSCQM principle maturity levels and implementation level of economic, ecologic and social sustainability parameters. Measure and determine current sustainability performance levels for the economic, ecologic and social parameters identified in Step 0.	Strengths, Weaknesses, Opportunities and Risks with reference to sustainable management established. Current sustainability performance levels determined.
Do - Step 3	Deploy policies and improvement projects internally (within the organisation) and across the supply chain for the areas identified as high risk and requiring improvement	Sustainability improvement action plan generated
Check - Step 4	Measure and monitor effects of policies and improvement projects deployed. Redeploy improvement actions and sustain improvements through standard work, as required.	The effect of improvement actions monitored and controlled for sustainable development
Act	Revisit Step 0 and 1, reassessing the voice of the stakeholders, organisational maturity levels against triple bottom line sustainability for continual sustainable development	Continual cycle of sustainable development through PDCA

Correctness, Completeness, Clarity and Conciseness test

The aim of this session is to verify:

A - "Correctness" of the proposed framework with reference to compatibility and consistency of its elements with stated theories and methodologies.

B - "Completeness/significance" of the proposed framework with reference to the validity of its context and its completeness as a management framework to drive continual sustainable development.

C - "Clarity" of the proposed framework with reference to its contents and adequacy for practitioners.

D - "Conciseness" of the proposed framework with reference to its simplicity and practicality of its contents and structure for practitioners.

Using the scale from 1 to 4, please indicate (X) your level of agreement with the following statements with reference to "correctness" of the proposed SSCQM framework: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
New management approaches are much required for integration of sustainability into management processes for sustainable development	○	○	○	○
The components of the framework is aligned with established theories and methodologies	○	○	○	○
Quality and supply chain management principles adopted in this framework are compatible for integration of sustainability into management structures of organisations	○	○	○	○
Plan-Do-Check-Act and step-by-step structure utilised is feasible for this type of framework for driving continual sustainability improvement	○	○	○	○

The framework facilitates measurement and improvement of organisational sustainability performance	○	○	○	○
The framework facilitates managerial decision making and action deployment with reference to sustainable development	○	○	○	○
The framework contributes to the body of knowledge through a novel framework integrating Sustainability with Quality and Supply Chain Management	○	○	○	○

Please provide your comments below, if you disagree with any o the above for further insight and development:

Your answer

Using the scale from 1 to 4, please indicate (X) your level of agreement with the following statements with reference to "completeness" of the proposed SSCQM framework: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
The framework is complete to drive integration of sustainability into organizational processes	○	○	○	○
The framework covers all essential steps necessary to drive continual sustainable development	○	○	○	○

Please provide your comments below, if you disagree with any of the above for further insight and development:

Your answer

Using the scale from 1 to 4, please indicate (X) your level of agreement with the following statements with reference to "clarity" of proposed SSCQM framework: *

	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
The description of the components aligns with the framework	○	○	○	○
The description of the framework is explicit and clear	○	○	○	○
The application of the framework is feasible	○	○	○	○

Please provide your comments below, if you disagree with any of the above for further insight and development:

Your answer

Using the scale from 1 to 4, please indicate (X) your level of agreement with the following statements with reference to "conciseness" of proposed SSCQM framework: *

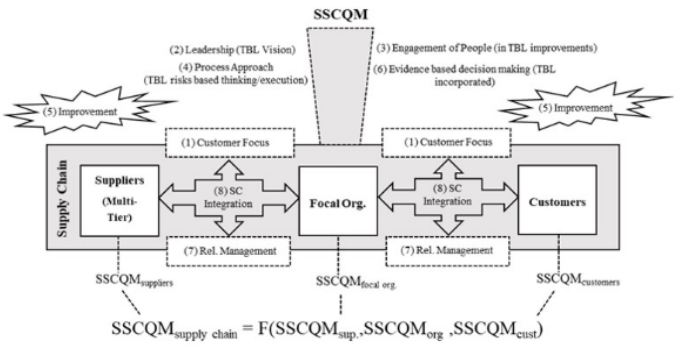
	1 - Strongly Disagree	2 - Disagree	3 - Agree	4 - Strongly Agree
The framework is neither complex nor over simplified	○	○	○	○
The interconnections between the components of the framework are clear	○	○	○	○
The framework is of practical use to industry.	○	○	○	○

Please provide your comments below, if you disagree with any of the above for further insight and development:

Your answer

Deployment to supply chains

As conceptualised below, the adoption of SSCQM philosophy across the supply chain of organisations carries the potential to not only allow sustainable management maturity assessment and improvement of the implementing organisations but also their supply chains. sustainability performance of the organizations and their supply chains.



Using the scale from 1 to 4, please rate your level of agreement with the following statement: "The promotion and implementation of similar SSCQM assessments at the upstream and downstream of supply chain networks will provide cumulative sustainability assessments and improvements for supply chains as illustrated above" *

- ○ 1 - Stongly Disagree
- ○ 2 - Disagree
- ○ 3 - Agree
- ○ 4 - Stongly Agree

Please provide your comments below

Your answer

APPENDIX FIVE

Action Research Study - Ethics Information Sheet and Consent Confirmation

The director of the organisation participating in the action research study was provided with the information sheet below, outlining key research ethics issues and his consent confirmed:

Information Sheet

Title of Study
Improving the performance of supply chains, integrating sustainability, supply chain management and quality management

Principal Investigator
Dr. Kapila Liyanage

Researcher
Mr. Ali Bastas – A.Bastas@derby.ac.uk

College of Engineering & Technology
University of Derby
Markeaton Street, Derby
United Kingdom
DE22 3AW

Background
Your participation is requested to take part in an action research study. Please read this information sheet and consent form carefully. Please consult the researcher if you may have any queries or if you may require any further information.

