

Mastering Continuous Improvement (CI): The Roles and Competences of Mid-Level Management and their Impact on the Organisation's CI Capability

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Abstract

This paper establishes a comprehensive basis for understanding the roles and competences of mid-level management and their influence on the effectiveness of Continuous Improvement (CI) capability within an organisation.

This research builds upon the hypothesis that methods alone do not lead to successful CI capability development. It focuses on the role of mid-level management in driving a CI Environment that underpins the effectiveness of CI capability. A reference model for the CI Environment is synthesised based on critical literature review, integrating CI Culture, CI enablers and CI Leadership elements. A comprehensive framework is introduced to define CI Leadership roles and competence indicators. A quantitative benchmarking study involving structured interviews with 15 UK organisations was undertaken to collect evidence for a causal relationship between CI Leadership competences and CI capability.

Analysis of the benchmarking data provides clear evidence of the causal relationship between the CI Leadership competences of mid-level management and CI capability of the organisation. Given that the empirical study was structured on the basis of the CI Leadership roles & competences framework introduced in this paper, this also provides validation for the proposed framework and the CI Environment model.

This research proves for the first time the significance of the causal relationship between the CI Leadership competences and the effectiveness of the CI Capability within an organisation, thus filling an important gap between established previous work, focusing on the role of mid-level management on one side and practitioner and team level roles, methodologies and tools. The proposed CI Environment model is a theoretical contribution with reference value for both practice and further studies. The comprehensive framework for mid-level management CI Leadership roles, responsibilities and competences introduced in this paper provides sound foundation to deliver CI Leadership in the workplace.

The evidence-based knowledge of the positive relationship between the mid-management CI Leadership competences and the effectiveness of the CI Capability informs strategic organisational development interventions towards enhancing CI capability and effectiveness, ultimately underpinning productivity enhancement and sustainability. The framework for mid-level management CI Leadership roles, responsibilities and competences introduced in this paper and grounded in underpinning work undertaken within a large automotive OEM, can be adapted by any organisation. The CI Environment reference model should provide a comprehensive support for strategists to communicate the framework for CI capability improvement within an organisation, to enhance acceptability and adherence to improvement actions.

Keywords: Continuous improvement, Leadership, Competences, Organisational Learning.

1. Introduction

Continuous improvement (CI) can be defined as a systematic and ongoing approach to improve products, services or processes (American Society for Quality, 2021). These improvement initiatives (seeking both incremental and breakthrough improvements) are expected to achieve benefits, both tangible and intangible, aligned with the strategic goals of the organisation. From an organisational and lean perspective, CI skills and competences are consistently identified by employers as essential to optimise efficiency, enhance business output and growth, and to drive higher quality standards (Bettsworth & Davies, 2016). In a competitive business environment, CI is often seen as an essential mechanism for survival (Andersson, *et al.*, 2006). High levels of organisational CI capability can also represent a competitive advantage (Bessant, 2001) (Gonzalez & Martins, 2016). Furthermore, methods and tools alone are not sufficient for successful deployment of CI, as they do not necessarily impact the organisational CI Culture (Bessant, 2001) (van Assen, 2018).

The literature about operational excellence highlights the importance of leadership in motivating, supporting and enabling CI effectively. However, CI Leadership roles have not been explicitly defined in the relevant literature, neither in terms of the required managerial competences, nor in terms of the routes to acquire the required competence levels.

While management and leadership roles are described to some extent within CI approaches, typical training and development interventions tend to focus mainly upon various practitioner roles, tools and techniques. However, little emphasis is given to building and maintaining the wider organisational culture required for success (Dahlgaard & Dahlgaard-Park, 2006).

Furthermore, studies on leadership-based inhibitors to CI (Haikonen, *et al.*, 2004) have identified the management role to be the foundation for success and highlighted the need for a clearer definition.

The focus of this paper is on middle management as it typically is responsible for leading teams in the implementation of CI initiatives (Jørgensen, et al., 2003). Furthermore, the paper seeks to establish a framework for roles and competences for mid-level management to underpin an effective CI capability. This research starts with the hypothesis that specific CI knowledge, skills and competences of managers and leaders are required to enable an effective organisational CI capability. An approach that exclusively focuses on CI tools and techniques, but disregards CI Leadership development, may have a significant negative impact on achieving an effective CI capability.

The research presented in this paper is guided by three research questions that have been defined:

RQ1. *What is the current expectation for the impact that managers and leaders are likely to have upon CI effectiveness?*

A critical review of background literature will be carried out to establish a model for the organisational environment that fosters CI capability development. This model will enable further reasoning about the importance of CI Leadership roles and competence requirements within the CI environment to achieve an effective CI implementation.

RQ2. *What are the role and competence requirements that enable mid-level managers to support effective CI within an organisation?*

The critical review of the state of the art will be synthesised in a comprehensive framework of CI Leadership role and competence requirements for mid-level managers to support an effective CI Environment. The proposed framework will provide a basis for evaluation of demonstrated CI Leadership competence within a benchmarking study.

RQ3. *Is there evidence for a relationship between the level of development of CI Leadership competences for mid-level management and the CI capability of an organisation?*

A quantitative benchmarking study will be carried out to establish the evidence for a relationship between the CI Leadership and CI capability of the organisation, as a premise for prescriptive organisational development actions to enhance the CI Capability. This study uses a survey based on structured interviews with CI practitioners and managers for quantitative data collection related to CI practices and applying a purposive sampling approach. Fifteen large organisations in different industrial sectors operating in the UK were targeted with statistical analysis employed to characterise the relationship between the CI Leadership competences and the Organisational CI Capability, based on the survey data.

The structure of the paper follows the research to answer the stated research questions. Section 2 develops the theoretical background on relevant CI concepts, with a reference model proposed to establish key enablers in the reinforcing cycle of CI Culture and CI Environment. Section 3 presents the development of the proposed framework defining middle management roles and competence requirements for CI Leadership. Section 4 introduces the methodology for the quantitative benchmark study of the relationship between CI Leadership and CI Capability, and section 5 discusses the results of the benchmarking study and analyses the strength of their relationship. Discussion of findings, practical implications, limitations and future scope are discussed in section 6.

2. Theoretical Background on Continuous Improvement Capability and Culture.

2.1 Tangible Enablers for Organisational CI Capability.

CI capability involves knowledge, mechanisms, systems, practices, etc. for involving the organisation in learning processes, towards achieving a learning organisation (Haikonen, *et al.*, 2004). Benefits of CI on organisational performance have been typically measured based on Return on Investment. However, this approach disregards other key areas of potential

benefit. Other approaches consider assessing potential benefits based on the level of CI maturity (Bessant, 2001), ranging from minimal benefits at lower maturity level to CI being considered a strategic asset for competitive advantage at the highest maturity level. Mature CI Capability has the potential to enhance innovation, research and development activities. Thus, CI capability can embed organisational learning in the CI Environment (Oakland, 2014), (Savolainen & Haikonen, 2007), (Barua, 2021). Capability maturity assessment models are typically based upon self-assessment and supported by independent facilitation (Bessant, 2001), (Jørgensen, et al., 2004), (Murray & Chapman, 2003), (Lean Six Sigma Academy, 2020), (Lindemulder, 2015). CI maturity assessment models also observe CI behavioural routines and assess CI enablers (Bessant, 2001).

The development of a successful CI capability is underpinned by critical enablers. These are required to initiate, develop, facilitate, and maintain CI activities, and to support the development of CI behaviours (Caffyn, 1997). Examples of enablers have been identified by Jørgensen, *et al.* (2003) and Frimenko (2012), including infrastructure requirements for effective Six Sigma deployment. Furthermore, implementing a robust Quality Management System (QMS), formulating clear strategic vision and objectives, and defining relevant Key Performance Indicators (KPIs) have been identified as CI enablers (Oakland, 2014), (Basu, 2011), (British Standards Institution, 2009) (Bouranta, 2020). Deming (1986) and Imai (1986) identify the role of standards in achieving effective CI through maintaining performance and improving the standards themselves. Table 1 summarizes the critical CI enablers that can be considered tangible organisational assets to strengthen CI capability. These enablers are elements of the CI Environment.

Enablers for Organisational CI Capability	Key Source Literature
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Business Vision & Quality Policy	(British Standards Institution, 2015a), (Chartered Quality Institute, 2020), (Deming, 1986), (Martichenko, et al., 2014), (Oakland, 2014)
Quality Management System	(British Standards Institution, 2015a), (Chartered Quality Institute, 2020), (Oakland, 2014)
Strategy, Objectives & Key Performance Indicators	(Automotive Industry Action Group, 2012), (British Standards Institution, 2015a), (Martichenko, et al., 2014), (Oakland, 2014)
Organisation Standards and Knowledge Management	(British Standards Institution, 2015a), (Chartered Quality Institute, 2020), (Deming, 1986), (Martichenko, et al., 2014), (Oakland, 2014)
CI Learning programme	(Automotive Industry Action Group, 2012), (Deming, 1986), (Juran, 1989), (Martichenko, et al., 2014), (Oakland, 2014)
CI Enablers and Infrastructure	(British Standards Institution, 2011), (Caffyn, 1999), (Bessant, 2001), (Breyfogle, 2003), (Harry & Schroeder, 2000)
Resource Allocation for CI	(Automotive Industry Action Group, 2012), (British Standards Institution, 2011), (Deming, 1986), (Juran, 1989), (Martichenko, et al., 2014), (Oakland, 2014)
Incentives, Rewards & Recognition (for participation in CI)	(Automotive Industry Action Group, 2012), (Breyfogle, 2003), (British Standards Institution, 2011), (Deming, 1986), (Juran, 1989), (Martichenko, et al., 2014), (Oakland, 2014)

Table 1. Critical enablers for organisational CI Capability.

