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Beyond the blueprint: benchmarking continuous improvement implementation patterns

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Abstract

Purpose – Prescriptive implementation frameworks and inventories of factors that are required for successful continuous improvement (CI) implementation are widely available. However, the available guidance typically assumes linear implementation processes, where an organization is expected to go through a prescribed stepwise implementation framework or overcome clearly specified hurdles. Contemporary insights have confirmed the non-linear nature of CI implementation processes, but left their typical trajectories and characteristics unclear. The purpose of this study is to examine how actual organizational CI processes typically deviate from CI theory and prescribed management guidance.

Design/methodology/approach – Twenty-five key informants from multiple industries engaged in designing and implementing CI were interviewed and secondary CI implementation archival company data was reviewed. A systematic approach to data collection and analysis, combined with meticulous documentation and subsequent triangulation procedures were applied to mitigate validity and reliability concerns.

Findings – Our findings reveal four distinct CI implementation patterns, ranging from short-lived foundationless implementations to implementations reaching a consolidated state (plateauing). The emergence of these patterns is explained by several factors both internal and external to the CI implementations studied.

Originality/value – The relative priority of both internal and external factors for CI implementation processes, how these are interrelated and their association to the four patterns of CI implementation identified provides an understanding that transcend the fragmented nature of CI implementation theory and guidance to date. The study findings can be used by practitioners to better tailor CI implementation processes and pro-actively identify aversive internal factors and external events.

Keywords Continuous improvement, Implementation, Adoption, Lean, Six sigma, Operational excellence

Paper type Research paper

1. Introduction

Organizations pursue continuous improvement (CI) and optimize processes to improve the quality of their products and/or services (Hietschold *et al.*, 2014; Sanchez-Ruiz *et al.*, 2022). CI is defined here as "*an organized effort where all members of an organization work together on an*

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ongoing basis, improving processes and reducing errors to improve overall performance for the customer" (Sunder and Prashar, 2020, p. 4894). CI facilitating methodologies such as Lean, Six Sigma, Lean Six Sigma (LSS) or their earlier manifestations such as Total Quality Management (TQM) and Just-in-Time (JIT) (Bhuiyan and Baghel, 2005; Rijnders and Boer, 2004) have been adopted by organizations in manufacturing (Orji and U-Dominic, 2022) and service industries alike (Henrique *et al.*, 2021) due to their potential to improve productivity and performance. For instance, consulting company McKinsey and Company (2019) reports exemplary productivity improvements as high as 20%, and cycle time reduction as high as 80% resulting from CI implementation. While these CI methodologies and tools evidently may improve operational and financial performance, they first need to be successfully implemented by the focal organization (Hietschold *et al.*, 2014). Strategic CI implementation, focused on organizational adoption of CI practices, is defined here as (Marodin and Saurin, 2013, p. 1) "*the processes of applying a set of principles and practices of [CI], exploring their synergies, and adapting them to the context of the focal organization*". Despite numerous success stories (Braunscheidel *et al.*, 2011), there is ample evidence that not all implementations are successful (Antony *et al.*, 2022; Li, 2024), with reported failure rates ranging between 50% and 90% (Bader *et al.*, 2024). For example, McKinsey and Company (2021) report that fewer than 30% of implementations are perceived to improve organizational performance and sustain those improvements over time. This arguably implies a deviation between the theory and reality of CI implementation. The purpose of this study is therefore to assess the extent to which actual organizational CI implementation processes deviate from the theory and prescribed management guidance for CI implementation and use these findings to (1) further CI theory and (2) improve CI guidance for implementation leaders.

Despite the extensive body of research on CI implementation, several reasons lay at heart for this research. First, there has been an evolution in how CI has been approached, progressing from a highly prescriptive application of tools and methods in assembly lines or cells, to a comprehensive customer-centric organization-wide business philosophy (Hines *et al.*, 2004). Concurrently, while the various methodologies at the core of CI (Lean, Six Sigma, TQM) were frequently treated as distinct (Marodin and Saurin, 2013), recent studies have increasingly been treating these methodologies as interchangeable or complementary (Sunder *et al.*, 2018; Sunder and Prashar, 2020). Consequently, questions arise about the extent to which CI implementation processes are to be studied and understood uni- or multidimensionally, based on the operational methodologies of choice. This leads to questioning:

RQ1. How do organizational CI implementation processes differ for the different CI methodologies available?