Purpose
The purpose of this action research study is to apply a new management concept and a business diagnostic tool developed by the researcher to facilitate integration and improvement of sustainability in its intended context (organisational and supply chain management).

Study Procedure
Your anticipated time commitment for this study is 10 hours over a period of 3 months (Dec 18 to Feb 19). As part of the study, you will be required to complete all four steps of the concept with the researcher as outlined in Figure 1 including:

- The voice of the stakeholders analysis that will establish the sustainability priorities of your organisation
- Current state analysis and sustainability integration maturity level assessment (using the business diagnostic tool provided)
- Implementation of sustainability integration and improvement actions
- Review effects of the actions implemented

Risks
The risks associated with this study is minimal. All organisational health, safety and environmental procedures will be followed by the researcher during the site visits. Confidentiality and anonymity regarding the participating organisation and its individuals will be maintained at all times and information destroyed post data analysis. You may choose to decline to answer any or all of the questions during the study and you may withdraw from the study at any time without providing any reason.

Benefits
It is anticipated that the study will provide your organisation with the following potential benefits:

- Definition of sustainability and its KPIs for your business, prioritizing the needs of your stakeholders
- Provide a quantitative current state risk analysis with reference to sustainability integration, guiding managerial improvement action planning
- Gaining access to a state-of-the-art research study, developing organisational learning with regards to organisational and supply chain sustainable development processes and know-how

Confidentiality
Your company name will be kept anonymous and confidential, unless you request that this information can be disclosed during academic publications. Every effort will be made by the researcher to maintain the confidentiality and anonymity of the participating business and individuals including the following:

- Meeting notes, company reports, company documentation, sustainability data, interview transcriptions, survey data and any other participant identifying information will be kept in a locked storage cabinet. All collected materials will be destroyed post data analysis.
- The researcher and the members of the research committee will review the data collected. This data will only be used for the purpose of this study and its associated publications.
- Any final publication will maintain the anonymity and confidentiality of the participating organisation and individuals.

Voluntary Participation
Your participation in this research is entirely voluntary. If you decide to take part in this study, you will be asked to sign a consent form. You are free to withdraw from this research study at any point in time, without providing any reasons. You are also free not to answer any questions if you may wish, during this study. This will not affect your relationship with the researcher.

Unforeseeable Risks
Every effort will be taken to minimize any risks during the study however, there may be risks that are not anticipated.

Costs to Subject
There are no costs associated to you and to your organisation for your participation in this study.

Compensation
There are no monetary or other means of compensation to you and to your organisation for your participation in this study.

Institutional Review Board
Should you have any questions with reference to your organisation's rights in this research or should you wish to discuss any problems / concerns which you do not feel you can discuss with the researcher, please contact the principal investigator by phone - +44(0)1332593260 or by email - K.Liyanage@derby.ac.uk or alternatively the institutional research office by email Researchoffice@derby.ac.uk.

Contact
Should you have any questions, concerns or require information about this research, please contact the researcher from the contact details outlined above.

UNIVERSITY of DERBY

Research and Ethics Consent Form

Independent Research S Organisation X
Improving the performance of supply chains, integrating sustainability, supply chain management and quality management
Action Research Project – Cyprus Environmental Enterprises Ltd., Cyprus

Name of Researcher: Ali Bastas

Email: A.Bastas@derby.ac.uk

	Please Tick
1. I confirm that I have read and understood the information sheet for the above study and have had the opportunity to ask questions as required, having been provided a copy of this consent form and the information sheet.	☑
2. I understand that my participation is voluntary and that I am free to withdraw at any time without the obligation to provide any reason.	☑
3. I agree to take part in the above study.	☑
4. I agree to the sustainability and associated management process, performance and related information data collection process.	☑
5. I agree that the researcher may use the data collected anonymously for academic publication purposes.	☑

CAN SAYI	01/12/2018	
Name of Participant (on behalf of the organization)	Date	Signature
ALI BASTAS	01/12/2018	
Name of Researcher	Date	Signature

APPENDIX SIX

Delphi Study Invitation Letter Template

Dear Mr./Dr./Prof. _____,

I am writing to request your participation in a Delphi Study to verify and validate a theoretical and conceptual framework which is being developed to support sustainable development of organisations and supply chains. The purpose of Delphi study is to seek the opinion of experts in or those who are familiar with the fields of sustainability, quality and supply chain management. In the view of your established expertise, your opinions and input are of great value / importance at this pioneering stage of the framework.

The first study is envisaged to take an average of 20 - 25 minutes and will be sent to you in the next three days via a link from the google forms website, if you wish to take part in the study. You will be expected to complete the study within two weeks after which, feedback will be made available to you or a follow-up study if a consensus is not reached.

The responses to the study are going to be anonymous and your details will not be shared with other participants or third parties.

I feel that your expertise will be extremely beneficial in the development of a management framework that aims to support sustainable development of businesses globally and would be very grateful if you would consider participating in this Delphi study. Please let me know whether you would like to take part by replying to this email.

Please do not hesitate to contact me if you may require any further information.

Many thanks in advance for your contribution,

Yours sincerely,

Ali Bastas
MEng(Hons) CQP MCQI DipQ PhD Candidate
E-mail: A.Bastas@derby.ac.uk
Voice: +44 (0)7412016279

Director of Studies: Dr. Kapila Liyanage
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