2.2. Organisational Culture as Enabler for CI Effectiveness.

Organisational culture has been casually explained as ‘the way things get done around here’ (Deal & Kennedy, 1982). However, it can be formally defined as the pattern of basic assumptions that a specific group has created, discovered or developed in its learning journey to deal with problems of external adaptation and internal integration (Schein, 1984). These assumptions become organisational culture when they are considered valid, adopted and taught to new members. Consequently, organisations may present a distinct and unique culture (Kotter & Heskett, 1992). Furthermore, the dynamic nature of organisational culture is reflected in how culture is created, learned, passed-on and changed (Schein, 1984). This is a complex process underpinned by beliefs, behaviours, norms, dominant values, rules and climate in the organisation (Oakland, 2014). Understanding opportunities and constraints related to the existing organisational culture ensures successful implementation of changes. In contrast, the inertia of the wrong organisational culture could become an obstacle for change

(Duffy, 2014). Therefore, organisational culture is key to achieve strategic objectives and performance excellence, as cultural variables can be strongly related to the strategy, structure and effectiveness of the organisation (Rother, 2010) (Schein, 1984).

Oakland (2014) identified five key components of organisational culture:

- (1) Behaviours based on people interactions.
- (2) Norms resulting from working groups.
- (3) Dominant values adopted by the organisation.
- (4) Rules of the game for 'getting on'.
- (5) The climate within and outside the organisation.

Schein (2010) describes three levels of organisational culture:

- (1) Artefacts – the phenomena which is seen, heard, felt, including the visible products of the group.
- (2) Espoused Beliefs and Values – group learning translated into underlying models which the group buy in to by consensus.
- (3) Basic Underlying Assumptions – rules which are taken for granted by the group to be true, not confronted, and difficult to change.

The role of leaders is critical in shaping and reinforcing the organisational culture at different organisational levels (Dahlgaard & Dahlgaard-Park, 2006; Schein, 2010; Oakland, 2014).

Culture is embedded through artefacts that they create and value. Artefacts include everything that is measured and controlled, systems, procedures, resource allocation, etc. (Schein, 2010), (Pamfilie, *et al.*, 2012).

Although organisational culture can be difficult to identify, it has a key impact on CI success (Dahlgaard & Dahlgaard-Park, 2006). Bessant, *et al.* (2001) discussed the importance of behavioural dimensions to the development of CI capability. Individual behaviours to support

CI must be nurtured to become organisational behaviours and routines embedded in the organisation's culture. Core values, beliefs and the purpose of the organisation are typically defined in strategic vision and mission statements (Oakland, 2014). These are important building blocks for organisational culture. However, those statements are not sufficient to shape the culture. The values and ethics need to be implemented through actions and behaviours of individuals. The development of CI capability can be considered an organisational change process. This process involves employees and organisational structures, emphasising renewal and improvement, and resulting in improved learning capacity (Haikonen, *et al.*, 2004). Implementation of successful CI initiatives (e.g. Total Quality Management (TQM), Six Sigma, etc.) requires establishing an organisational culture where staff are proactively working to achieve organisational goals (van Assen, 2018), (Dahlgaard & Dahlgaard-Park, 2006), (Laureani & Antony, 2018), (Unzueta, *et al.*, 2020). An organisational culture aligned to deliver effective CI is associated with intangible benefits, including motivational aspects of successful development and deployment of CI capability (Imai, 1986) (Jørgensen, *et al.*, 2004).

2.3. Proposed CI Environment Model: Establishing the Relationship between Organisational CI Culture & CI Enablers.

A conceptual model is proposed to represent links and causal relationships of key elements in the cycle of reinforcing CI culture. Figure 1 illustrates this model that identifies both the visible and tacit elements impacting CI culture. The arrows indicate causal linkages, which define a cycle of influences that shape the development of the CI Culture.

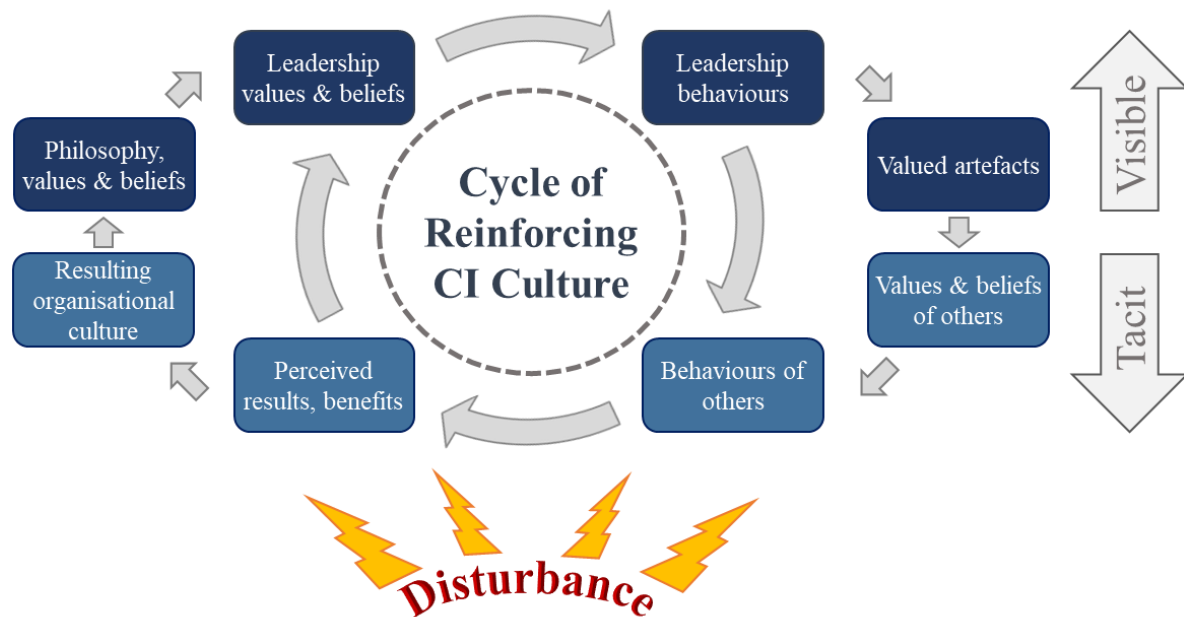


Figure 1. Model of the development of organisational CI culture.

Figure 1 depicts the causal influence that values and beliefs of organisation’s leaders have on their visible behaviours related to CI activities. Similarly, leadership behaviours have a causal influence on values, beliefs and behaviours of their teams and other individuals operating in the CI Environment. Additional interactions between the CI leaders and ‘others’ are identified within the tacit cultural elements (Liker & Convis, 2011) (Laureani & Antony, 2018) (Lakshman, 2006). The perceived results and benefits achieved due to these behaviours supporting CI activities will generate a reinforcing feedback loop upon leadership values and beliefs. This reinforcing cycle will strengthen the CI Culture at all levels in the organisation and make CI Capability more effective. The model also illustrates that CI Culture will be constantly challenged by ‘disturbances’ from competing initiatives, cultures, and business pressures, etc. This is known as the risk of entropy (Liker & Convis, 2011).

By considering the influence of CI enablers on CI Culture, a holistic model is defined to depict the cycle of reinforcing CI Culture and CI enablers within the CI Environment (see

Figure 2). The CI Environment is integrated with the organisational structure, resources, and culture that supports the successful development of CI Capability. CI practitioners and mid-level managers operate within the CI Environment, supporting and leading teams in CI initiatives. This model illustrates how values, beliefs and behaviours of CI leaders are the link between tangible elements of the organisation's CI Environment and the intangible elements related to CI Culture. Those tangible elements are represented by key enablers of CI Capability that exist within the current CI Environment. These include strategic vision, quality policy, QMS, strategic objectives, KPIs, standards, etc. Thus, the cycle of reinforcing CI Culture will enhance enablers of CI Capability through CI Leadership. Furthermore, leadership values, beliefs and behaviours influence the definition of roles and competences required to form effective CI leaders. It is important to define these leadership roles and competences in more detail and identify relevant KPIs to facilitate effective performance measurement in the context of CI Capability. CI Environment and CI Culture are strongly interdependent and together they will determine CI capability.

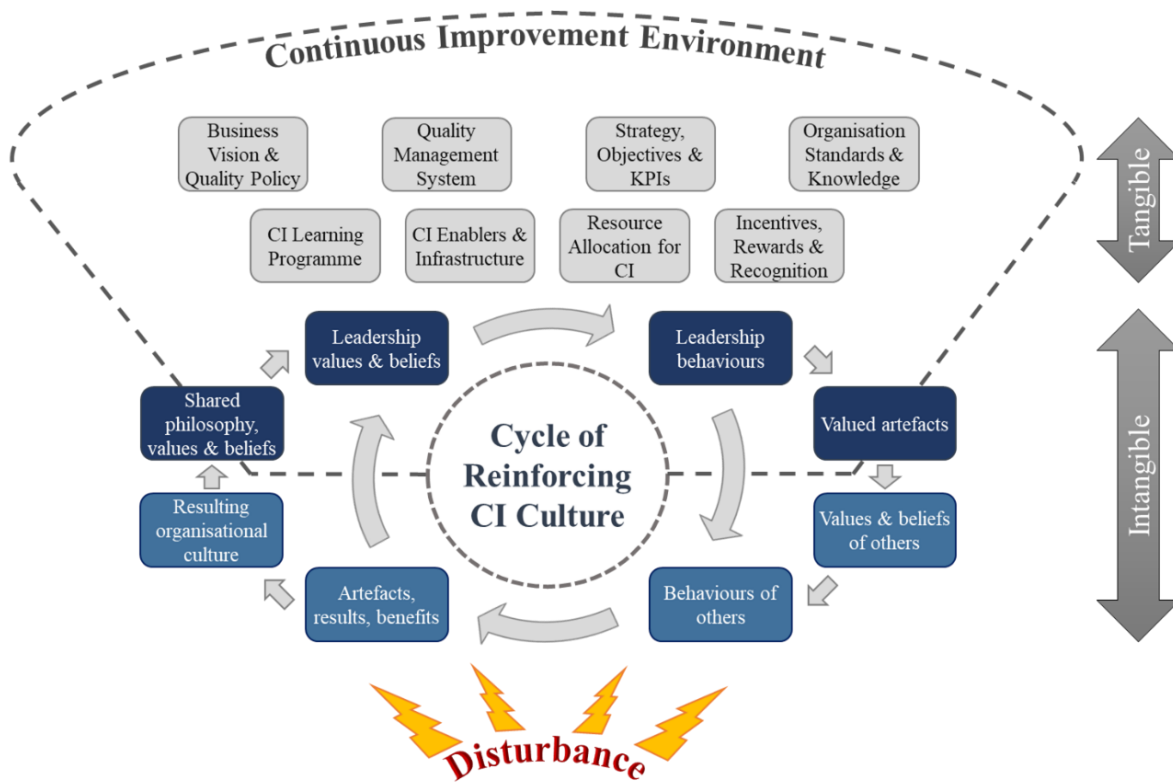


Figure 2. Holistic model for the CI Environment.