Second, the processes by which CI methodologies and tools are adopted and implemented in organizations have resulted in a body of knowledge available to support managerial decision-making. Inventories of factors that are required for a successful implementation (Hietschold *et al.*, 2014; Marodin and Saurin, 2013) and prescriptive CI implementation and maturity models (Alanazi, 2024; Lameijer *et al.*, 2023) are available. Factors required for a successful implementation are referred to as readiness factors (Shokri *et al.*, 2016), critical success factors (CSFs) and/or critical failure factors (CFFs) (Hietschold *et al.*, 2014; Sunder and Prashar, 2020). The most prevalent research approaches to identify these factors have been case studies (Jaca *et al.*, 2014) and self-assessment questionnaires (Marodin and Saurin, 2013). Extensive lists of factors associated with the successful implementation of Lean (Knol *et al.*, 2018), Six Sigma (Brun, 2011), LSS (Manville *et al.*, 2012) and TQM (Hietschold *et al.*, 2014) have been identified. Problematic here is that the resulted enabling and/or inhibiting factors largely ignore interlinkages (i.e. correlations between the identified factors internal to the CI implementation) (Marodin and Saurin, 2013), contingencies (i.e. correlations with external events/contextuality) (Sunder and Prashar, 2020) and prioritization, and thus actionability. This leads to:

RQ2. What are the vital few success factors internal to CI implementation, and how are these related to events external to CI implementation processes?

Third, the available CI implementation and maturity models typically assume a linear implementation process, where an organization is expected to go through a prescribed stepwise implementation plan (Lameijer *et al.*, 2017; Rijnders and Boer, 2004). Progress towards full implementation can be benchmarked against a maturity scale (De Mast *et al.*, 2022). The goal is to gain competitive advantage by establishing an organizational "CI capability", defined by Bessant and Francis (1999) as "*an idiosyncratic ability, equivalent to the state of organizational learning*". Prior research found such models to be primarily based on exploratory empirical research methods, and lacking theoretical grounding and embracing "*a programmatic view on implementation processes*" (Lameijer *et al.*, 2017, p. 18). Such stepwise implementation approaches have been qualified as "normative" and "prescriptive" and appear in contrast with the "chaotic" and "complex" reality of CI implementation (Rijnders and Boer, 2004). The acknowledged reality is that prescribed implementation guidance is useful, as this capture previously learned and codified knowledge. However, the implementation is also characterized by making adaptations to methodologies to better fit the organizational context (De Mast *et al.*, 2022; Netland *et al.*, 2021). This is acknowledged as a complex learning process, comprising the need to learn how to adopt prescribed knowledge while also adapting CI methodology and the organization. Hence, contemporary insights have confirmed the non-linear nature of CI implementation processes (De Mast *et al.*, 2022; Knol *et al.*, 2022). Nevertheless, the trajectories and characteristics of these non-linear CI implementation processes remain unclear. Furthermore, several of the most widely cited implementation models have been developed nearly twenty years ago (Bessant *et al.*, 2001; Rijnders and Boer, 2004; Wu and Chen, 2006) and do not acknowledge the emergence of company-specific tailored CI methodologies (Netland, 2013), the widely adopted preference for more iterative ways to manage organization-wide transformations (Rigby *et al.*, 2018), and the questioned convergence of existing CI methodologies. This leads to:

RQ3. What are recognizable patterns in CI implementation processes, and how do these patterns concur with existing CI implementation theory?

To address our research questions, we first review the literature on CI implementation processes, focusing on (1) the convergence of CI methodologies, (2) CI success factors and (3) CI implementation frameworks and maturity matrices developed for these models. We subsequently describe the research approach designed to investigate CI implementation processes in 25 organizations and present our results. Our findings reveal four distinct CI implementation patterns, ranging from short-lived foundationless implementations to implementations reaching a consolidated plateauing state. The emergence of these patterns is explained by several factors both internal and external to the CI implementations studied.

2. Literature review

In this section, the evolution of CI methodologies is reviewed, demonstrating how these methodologies have converged. Subsequently, the research on success and failure factors of CI implementations are reviewed, and this section concludes with a review of the roadmaps, implementation frameworks and maturity models that attempt to prescribe comprehensive approaches to CI implementation.