3. Development of a Framework for Middle Management Roles and Competence

Requirements for Effective CI Leadership

3.1. CI Leadership Role of Middle Management

The role of middle management requires more analysis from a leadership perspective (Lakshman, 2006). Senior leaders are responsible for creating strategies to plan, create and deliver products and services. In contrast, mid-level managers have responsibility for building teams, coaching behaviours, managing systematic experimentation, engaging employees and ensuring effective teamwork.

Holmemo & Ingvaldsen (2016) described mid-level managers as a diverse group of managers between top-level leadership and first-line of supervision with the role of linking strategic decisions and actions of top-level management with the operational level. This role allows

middle management to understand potential weaknesses in communication, systems, improvement initiatives, required resources, commitment from higher management levels, required motivation, teamwork, etc. These elements are critical for successfully implementing CI Culture, tools and methods (Lodgaard, *et al.*, 2016). Thus, local leadership is critical in applying the appropriate teamwork approach for successful deployment of CI in different functional areas (de Jager, *et al.*, 2004).

Jurburg *et al.* (2017) discussed that the willingness of employees to participate in CI initiatives should be an objective of managers and delivered through both training and engagement within the CI system. Thus, middle managers play a key role as change agents, improving processes and enhancing organisational learning (Haikonen, *et al.*, 2004), (Holmemo & Ingvaldsen, 2016). Dahlgaard & Dahlgaard-Park (2006) described the need to build quality into people to enable a successful CI Culture, aiming to develop both core values and competences. Therefore, CI Leadership represents a critical role for mid-level managers who lead, motivate, and communicate with their CI teams, creating the conditions to take effective action, enhancing team performance, supporting the creation of a CI Environment and maximising organisational benefits.

3.2. Proposed Framework for Leadership Roles and Competences

The Engineering Council (2014) defines competence as “the ability to carry out a task to an effective standard”. This task-based definition of competence will be used in this study rather than the behaviour-based definition used widely in human resource management (Whiddett & Hollyforde, 2003). The competence of employees has a clear relationship to organisational performance, strategic vision, objectives and culture (Holt & Perry, 2011) (Mills, 2004). The most comprehensive definitions of leadership roles to support CI are associated with the concept of Lean (van Dun, *et al.*, 2017), (Gran, *et al.*, 2012). However, the literature tends to emphasize values and behaviours rather than the explicit roles and competence requirements.

CI practitioner roles and capabilities have been described in general terms (Breyfogle, 2003), (Basu, 2011), (Harry & Schroeder, 2000), (British Standards Institution, 2011). For example, ISO 13053-1 (British Standards Institution, 2011) describes the role of Six Sigma ‘Belts’ as the primary leaders of improvement projects and outlines the required training. Although this standard defines the leadership roles of ‘Champion’ (of the deployment), ‘Deployment Manager’ and ‘Project Sponsors’, it does not emphasise the associated training requirements. The ISO 18404 standard (British Standards Institution, 2015b) also defines competences for Six Sigma ‘Belts’ and lean practitioners. Thus, the contribution of CI leaders is described in general, but without specifically defining their role or competences required.

Relevant ISO standards (British Standards Institution, 2015a) (British Standards Institution, 2009) also identify leadership responsibilities related to QMS. However, they do not specifically identify the required leadership level, roles or competences. The Chartered Quality Institute (2020) competence model for quality professionals provides a useful reference, although relevant leadership roles are not defined. Juran (1989) and Deming (1986) also provide definitions of leadership roles and responsibilities. Through these definitions, it is possible to identify and categorise leadership roles, responsibilities, relevant knowledge, required skills and competences. These are essential for mid-level managers and practitioners leading CI efforts. A framework is proposed to categorise key CI leadership roles and competence requirements for mid-level managers (see Table 2). A total of 15 CI Leadership role and competence requirements have been identified. These have been categorised into 4 main groups to indicate the type of application: (i) pre-requisites for CI (enablers), (ii) role requirements to support the CI Environment, (iii) role requirements involved in implementing CI activities, and (iv) underlying knowledge of key principles required for CI roles.

Appendix A expands Table 2, providing a comprehensive framework for defining roles and competence indicators. This contribution represents an essential and practical guide for CI practitioners and managers.

Group	No.	Role/Competence Title	Source											
			Perspective	Upper Mgt.	Middle Mgt & Supervisors	Mgt.	Middle Mgt & First-level	Leadership	Middle Mgt.	Project Champion & Sponsor	Project Sponsor	Lean Manager	Middle Mgt.	Chartered Quality Professional
Underlying Quality Management System (Pre-requisite for CI roles)	1	Recognise vision & quality mgt. (operating) system, apply systems & process thinking.		X		X	X	X	X	X		X	X	X
	2	Establish goals, measures, objectives & plans.		X	X	X	X	X	X	X		X	X	X
	3	Improve understanding of customer & stakeholder requirements. Develop & improve standards.			X	X	X	X	X			X	X	X
	4	Maintain & improve organisational knowledge through learning.						X				X		
CI Specific Role Requirements (Supporting the CI Environment)	5	Develop capabilities in self & others that are required for improvement.		X	X	X	X	X	X			X		
	6	Identify, scope & prioritise improvement activities.				X	X	X		X		X	X	
	7	Establish, coach, & enable teams to deliver improvement.		X	X	X	X	X	X	X	X	X	X	
	8	Reinforce required CI behaviours. Motivate & support individuals & teams.		X		X	X	X	X	X		X	X	
CI Specific Role Requirements (Involvement in CI Activities)	9	Review & challenge the progress of problem solving & improvement activities.		X		X	X	X	X	X	X	X	X	X
	10	Be personally & actively involved in quality and improvement activities.		X	X	X	X		X	X	X	X	X	X
	11	Engage stakeholders in improvement & change.		X		X	X	X	X			X	X	
	12	Implement effective change to maintain improvement.										X	X	
Knowledg	13	Business excellence principles.					X				X		X	

14	Business improvement principles.				x		x		x		x	
15	Team improvement principles.				x							

Table 2. Proposed framework for CI leadership roles and competence (mid-level managers).

It is important to establish whether a clear relationship exists between CI leadership actions (including roles and competence requirements) and organisational CI Capability. This will allow better understanding of how CI leaders can enable effective CI Capability within organisations.

4. Quantitative Research Methodology: Benchmarking Study to Explore the Relationship between CI Leadership & Organisational CI Capability

4.1 Benchmarking Study Methodology

Quantitative data is required to probe research question RQ3 to demonstrate a clear relationship between CI Leadership competences of mid-level management and achieving an effective organisational CI Capability. This will also validate the proposed CI Leadership framework and the CI Environment model.

The quantitative research was based on a benchmarking study of large industrial organisations operating in the UK. This study started with empirical data collection carried out through a survey based on structured interviews. The benchmarking study was based on a purposive sampling approach (Robinson, 2014). Thus, 15 large organisations with mature CI culture in different industrial sectors were initially targeted. The expertise, networking skills and CI practitioner contact base of the lead researcher were essential to persuade potential participants to collaborate in this survey. The participants had managerial positions or CI practitioner roles with relevant insight into organisational CI practices. The data collected was

relevant to organisational CI capability, CI competences of mid-level managers, and approaches used to develop these competences.

The following criteria were adopted to identify suitable organisations for the survey:

- Large business organisations with more than 1000 employees.
- Mixture of automotive & non-automotive businesses (see Table 3).
- Mature CI Capability with medium-long term application of CI approaches.
- Willingness to participate on a collaborative basis.

A sample-size of 15 organisations was set on the basis that this should be sufficient to establish a simple ‘X versus Y’ relationship between ‘CI Leadership capability’ of mid-level management, and the CI capability of the wider organisation. This sample-size would support the fit of a linear or simple curved prediction model which could be analysed using a linear regression approach. Furthermore, this would also provide sufficient degrees of freedom to establish a robust R² measure to evidence the strength of this relationship (Breyfogle, 2003). Table 3 provides insight into the key characteristics of the participating organisations and their CI characteristics. 14 of the targeted organisations met the selection criteria to be considered for the benchmarking study.

Industry Sector & Characteristics of Benchmarking Organisation	CI Characteristics
O1: Large global automotive OEM with Japanese origin	TQM philosophy, Quality Circles and PDCA activity at all levels of the organisation.
O2: UK Logistics provider & automotive tier 1 supplier.	Strong Way based application of Lean, and Six Sigma.
O3: Large global automotive OEM with Japanese origin	Strong Way based culture & TPS principles, embedded application of Lean & Kaizen.
O4: Large global automotive OEM with EU origin	TPS inspired approach to Lean, wide use of Maturity models.
O5: Large global automotive OEM with EU origin	Iterative product quality improvement focus.

Industry Sector & Characteristics of Benchmarking Organisation	CI Characteristics
O6: UK wide high street & internet home shopping	DMAIC projects with Lean & Six Sigma tools. Some event-based Kaizen.
O7: Global building construction equipment design & manuf.	Strong Six Sigma application & deployment within organisational culture.
O8: Large global premium automotive OEM with UK origin	Lean Manufacturing capabilities, Six sigma capability in Engineering business function, problem solving focus.
O9: Global design & manufacture of IC engines & components	Strong Six Sigma application & deployment, Op. System, Lean value-stream transformation.
O10: Global automotive tier 1 supplier	TPS inspired Op. System, with CI as a pillar, Lean & Kaizen, Maturity model assessments.
O11: Global manufacturer of paints and coatings	Six Sigma DMAIC projects, event-based Kaizen, & local Kaizen, cost focus.
O12: Large global automotive OEM with Japanese origin	Strong Way based culture & principles, process adherence, product quality, x-functional team process improvement.
O13: Large global provider of high-value Engineering, manufacturing & support services (EU origin)	Business process transformation drive, application of Six Sigma through professional Belts, combining with Lean deployment.
O14: Global provider of contract services to public & private sectors	No significant central CI deployment of specific approaches. Innovation within contracts, cost driven
O15: UK based provider of banking and banking services	Lean deployment from central expert group, cost reduction focus.

Table 3. Key characteristics of participating organisations and their CI characteristics.

Collection of data through research interviews was preferred to remote survey to enable the researcher to fully explain the research background to participants. In this way, it was also possible to verify participants' understanding of questions in the research instrument. Further, for each question set, participants were prompted to provide examples of how the capability or competence could be evidenced within the organisation. This interactive approach ensured that the Likert assessment criteria were reasoned by the participants and response scores were verified by them before continuing to the next section of the survey. The interviews maintained anonymity of responses by coding the response data at source in a way that only the researcher could link responses to specific organisations. Subsequent analysis and reporting were undertaken using the coded data.

The structured interviews were conducted with a face-to-face approach when possible. Telephone and internet conferencing interviews were carried out as an alternative in some cases. Interviews were pre-scheduled through e-mail and telephone communication with participants. Interviews took around 45 minutes on average to be completed. Survey instruments were used sequentially through the interview, starting with the Organisational CI capability assessment, then the Demonstrated CI Leadership Competence assessment. Data was collected by the researcher using a digital form during the interviews and verified with the survey participant in real-time. Survey data was also shared with participants by email following the interview.

4.2 CI Capability Assessment

The assessment of CI capability in organisations was based on an adapted implementation of the CIRCA CI assessment (Caffyn, 1999). The approach implemented focussed on the assessment of ten key behavioural CI norms associated with six core organisational abilities. Table 4 illustrates these core organisational abilities and their related CI behaviours. The benchmarking interviews collected quantitative data by direct assessment against a Likert scale, designed to elicit the extent to which these 10 key CI behaviours were present within the participant organisations. The Likert scale adopted, illustrated in Table 5, was based on recommendations from ISO 33020 (British Standards Institution, 2015c). Whilst this Likert scale has a proposed percentage range for assessment, for this study the mid-point in the percentage range of the scale category was assigned as the answer score for each question. Total scores for the individual surveys and for question sub-groups were calculated as an average of the percentage scores for the question group.

Core organisational abilities	Key behaviours for effective CI in the Organisation
A. The ability to link CI activities to strategic goals.	1. Employees demonstrate awareness and understanding of aims & objectives.
	2. Individuals & groups use strategic goals & objectives to focus and prioritise their improvement activities.
B. The ability to strategically manage the development of CI.	3. Enabling mechanisms (e.g. training, teamwork, methodologies) used to promote CI are developed & monitored.
	4. Ongoing assessment ensures that the organisation's structure, systems & procedures, and the approach & mechanisms used to develop CI, consistently reinforce & support each other.
C. The ability to generate sustained involvement in CI.	5. Managers at all levels display leadership and commitment to CI.
	6. People engage proactively in incremental improvement.
D. The ability to move CI across organisational boundaries.	7. CI is effective across internal & external boundaries at all levels.
E. The ability to learn through CI activity.	8. People learn from both own & others' experiences.
	9. The learning of individuals & groups is captured & deployed.
F. The ability to articulate & demonstrate CI values.	10. People are routinely guided through shared CI cultural values.

Table 4. Core organisational abilities and key behaviours for effective CI Capability (adapted from (Caffyn, 1999)).

Response scale in the range of 100% to 0%, divided in 4 categories of satisfactory levels	The assigned score was the mid-point in the percentage range of the response
Example of question: 1. Employees demonstrate awareness and understanding of organisation's aims and objectives.	
Not at all	0%
Rarely (0%-15%)	7.5%
Partially (15%-50%)	32.5%
Largely (50%-85%)	62.5%
Fully (85%-100%)	92.5%

Table 5. Likert scale applied to assess the different questions of the survey.

4.3 CI Leadership Competence Assessment

It was also necessary to obtain insight from participant organisations on the extent to which managers demonstrate CI Leadership competences. The 15 CI Leadership role and competence requirements defined in this paper (see Table 2) were used to structure both the assessment of existing mid-level management knowledge, skills, and competence, and to probe leadership development practices. Similarly, a Likert scale was also implemented for the assessment of CI Leadership across the 15 questions, and data was collected from respondents using an online form (excerpt shown in Appendix B, Figure 3). This provided a quantitative assessment of current demonstrated leadership practice across each CI role/competence group.

5. Results and Analysis of the Quantitative Benchmarking Study for Organisational CI Capability and CI Leadership Competence

5.1 Results

The benchmarking study was conducted over a period of 3 months, carrying out 16 interviews (one from each organisation in Table 2 and one organisation represented by two respondents), including self-evaluation on the Likert scale and transcripts of the broader discussion. The interview also probed for evidence supporting the respondent's assessment, to augment the quantitative data. This approach ensured that the interview questions had been fully understood and provided context, which was useful to explain the assessment, such as the 'CI Characteristics' described in Table 3. One organisation in the study returned a particularly low 'Organisational CI Capability' score, and through the interview discussion it was established that a mature CI capability was not present, and therefore the organisation fell outside the scope of the study. This response was excluded from further analysis, leaving 15 valid quantitative assessments.

Quantitative data from individual Likert scale responses were converted into normalised percentage score metrics, which provided a basis for analysis of the benchmarking study data. The results from the study for ‘Organisational CI Capability’ score are shown in Appendix C. The total average score of the 10 question responses is shown, and individual question responses shown as a heat-map corresponding with the Likert score for each question. Separate average scores for question sets which relate to ‘Structural’ (core abilities A&B) and ‘Cultural’ (core abilities C,D,E,F) questions in the CIRCA CI assessment were also calculated. The highest CI capability score for a participant organisation was 83.5% and the lowest was 25.5%, with other results being evenly distributed between those scores.

The scores from the benchmarking study for ‘Demonstrated CI Leadership Competence’ are illustrated in Appendix D. The total average score of the 15 question responses is shown, with individual Likert responses also shown as a heat-map. Separate average scores for the role/competence groups in the framework (Table 2) were also calculated and shown as a heat-map. The highest score for demonstrated CI Leadership roles and competences was 74.5% and the lowest 12%, with scores for 8 organisations in the 50-65 range.

5.2 Quantitative Analysis Based on Interviews Data

Individual data points for organisations within the benchmarking study were plotted as an X-Y scatter plot, with Organisational CI Capability as the response (Y) variable and CI Leadership Competence on the X-axis. Alternative linear and non-linear regression (Breyfogle, 2003) models were fitted to the data to establish an acceptable model fit with high R^2 and acceptable distribution of residuals. The result of this analysis, shown in Figure 4, suggests that a relationship exists between these two scores, and that the relationship may be

non-linear, with Organisational CI Capability increasing at a higher rate for higher Leadership CI Competence scores.