2.1 The origins and convergence of CI methodologies

CI is a widely recognized concept that has received extensive attention in the academic literature, yet lacks consensus on exact definition (Bhuiyan and Baghel, 2005). One narrow interpretation of CI is as an element of Lean, involving the CI of processes. For example, Knol *et al.* (2018, 2022) refer to CI and operating routines as part of Lean production. Bessant *et al.* (2001) have included behavioural aspects and view CI more generally as a bundle of routines that can help an organization improve. Bhuiyan and Bagel (2005, p. 761) take an even broader view and define CI as a "*culture of sustained improvement targeting the elimination of waste in*

all systems and processes of an organization". A more recent definition of CI adopted by Sunder and Prashar (2020) expands on previous definitions by incorporating aspects from Lean, Six Sigma and TQM. We adopt Bhuiyan and Bagel (2005, p. 761) and Sunder and Prashar's (2020) broader view of CI as a philosophy that also serves as an umbrella for CI methodologies such as Lean, Six Sigma and TQM.

The origins of CI as concept and methodologies are frequently credited to the American discipline of statistical quality control (Shewhart, 1931) and to the Japanese "Kaizen" (Imai, 1986). Several codified methodologies have emerged, including Lean, Six Sigma, the hybrid thereof LSS and TQM. Lean is commonly seen as having emerged from the Toyota Production System (TPS) in Japan in the 1950s (Drohomeretski *et al.*, 2014). While the focus of Lean is on eliminating waste and non-value-added activities, it has evolved from a set of tools to a complex and more philosophical business system referred to as Lean production or Lean thinking (Åhlström *et al.*, 2021; Hines *et al.*, 2004). Six Sigma is the quality improvement methodology introduced by Motorola in 1986 and further popularized by the publicized benefits achieved by GE in the late 1990s. Six Sigma emphasizes the use of statistical methods to reduce defects (Linderman *et al.*, 2003). Lean and Six Sigma are combined to benefit from their synergies with LSS adopting the organizational structure and stepwise methodology prescribed by Six Sigma and incorporating the tools and techniques of both methods (Sunder *et al.*, 2018). TQM was, at its inception, broader, making it a more integrated and company-wide approach with less emphasis on tools (Hietschold *et al.*, 2014) and a greater emphasis on soft tools (Calvo-Mora *et al.*, 2013). These CI methodologies share similarities. First, they all have a strong customer focus, with Lean using it to define waste, Six Sigma to define defects and TQM to define quality. Similarly, all the described CI methodologies share a project-based approach to problem solving, with TQM using the Plan-Do-Check-Act (PDCA cycle) and Six Sigma and LSS using Define-Measure-Analyse-Improve-Control (DMAIC). A notable difference between these methodologies is the Six Sigma–specific structure of Green, Black and Master Black Belts, later adopted by Lean and LSS. Conversely, in TQM quality is the responsibility of all employees in the organization, making it more of a philosophy and less focused on tools (Hietschold *et al.*, 2014).

Early implementation research clearly distinguished between CI methodologies. Marodin and Saurin (2013) deliberately scoped their work to Lean, excluding variations on what they called "the original Lean principles". Similarly, Hietschold *et al.* (2014) limited their work to TQM. Nevertheless, studies addressing the organizational implementation and adoption issues from the context of a particular CI methodology have not always explicitly defined: (1) their focal CI methodology, (2) the level of analysis (Åhlström *et al.*, 2021) and/or (3) checked whether the sample organizations had adopted the focal CI methodology as defined (e.g. Tortorella *et al.*, 2020). Drohomeretski *et al.* (2014) have explicitly tested for differences between Lean, Six Sigma and LSS, yet relied on a single self-report measure to classify participating organizations. Such absence of detail contributes to the field's ambiguity on how the CI implementation process is to be understood and managed. Recently, evidence that CI methodologies are converging, in reality, appeared. Organizations reportedly are increasingly adopting hybrid versions of CI methodologies (Bhuiyan and Baghel, 2005; Sunder *et al.*, 2018) or are developing their own programme based on combinations of CI methodologies and tools (Netland, 2013), a term coined cross-fertilization (Bhamu and Singh Sangwan, 2014). This allows to tackle complex organizational problems by taking advantage of the synergies of CI methodologies.

Arguably, CI is increasingly seen as an overarching philosophy fundamental to methodologies such as TQM, Lean, Six Sigma and LSS, with the terms being used interchangeably (Sunder and Prashar, 2020). While the convergence of CI methodologies is practical, it leads to methodological challenges for researchers, making it necessary to determine whether empirical research needs to consider the process of CI implementation and organizational adoption as an overarching concept, or whether there is still a need to distinguish between CI methodologies to understand how its implementation process is best managed (RQ1).