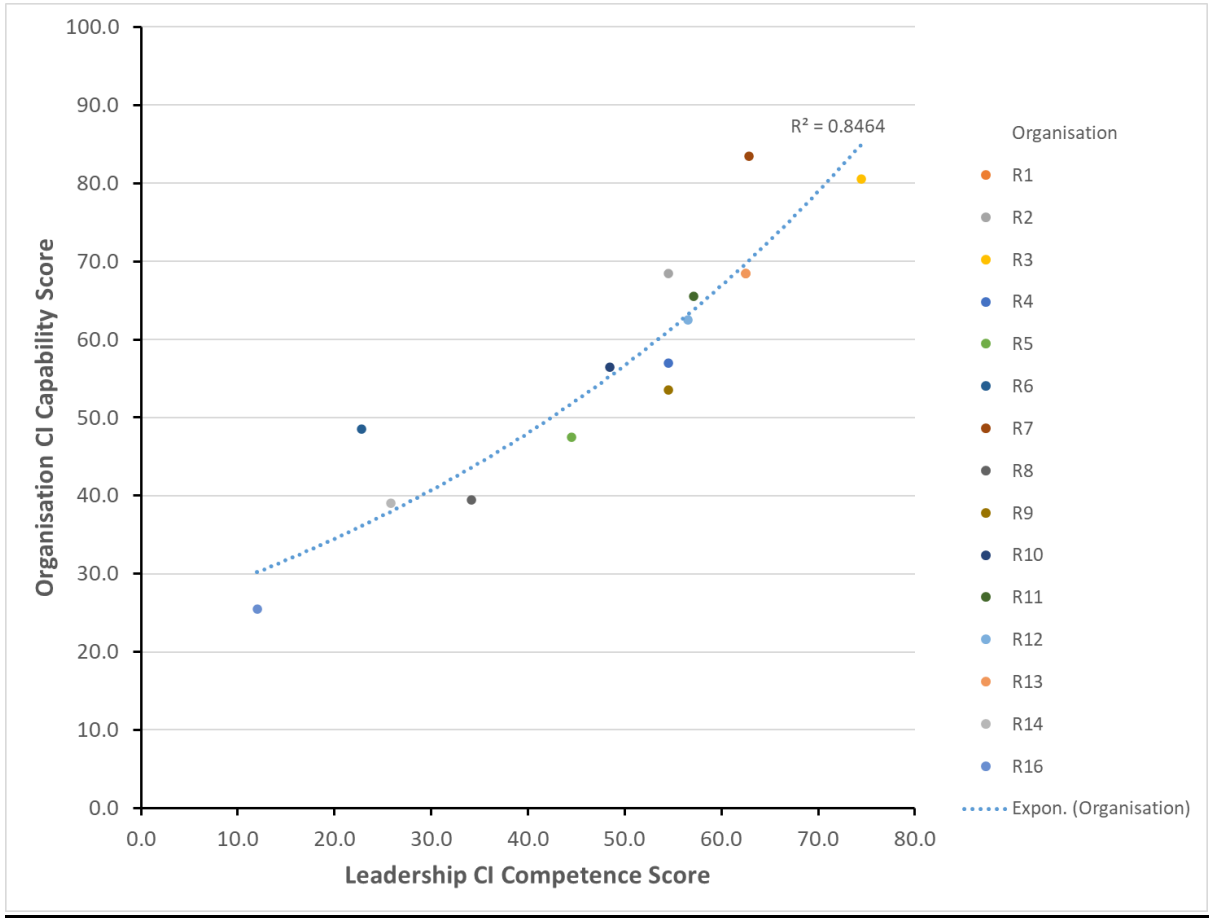


Figure 4. Benchmarking Study Results (percentages) - Relationship between Organisation CI Capability & Demonstrated CI Leadership Competence.

The fitted curve for this data, based upon an exponential model, shows a relatively high R^2 of 0.85. This indicates that this model explains a high proportion of the variability in the data and, therefore, high confidence that a relationship exists between these scores. Analysis of Residuals indicate a reasonable fit to a normal distribution, given the low sample size of the data within the study. The Y-axis intercept of the fitted curve shows an Organisational CI Capability score of around 25, implying that for the organisations within this study, a certain

level of CI capability is in place even where very low levels of management CI Leadership competence are demonstrated. Relationships between separate role/competence groups (identified in Table 2) within the CI Leadership Competence score, and Organisational CI Capability were also converted to individual normalised percentage scores, and plotted as separate X-Y scatter plots, illustrated in Figure 5. All four CI Leadership Role/Competence groups appear to demonstrate an increase in Organisational CI Capability with an increase in the groups score, and apparent presence of linear relationships.

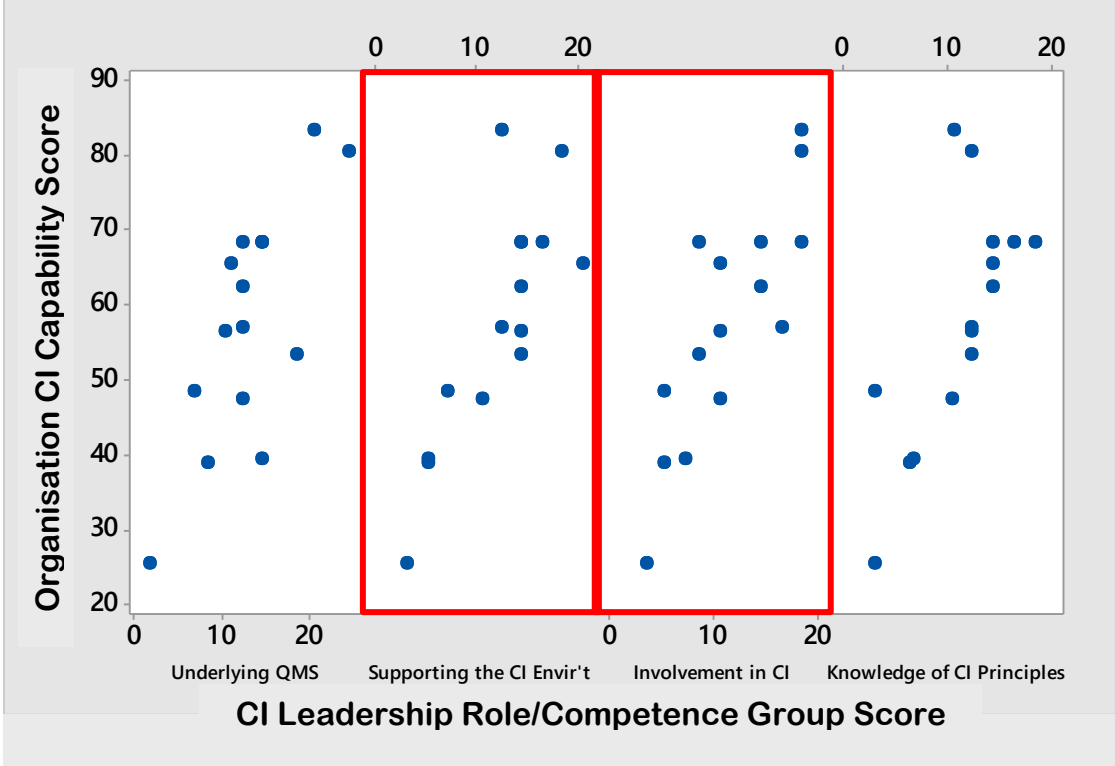


Figure 5. Matrix Scatter Plot of Relationship between Organisational CI Capability & CI Leadership Role/Competence Groups. Statistically significant relationships (P-value < 0.15) are highlighted in red for Supporting the CI Environment and Involvement in CI Activity.

To assess statistical confidence in these separate regressor variables, multiple (linear) regression analysis (Breyfogle, 2003) was applied to the CI Leadership competence groups as

predictors of Organisational CI Competence. This analysis identified statistically significant relationships (P-value <0.15) for ‘Supporting the CI Environment’ and ‘Involvement in CI Activity’ CI Leadership competence groups (Figure 5). The ANOVA table and analysis for the reduced regression model is displayed in Figure 6, and identifies high R² and R² adjusted, with Variance Inflation Factors (VIF) for both terms significantly <5, indicating low multicollinearity. Similar coefficients for both of the significant role/competence groups are observed within this analysis, suggesting their similar impact upon the Organisational CI Capability score.

Analysis of the residuals for this multiple regression model indicated potential skewness in the distribution - not of significant concern given the low sample-size of this data set. This therefore represents a useful analysis given the sample size and provides statistical validation for two of the CI Leadership Role/Competence groups developed within this research.

Analysis of Variance						
Source	DF	Adj SS	Adj MS	F-Value	P-Value	
Regression	2	2911.1	1455.55	27.54	0.000	
Supporting the CI Environment	1	466.0	466.03	8.82	0.012	
Involvement in CI Activity	1	543.7	543.65	10.29	0.008	
Error	12	634.1	52.84			
Total	14	3545.2				

Model Summary			
S	R-sq	R-sq(adj)	R-sq(pred)
7.26937	82.11%	79.13%	69.97%

Coefficients						
Term	Coef	SE Coef	T-Value	P-Value	VIF	
Constant	20.70	5.35	3.87	0.002		
Supporting the CI Environment	1.492	0.502	2.97	0.012	1.75	
Involvement in CI Activity	1.594	0.497	3.21	0.008	1.75	

Regression Equation
Org. CI Capability = 20.70 + 1.492 Supporting the CI Environment + 1.594 Involvement in CI Activity

Figure 6. Multiple Regression Analysis of CI Leadership Role/Competence Group Scores on Organisation CI Capability Score.

6. Discussion of Findings, Implications and Limitations

6.1 Discussion and Findings

This research has synthesised a generic model describing the CI Environment of an organisation. The model also helps to establish the tangible and intangible aspects of an organisation's CI Environment from the perspective of a CI practitioner. Several key CI enablers have been identified and considered in the model (Caffyn, 1997), (Frimenko, 2012), (Anand, et al., 2009), (Bateman, 2005). Selection of enablers depend on several background characteristics of the organisation itself. CI Leadership competence of management teams in organisations will have a strong impact on these enablers, the underlying CI Culture and, therefore, on the CI Environment.

The dynamic nature of both behavioural and cultural elements within this model indicate that the CI Environment will be subject to constant change and re-balance. This dynamic will be affected by individuals within the organisation, through changing priorities, and by both internal and external challenges. Thus, the CI Environment model proposes a cycle of reinforcing CI Culture. However, it is also reasonable to infer that this cycle could represent a diminishing CI Culture and, therefore, diminishing CI capability within an organisation.

While the development of CI capability of an organisation can be described as evolutionary (Hoem & Lodgaard, 2016), capability can also degrade over time. The risk of diminishing CI behaviours, capability, and culture is ever present within any organisation practising CI. Liker & Convis (2011) describe the need for leaders within the organisation to continuously “add energy” to the CI Culture as a countermeasure to the inevitable entropy effect. This aspect of

CI Leadership is captured within the roles and competences of mid-level management defined in this research.

It is useful to explore how CI Leadership roles and competence requirements fit within model of the organisation's CI Environment. Figure 7 maps the 15 roles and competence requirements of CI Leadership defined in the framework onto the CI Environment model. The orange circles illustrated in the model identify the corresponding number of the role/competence in the framework. The location of these 15 leadership roles/competences within the elements of the model fits with the CI Leadership role/competence groups (e.g. CI pre-requisites, requirements to support CI Environment, requirements for implementing CI activities, and knowledge for CI roles). Furthermore, the location of these roles/requirements at the key interfaces between CI leaders and practitioners within the CI Culture cycle confirms that there is logical alignment between CI Environment model and the CI leadership roles and competence requirements defined through this research.

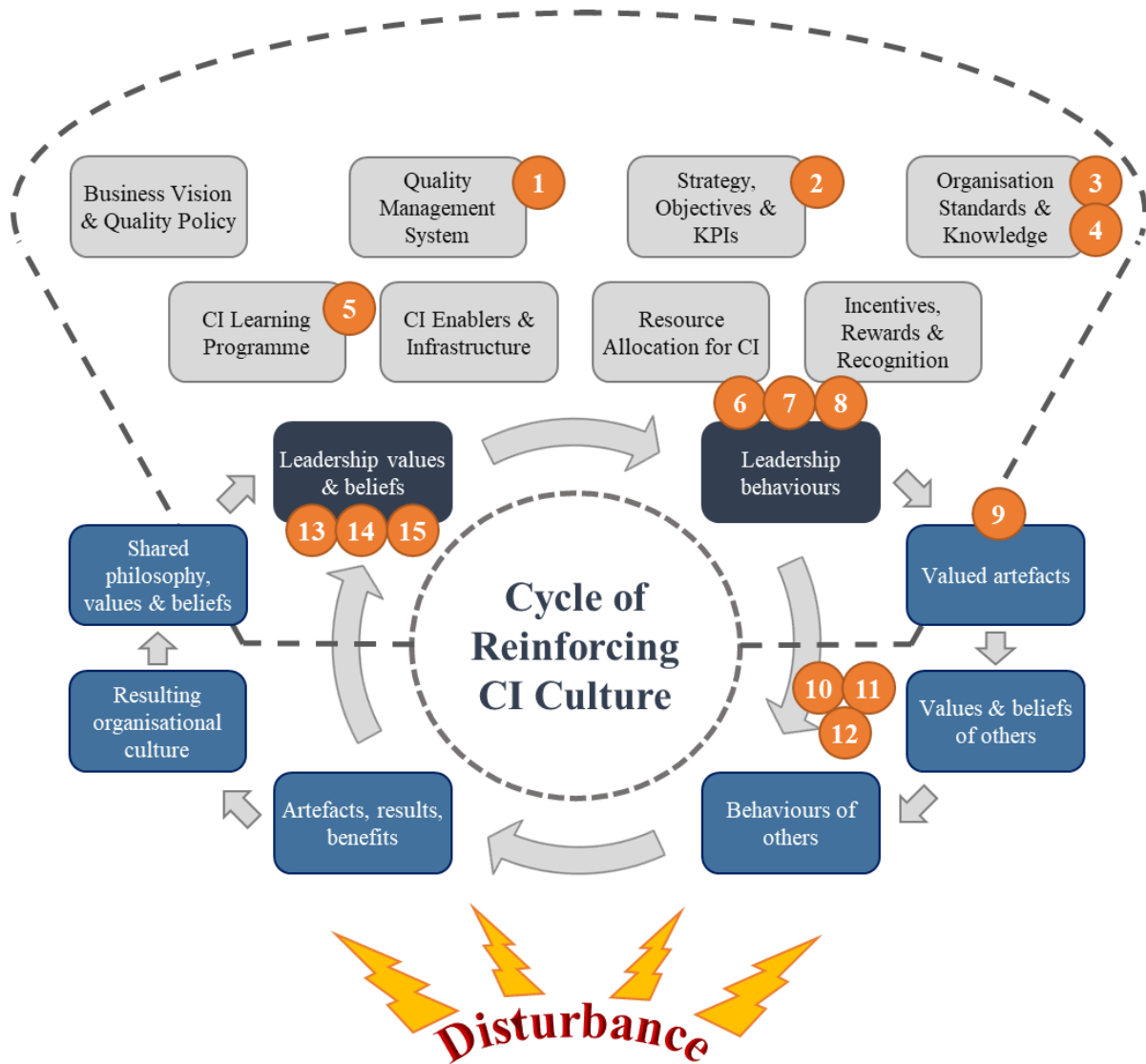


Figure 7. Conceptual Model of the CI Environment and the linkage with CI Leadership roles and competences.

This research has also established the critical role of mid-level management to strengthen the organisation’s CI Capability. The quantitative data analysis from the benchmarking study identifies a clear relationship between CI Leadership role and competence requirements of mid-level management and CI capability of the wider organisation. However, a direct causal link is not expected. The fundamental underpinning of the apparent causal link existing between these characteristics is beyond the scope of this research. However, the data analysis

based on the survey clearly shows that there is no organisation within this study with low CI Leadership scores that achieves a high Organisational CI Capability score.

There are also potential explanations for the flattening of the curved relationship at low levels of CI Leadership competence and corresponding low values for CI Capability (see Figure 4). The sampling strategy focussed on organisations with a mature CI capability. Organisations following a QMS guided by ISO standards will inherently be driven to at least an initial level of CI capability. It was also identified through the interviews that two of the low scoring organisations for this metric were deploying a strategy of ‘expert team’ CI deployment, which did not focus on wide staff participation. The implication could be that an initial level of Organisational CI Capability is possible without CI Leadership competence within management teams. It is possible that a low-level of CI capability can be acquired without significant organisational change. However, the higher levels of CI capability, which are more valuable to organisations (Bessant, 2001), require the engagement of managers and their CI Leadership competence.

The analysis of the benchmarking data provides clear evidence of the causal relationship between the CI Leadership competences of mid-level management and CI Capability of the organisation.

Given that the empirical study was structured on the basis of the CI Leadership roles & competences framework introduced in this paper, this also provides validation for the proposed framework and the CI Environment model.

6.2 Practical Implications

The evidence-based knowledge of the positive relationship between the mid-management CI Leadership competences and the effectiveness of the CI Capability of an organisation,

informs strategic organisational development interventions towards enhancing CI capability and effectiveness, ultimately underpinning productivity enhancement and sustainability.

The framework for mid-level management CI Leadership roles, responsibilities and competences introduced in this paper has been grounded in underpinning work undertaken from within a large automotive OEM. This contribution represents an essential and practical guide for CI practitioners and mid-level managers to support the successful development of CI teams and initiatives. This framework can be adapted and adopted by any organisation. Finally, this paper introduces the subject of the CI Environment. The CI Environment reference model should provide a comprehensive support for industry-based organisational strategists to communicate the broader framework for CI capability improvement within an organisation, to enhance acceptability and adherence to improvement actions.

These findings should encourage senior leaders and organisations to develop other leaders to support CI initiatives appropriately and contribute to enhancing organisational CI Capability.

6.3 Limitations and Future Scope

Access to CI practitioners and mid-level managers who lead CI initiatives is not an easy task. Due to the work experience and networking skills of the principal author, it was possible to persuade the participation of 15 large industrial organisations in different sectors. However, the obtained results and feedback have been of great significance and impact on this study. The methodology applied for this small sample has been practical and effective.

The purposive sampling approach provided plot points across a wide range of CI capability and CI Leadership competence scores to confirm their relationship. However, this approach also represents a limitation for the benchmarking study. A higher sample size would have provided more confidence in the analysis of quantitative data. Furthermore, a larger sample size would have also provided more statistical power to assess the significance of

role/competence groups, possibly even at the level of individual CI Leadership role/competence. The benchmarking structured interviews represented a notable cost for this research in terms of the time invested by the researcher and participants in arranging and conducting these. This was also a key factor considered while making sampling decisions. In some cases, detailed study insight was not possible within the scope of this research, and therefore these opportunities remain for future study.

The scope of the quantitative study also represents a further limitation of this research. The focus on large organisations within the study does not provide confidence in the conclusions for small or medium sized organisations. The focus on UK based organisations means that extrapolation of results and insights to other regions of the world may not be valid. While both the CI environment model and the CI role/competence framework should extend to a much wider scope, confirmation of the extent of applicability of the contribution of this research should be further studied.

The design and implementation of the survey instrument is a key process worth explanation in greater detail on a separate paper. In addition, it would be worthy future research to establish a causal relationship in more detail between CI Leadership role and competence requirements of mid-level management and CI capability.

7. Conclusions

Though management impact upon an organisation's CI capability is recognised in the relevant literature, no definitive role and competence requirements for management CI have been clearly defined. This research has synthesised and reflected this issue into two reference models that were subsequently considered as a basis for empirical research through a benchmarking study. The developed reference models include:

- A reference model for the CI Environment, which provides a theoretical contribution regarding the importance of CI Leadership to support both this CI Environment, and a Cycle of Reinforcing CI Organisational Culture.
- The comprehensive and detailed framework for mid-level management CI Leadership roles, responsibilities and competences contributes with a sound foundation to guide and deliver CI Leadership in the workplace for practitioners and managers (Appendix A).

These reference models have comprehensive value for both practice and research, setting the foundation to conduct further longitudinal studies.

From an empirical research perspective, this work has established the following:

- The CI Leadership Competence in mid-level management teams has an exponential impact upon the CI capability of the wider organisation.
- The proposed CI Leadership Role/Competence Framework has been validated at CI Leadership Competence group level based on analysis of the benchmarking study results.

This research proves for the first time the significance of the causal relationship between the CI Leadership competences and the effectiveness of the CI Capability within an organisation, thus filling an important gap between established previous work focussing on the role of mid-level management on one side and the practitioner and team level roles, methodologies and tools.

Organisations working to develop their CI capability should recognise the importance of both the CI Environment, and the critical role and influence that mid-level managers hold within this environment. As practitioner CI competences are developed, leadership competences of managers should also be considered and developed in parallel. This work provides a basis for

validation of CI Environment and CI Leadership aspects, as they apply to and impact upon the CI Capability of different organisations.

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Appendix A.

Table 6. Mid-level management ‘CI Leadership’ roles, responsibilities, and competences required to support effective CI.