2.2 CI implementation success and failure factors

The conundrum about whether CI methodologies need to be considered as distinct, initiates questions about the relevancy and relative importance of CI implementation success factors. Research has labelled these "readiness factors" (Akmal *et al.*, 2022; Shokri *et al.*, 2016), "failure factors" (McLean *et al.*, 2017), "CSFs" (Coronado and Antony, 2002) and "CFFs" (Sunder and Prashar, 2020). While CSFs and CFFs are not one-on-one opposites of each other, they overlap (Sunder and Prashar, 2020). For example, some authors view leadership commitment and support as a CSF (Bagherian *et al.*, 2025; Nonthaleerak and Hendry, 2008) while others refer to the absence thereof as a failure factor (McLean *et al.*, 2017), necessary condition (Knol *et al.*, 2018) or barrier (Sanchez-Ruiz *et al.*, 2019). These factors, internal to the CI implementation and the external events, have been researched widely (Brun, 2011; Manville *et al.*, 2012).

Prevalent is leadership commitment and support (Alhaqbani *et al.*, 2016; Bagherian *et al.*, 2025; Calvo-Mora *et al.*, 2013; Laureani and Antony, 2019), to articulate a vision and generate buy-in, make resources available, remove obstacles and show continued commitment through communication (Laureani and Antony, 2017). Yet, CI implementations typically require prolonged periods of investment, making them vulnerable to external events such as changes in leadership (Rijnders and Boer, 2004). Additionally, the ability to link CI to organizational strategy (Akmal *et al.*, 2022), performance metrics and business needs and practical realities (Bamford *et al.*, 2015) are found to be important, in addition to numerous other factors. Despite the body of research, there is no consensus regarding priority and interrelatedness of these factors. Early studies used conceptual approaches or qualitative case-based approaches to inventory success factors in a descriptive fashion (Coronado and Antony, 2002). More recently, studies have employed self-reported questionnaires to discriminate between success factors, resulting in per-CI methodology importance rankings (Sanchez-Ruiz *et al.*, 2022). Simultaneously, earlier studies were scoped to the application of the tools of a single methodology, such as 5 S (Jaca *et al.*, 2014), whereas more recent works encompass a broader range of success factors consistent with the comprehensive definition of CI (Sunder and Prashar, 2020). Finally, increasing attention is given to contextual/external factors affecting CI implementation processes (Netland, 2016). Therefore, we argue specific CI methodology independent research, which does consider contextuality- and interrelatedness between the factors and events at play, is helpful to further CI implementation theory and guidance (RQ2).

2.3 CI implementation theory and management prescriptions

Success factors typically are not static, but dynamic in nature. Therefore, a complementary source of CI implementation theory and guidance is manifested in roadmaps, implementation frameworks, and maturity models (Lameijer *et al.*, 2023), excellence models (Alanazi, 2024; Calvo-Mora *et al.*, 2013; Edgeman, 2018) and conceptual models (Citybabu and Yamini, 2024). These models typically fulfil one or a combination of three purposes. Descriptive models are used as diagnostic tools to assess an organization's current capabilities with respect to given criteria. Prescriptive models contribute to the identification of a desirable maturity level and provide improvement measures. Comparative models are used to benchmark an organization's capabilities against other (internal or external) organizations or business units (Calvo-Mora *et al.*, 2013). Bessant and Francis's (1999) Continuous Improvement Research for Competitive Advantage (CIRCA) project was seminal in the research on CI implementation theory, culminating in a behavioural model describing the evolution of an organizational CI capability (Bessant *et al.*, 2001) through five levels. Wu and Chen (2006) objected that Bessant *et al.*'s (2001) framework was difficult to operate for managers. To remedy this, they conceptualized CI implementation as an evolutionary process and used their framework to identify reasons for failure at each level. Similarly, Garcia-Sabater *et al.* (2012) used Grounded Theory to link Bessant *et al.*'s (2001) framework with enablers and abilities necessary for the organization to move from one level to the next. More recently, the advent of Industry 4.0 has led to an attempt to combine digitalization and CI methodologies (Citybabu and Yamini, 2024; Kokkinou *et al.*, 2024).