Group	No.	Proposed Role / Competence Title	Detailed definition of roles / responsibilities	Competence indicators for mid-level leadership - Be able to...
Underlying Quality Management System (Pre-requisite for CI roles)	1	Recognise the vision & 'Quality Management (Operating) System', apply systems and process thinking.	<p>Articulate a clear vision for quality as a strategic imperative that supports the organisations broader aims and objectives.</p> <p>Understand the organisation system. Take accountability for the effectiveness of the Quality Management System (QMS) & integration of business processes within the QMS.</p> <p>Manage processes that create value, and connections between processes, and between people and processes.</p> <p>Take action to transform, use a system & process thinking and risk-based approach, looking across business functions and hierarchies to promote a holistic view of the organisation and its requirements. Understand the system, identify & remove causes of failure.</p>	<p>Articulate the organisation's purpose and Customer Value Proposition. Recognise, understand, and explain to others the organisations vision for quality, and its importance as a strategic imperative which supports the organisations broader aims and objectives.</p> <p>Understand the organisation as a system and explain to others. Review and improve the effectiveness of the Quality Management / Operating System (QMS) and underlying processes, within the scope of their own organisational responsibilities. Develop management systems that support Lean thinking.</p> <p>Apply systems, value-stream & process thinking to take and communicate a holistic view of the organisation, and the role of their own local organisation within this system. Identify the value-streams, internal suppliers and customers, process interfaces, and flow within the system & visualise these.</p> <p>Evaluate the performance of local processes and their impact on the wider system, identify and remove causes of process failure. Identify and evaluate risks related to future process performance. Manage connections between people and processes, and between processes.</p>
	2	Establish goals, measures, objectives & plans.	<p>Ensure that quality policy and quality / delivery / cost / growth objectives are established, implemented & maintained in line with the organisations objectives.</p> <p>Identify critical areas of performance. Develop performance measures that enable monitoring and improvement of the value-stream. Set performance targets</p>	<p>Know, communicate, and support the purpose of the business. Establish and agree measurable quality / delivery / cost / capability /growth goals and objectives for own area of responsibility from higher-level cascade of the organisations objectives and quality policy, ensuring traceability. Review performance vs objectives for own area of responsibility.</p>

Group	No.	Proposed Role / Competence Title	Detailed definition of roles / responsibilities	Competence indicators for mid-level leadership - Be able to...
			<p>and communicate all of these with effective visual management & measurement dashboards.</p> <p>Cascade vision to strategy to tactics which will deliver objectives - develop tactical plans to fulfil the strategic plan. Document what actions need to be taken by who, when.</p>	<p>Establish local strategies and tactics to deliver the organisations objectives and vision. Prepare and communicate tactical plans to fulfil delivery of the strategic plan. Identify and agree ownership of tactical actions, and cascaded SMART objectives to own reporting structure.</p> <p>Create and visualise metrics that enable monitoring and improvement of the Value-stream and underlying processes.</p>
	3	<p>Improve understanding of customer & stakeholder requirements. Develop & improve Standards.</p>	<p>Ensure that customer and applicable statutory & regulatory requirements are determined, understood, and consistently met with the aim of enhancing customer satisfaction.</p> <p>Act as the conscience in the organisation, making interventions whenever necessary to ensure customer and stakeholder requirements are addressed.</p> <p>Use appropriate methods to understand all stakeholder needs, implementing this insight into standards. Follow standards first, recognise and reinforce adherence to standards.</p> <p>Align people and processes around delivery of customer requirements.</p>	<p>Identify customers and stakeholders of processes within their own area of responsibility.</p> <p>Select & apply tools to establish and translate customer and stakeholder requirements into appropriate process measures and standards. Align processes to focus on delivering these requirements.</p> <p>Maintain adherence to process and standards. Recognise the need to review and improve standards in line with evolving customer and stakeholder requirements and use learning from problem solving and improvement projects to do so.</p>
	4	<p>Maintain & improve organisational knowledge through learning.</p>	<p>Assess and protect the organisations current knowledge base and develop plans to obtain the knowledge required for the present and future organisation needs.</p> <p>Create a safe environment for learning - both physical and psychological. Use reflection and enquiry for enhancement of organisation learning and driving CI.</p>	<p>Identify knowledge assets within own area of responsibility, and ensure that these are retained appropriately within standards, strategies, processes, methods and guides.</p> <p>Create a safe environment for learning, both physical and emotional, apply and drive use of reflection for learning.</p> <p>Review and assess future organisational knowledge requirements within their own area of responsibility and establish plans to acquire the necessary knowledge through research and learning.</p>

Group	No.	Proposed Role / Competence Title	Detailed definition of roles / responsibilities	Competence indicators for mid-level leadership - Be able to...
CI Specific Role Requirements - Supporting the CI Environment	5	Develop capabilities in self and others that are required for improvement.	<p>Acquire depth of knowledge required to choose a course of action to deliver own roles and responsibilities. Look for learning opportunities and be willing to learn. Use enquiry for learning in self and others.</p> <p>Encourage education and self-improvement for everyone. Know the skills, strengths, and qualifications of their people to maximise potential. Recognise and apply coaching and mentoring to support development of individuals and teams.</p> <p>Determine the necessary competence for personnel within own area of responsibility to ensure conformance to the QMS, and effective problem solving and improvement activity. Provide training or take action to achieve necessary competence.</p>	<p>Recognise and develop the personal depth of knowledge required to effectively perform their role in the organisations Continuous Improvement (CI) environment. Learn from mistakes and develop capability to teach & coach others.</p> <p>Identify the knowledge, skills and competencies required to maintain and improve the QMS, value-streams and processes, and deliver effective CI within their own team. Recognise the existing skills, strengths, and qualifications of their own people, and their potential suitability for CI roles in the organisation.</p> <p>Communicate the need for self-improvement for everyone. Recognise and utilise the personal development routes and training available within the organisation for development of CI knowledge and skills.</p> <p>Establish plans for all individuals within own area of responsibility to develop the necessary competencies and behaviours for effective CI, which supports and/or maintains the required level of team CI capability. Support learning through doing and use enquiry to reinforce learning.</p>
	6	Identify, scope & prioritise improvement activities.	<p>Evaluate measures / results to establish priorities for change. Use benchmarking and other appropriate tools and techniques to evaluate performance and improvement priorities.</p> <p>Ensure that the risks and opportunities that can affect conformance to standards and the ability to enhance customer satisfaction are determined & addressed.</p> <p>Work with own team to reduce defects and eliminate waste by identifying & prioritising improvement activities, scoping improvement projects, and selecting appropriate method / approaches to deliver improvement activity.</p>	<p>Evaluate key performance measures and results and use self-assessment tools and benchmark data to evaluate performance and identify opportunities for improvement, making problems visible to everyone.</p> <p>Apply a risk-based approach to identify areas of process which could affect conformance to standards, or enhance customer satisfaction, therefore representing improvement opportunities.</p> <p>Prioritise improvement activities in line with business aims and objectives, and scope improvement projects to meet improvement needs. Apply focus to elimination of waste.</p> <p>Recognise the different improvement project approaches that may be applied to deliver improvement activities, the associated decision criteria to select the</p>

Group	No.	Proposed Role / Competence Title	Detailed definition of roles / responsibilities	Competence indicators for mid-level leadership - Be able to...
				best approach, and the delivery stages within each. Identify appropriate methods / approaches to deliver the improvement project portfolio.
	7	Establish, coach, and enable teams to deliver improvement.	<p>Design and coach teams. Select the right people to engage in the problem solving process at appropriate stages.</p> <p>Secure the resources with the competency to effect the necessary change - give people time, tools, and resources to deliver problem solving and improvement.</p> <p>Ensure that the necessary problem solving infrastructure is in place.</p> <p>Be an advocate for CI and evidence based approaches to improvement. Remove barriers to success and ask how to help. Escalate issues to higher management that cannot be resolved locally.</p>	<p>Identify the required team structure and roles to deliver priority improvement project activities and align team members to projects. Ensure that individuals assigned to project roles have appropriate competences to contribute in their role to the success of the improvement projects.</p> <p>Coach individuals and teams to apply structured improvement methods, with appropriate use of evidence and data, and to apply their own learning of methods and tools to achieve the required project deliverables. Use listening, enquiry, and advocacy to encourage understanding and drive teams to deliver results.</p> <p>Identify and utilise the improvement infrastructure required to deliver priority improvement projects. Support progress of projects by working with teams to identify and remove barriers to success, using escalation where necessary.</p>
	8	Reinforce the required CI behaviours. Motivate, support, and recognise individuals and teams.	<p>Never be satisfied with the current state or progress, challenge teams to pursue perfection.</p> <p>Motivate and support individuals and teams, showing respect for people. Ask for and encourage open communication from everyone.</p> <p>Recognise and reward employees and teams who demonstrate the correct behaviours. This should comprehend effective prevention efforts, not just "fire fighting". Avoid criticism, if possible.</p> <p>Celebrate and recognise success, share successes across the organisation, and capture as 'best-practices'.</p>	<p>Recognise the required behaviours which engage individuals and teams in improvement activity, demonstrate these personally by example, and motivate others to do the same.</p> <p>Be constructively dissatisfied with the current state, progress and self-improvement - Challenge individuals and teams to pursue perfection.</p> <p>Identify, recognise, and reward positive CI behaviours in others, and reinforce these positively.</p> <p>Understand the criteria for project success throughout the delivery lifecycle, recognising and celebrating success of achievement where appropriate.</p>

Group	No.	Proposed Role / Competence Title	Detailed definition of roles / responsibilities	Competence indicators for mid-level leadership - Be able to...
CI Specific Role Requirements - Involvement in CI Activities	9	Review & challenge the progress of problem solving & improvement activities.	<p>Manage problem solving and improvement as project management. Ensure that timely and effective progress is made toward improvement.</p> <p>Be connected to where the work is being done and use questions and enquiry to deeply understand problems.</p> <p>Promote a culture of decision-making based on factual evidence and the measurement of performance. Use data insights sensibly with awareness of statistical implications.</p> <p>Participate in project "gate reviews", verify completion of phase deliverables. Review and provide feedback on performance vs goals.</p> <p>Use effective measurement and feedback systems to monitor improvement effectiveness.</p>	<p>Understand the importance of performance measurement and decision making based on facts and evidence, have an awareness of the fundamentals of applied statistical methods and good use of data insights. Ensure that decisions with data are made with these considerations in mind.</p> <p>Drive individuals and teams to fully understand problems. Recognise key deliverables throughout improvement project lifecycle stages (phases) and apply this knowledge to coaching and "gate review" of improvement projects with project teams to verify the completion of phase deliverables. Provide feedback to individuals and teams on performance vs goals.</p> <p>Ensure that the effectiveness of improvement actions has been appropriately verified, and review measurement and feedback to monitor the effectiveness of improvements.</p>
	10	Be personally and actively involved in quality and improvement activities.	<p>Get involved and lead by example, serve on project teams. Demonstrate that all employees are problem solvers at some level. Formally plan for work site observation & stick to the plan.</p> <p>Formally plan for improvement work every day & stick to the plan. Understand and use effective problem solving and improvement approaches.</p> <p>Leverage project results. Ensure process improvements are implemented & sustained. Obtain necessary approval for process changes.</p>	<p>Plan and apply appropriate improvement approaches, methods, and tools to own work to eliminate waste and deliver improvement and contribute directly to problem solving and improvement project delivery.</p> <p>Plan and spend time on workplace observation in collaboration with teams, creating a safe environment and an opportunity to learn together with teams.</p> <p>Distinguish key learning and benefits from improvement project activity and ensure that these are recognised and applied effectively by the organisation. Evaluate to what extent practice, learning and benefits can be applied more widely within the organisation, communicating effectively to ensure maximum benefit to the enterprise.</p>

Group	No.	Proposed Role / Competence Title	Detailed definition of roles / responsibilities	Competence indicators for mid-level leadership - Be able to...
	11	Engage stakeholders in improvement and change.	<p>Ensure that organisation vision & quality policy is communicated, understood, and applied within the organisation. Ensure the promotion of customer focus throughout the organisation. Ensure a common direction & common message.</p> <p>Create a sense of urgency & articulate the source of urgency.</p> <p>Communicate with and respond to people and encourage them to participate in improvement activities. Listen to concerns, fears, & ideas. Be accessible and actively listen.</p> <p>Set expectations of employees at a local level to use structured problem solving and improvement methods as part of their jobs. Ensure that employees are aware of their roles.</p>	<p>Recognise and communicate the organisation vision and quality policy in a way that can be understood and applied within own area of responsibility. Identify the importance of and promote customer focus throughout the organisation.</p> <p>Engage others to participate proactively in improvement activities. Enquire with, listen to and evaluate the concerns and suggestions of others, and use this understanding to the benefit of improvement. Create a sense of urgency, ensuring the source of this is understood by others.</p> <p>Establish and communicate appropriate expectations of others with respect to quality, delivery of improvement activity, and use of structured problem solving and improvement methods to deliver improvement objectives.</p>
	12	Implement effective change which delivers improvement & maintains the gains.	<p>Evaluate the nature and magnitude of change required and how to achieve the required changes through the development of the organisation's people processes, tools, technologies, and/or infrastructure.</p> <p>Focus on & manage the total cost within business decisions.</p> <p>Ensure that the gains from improvement activity are maintained in the long-term through permanent update of and adherence to systems, processes, methods, tools and standards.</p>	<p>Evaluate the impact of change required to deliver improvement objectives, and work with improvement project teams to establish plans to manage these changes through people, processes, tools, technologies, and/or infrastructure.</p> <p>Challenge teams to confirm that appropriate 'Control measures' are developed, implemented, and maintained to ensure that gains from improvement activity are maintained in the long-term. Make sure that organisation knowledge is permanently updated to fully reflect the learning from improvement projects.</p>
Underlying Knowledge required for CI roles	13	Principles of Business Excellence		<p>Understand the principles of business excellence & be able to interpret the requirements of the quality policy and the QMS.</p> <p>Design, implement, review, and change parts of the Quality Management System.</p>
	14	Principles of Business Improvement		Understand the importance of maintaining process stability & control,

Group	No.	Proposed Role / Competence Title	Detailed definition of roles / responsibilities	Competence indicators for mid-level leadership - Be able to...
				<p>recognising that processes are subject to entropy.</p> <p>Understand and apply the fundamentals of structured improvement methods and understand / appreciate the tools that support them.</p>
	15	Principles of team based improvement		<p>Recognise the benefits of team-based improvement projects, the structure of teams to deliver these, and the different roles and competences required.</p> <p>Understand the dynamics of project teams and evaluate how best to support their effectiveness.</p>

Appendix B.

Figure 3. Excerpt from the data collection form used to gather benchmarking data during structured interviews

CI development for leadership

Review of literature has identified a number of roles and responsibilities for mid-level leadership related to CI within their organisation. For leaders, underlying knowledge, skills, and competence in these areas may support the CI capability of the organisation.

To what extent do leaders demonstrate knowledge, skills, and competence in CI related activity - Creating and supporting the CI environment... *

	Not at all	Rarely (0-15%)	Partially (15-50%)	Largely (50-85%)	Fully (85-100%)
Developing the capabilities required in self and others that are required for CI.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identification, scoping, and prioritisation of improvement activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Establishing, coaching, and enabling teams to deliver improvement activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reinforcing the required CI behaviours & environment, including motivation, support, and recognition of individuals & teams.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix C.

Table 7. Scores of Organisational CI Capability from the Benchmarking study.

Date of data collection	Coding for this data collection	Interview Question Assessment										Total Average Score	Sub-scores	
		1	2	3	4	5	6	7	8	9	10		Average Structural CI Capability (Q1-4)	Average Cultural CI Capability (Q5-10)
13/02/2017	R1	Yellow	Yellow	Green	Yellow	Green	Yellow	Orange	Yellow	Yellow	Green	68.5	70	67.50
17/02/2017	R2	Yellow	Orange	Green	Yellow	Green	Green	Yellow	Orange	Yellow	Green	68.5	62.5	72.50
22/02/2017	R3	Yellow	Green	Green	Green	Green	Green	Yellow	Yellow	Green	80.5	85	77.50	
23/02/2017	R4	Green	Yellow	Green	Yellow	Orange	Red	Yellow	Yellow	Orange	57	77.5	43.33	
01/03/2017	R5	Yellow	Yellow	Orange	Green	Orange	Orange	Orange	Orange	Yellow	47.5	62.5	37.50	
02/03/2017	R6	Yellow	Yellow	Green	Red	Green	Green	Green	Green	Red	48.5	56.25	43.33	
03/03/2017	R7	Green	Green	Green	Green	Green	Green	Orange	Yellow	Green	83.5	92.5	77.50	
14/03/2017	R8	Yellow	Red	Yellow	Orange	Red	Orange	Orange	Yellow	Orange	39.5	41.25	38.33	
15/03/2017	R9	Orange	Yellow	Green	Yellow	Orange	Orange	Yellow	Orange	Yellow	53.5	62.5	47.50	
21/03/2017	R10	Yellow	Orange	Orange	Yellow	Green	Orange	Green	Orange	Yellow	56.5	47.5	62.50	
23/03/2017	R11	Green	Green	Green	Orange	Green	Yellow	Yellow	Orange	Orange	65.5	77.5	57.50	
24/03/2017	R12	Yellow	Yellow	Green	Yellow	Yellow	Orange	Yellow	Yellow	Yellow	62.5	70	57.50	
31/03/2017	R13	Yellow	Green	Orange	Yellow	Yellow	Orange	Green	Green	Green	68.5	62.5	72.50	
13/04/2017	R14	Orange	Orange	Yellow	Orange	Red	Orange	Orange	Yellow	Yellow	39	40	38.33	
19/04/2017	R16	Yellow	Orange	Orange	Orange	Red	Red	Red	Red	Red	25.5	40	15.83	

Appendix D.

Table 8. Scores of CI Leadership roles and competences from the Benchmarking study.

Date of data collection	Coding for Organisation	Interview Question Assessment - Leadership CI Role / Competence Ref. #															Sub-Scores				Total Score	
		Underlying Quality Management System				Supporting the CI Environment				Involvement in CI Activity				Knowledge of Underlying CI Principles				Underlying Quality Management System (1-4)	Supporting the CI Environment (5-8)	Involvement in CI Activity (9-12)		Knowledge of Underlying CI Principles (13-15)
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15						
13/02/2017	R1																14.7	16.7	14.7	16.5	62.5	
17/02/2017	R2																12.7	14.7	8.7	18.5	54.5	
22/02/2017	R3																24.7	18.7	18.7	12.5	74.5	
23/02/2017	R4																12.7	12.7	16.7	12.5	54.5	
01/03/2017	R5																12.7	10.7	10.7	10.5	44.5	
02/03/2017	R6																7.0	7.3	5.3	3.2	22.8	
03/03/2017	R7																20.7	12.7	18.7	10.8	62.8	
14/03/2017	R8																14.7	5.3	7.3	6.8	34.2	
15/03/2017	R9																18.7	14.7	8.7	12.5	54.5	
21/03/2017	R10																10.7	14.7	10.7	12.5	48.5	
23/03/2017	R11																11.3	20.7	10.7	14.5	57.2	
24/03/2017	R12																12.7	14.7	14.7	14.5	56.5	
31/03/2017	R13																14.7	14.7	18.7	14.5	62.5	
13/04/2017	R14																8.7	5.3	5.3	6.5	25.8	
19/04/2017	R16																2.0	3.2	3.7	3.2	12.0	