As methods for CI evolved, so did implementation frameworks (see Lameijer *et al.*, 2023 for a review). Even though these frameworks are frequently used to advocate full implementation as the way to achieve the benefits of CI, many organizations only achieved partial implementation (Bamford *et al.*, 2015), highlighting the failure of programmatic prescriptions to provide suitable guidance at given moments in CI implementation processes (De Mast *et al.*, 2022). Hence, CI implementation processes are complex and much remains unclear about why they succeed, fail or stagnate (Bhamu and Singh Sangwan, 2014). Therefore, understanding how actual CI implementation processes deviate from CI implementation theory and prescribed guidance could help understand their success or failure (RQ3).

3. Research methods

The unit of analysis for this study is the organizational CI implementation process. CI implementation is a complex phenomenon, with an organization's unique context and a combination of external events and internal factors at play (Sunder and Prashar, 2020). A qualitative research approach, to gain in-depth within- and cross organizational understandings and to explore relations between CI implementation process patterns and their antecedent or causal factors, was designed. Inspired by the research methods applied by Braunscheidel *et al.* (2011) and Ralston and Blackhurst (2020), key informants from multiple industries engaged in designing and/or implementing CI were questioned in semi-structured interviews.

3.1 Research protocol development

Qualitative research poses challenges due to its reliance on small-sample data (Gray, 2014), and the use of semi-structured interviews is prone to researcher biases (Patton and Appelbaum, 2003). To mitigate these risks and address issues of construct validity, internal validity, external validity and reliability, a systematic approach for data collection and documentation was designed, complemented with triangulation methods (Braunscheidel *et al.*, 2011; Patton and Appelbaum, 2003; Ralston and Blackhurst, 2020).

The reviewed literature was used to develop the semi-structured guide and define the relevant constructs under research (Braunscheidel *et al.*, 2011). Interviews started by discussing the organizational motives to pursue CI, the CI methodology and tools employed, and key "historical" moments in the implementation. The remainder of the interviews was structured around success factors and key informants were asked to reflect on decisions made involving them. These questions allowed us to carefully consider the organizational context of each organization included in the sample. Attention was given to how each organization defined and scoped CI implementation. The semi-structured interviews were based on open question interview protocols. This allowed important topics to be addressed while allowing for interviewees to express their emerging insights and comments. The semi-structured interview guide and data collection procedures were pilot tested with six CI professionals. Like the intended sample, these professionals fulfilled senior roles in CI programs and had a Lean Six Sigma Black Belt or equivalent training (i.e. more than 1 week of full-time training).

3.2 Sampling

We applied non-probability heterogeneous purposive sampling to recruit organizations from a wide range of industries and in various stages of implementing CI as this ensured substantial variation in organizational contexts and resulted in richer data (Gutierrez *et al.*, 2022). To be included in the study, organizations needed to have an ongoing (at least one year) or recently terminated (at most one year) formal CI implementation. We actively sought out organizations in diverse industries. During the recruitment process implementation duration was used as proxy for implementation stage.

The final sample included organizations in services (n = 5), production (n = 8), logistics (n = 6), retail (n = 3) and education (n = 3) industries. The implementation duration of the sampled organizations ranged from 1 to 14 years, with an average of 7.24 years (SD = 4.136) and ranged from organizations that had just started to companies with implementations publicly celebrated as successful. As several organizations indicated having made various attempts to implement CI, duration was defined as since the last formal launch, hence the indication "restarted" in Table 2. Table 2 presents a summary of the key informants and their organizations.

To participate in the study, respondents from these organizations were considered key informants if they participated in their organizations' CI implementation in a formal and senior role (e.g. programme management). All key informants were asked to give informed consent prior to the start of the interview, after being informed about the study procedures. All key informants were required to have Black Belt or equivalent training (i.e. at least 10 days of full-time CI training), and their experience with Lean, Six Sigma and/or LSS ranged from 3 to 20 years, with an average of 11.593 years (SD = 4.593). The key informants interviewed had extensive knowledge of the CI programme within their organization by being directly involved in its design, administration and execution. Additionally, two consultants with experience in diverse contexts were interviewed. For the purpose of triangulation, three focus groups were organized in March 2021, October 2022 and April 2023 with representatives of the organizations that participated in the interviews. Each focus group consisted of multiple members of a single organization. During each focus group (preliminary), findings were presented and discussed leading to refinement of the findings.

3.3 Data collection and analysis procedures

To reduce the potential for interviewee bias and recall bias the procedures detailed by Rijnders and Boer (2004) were applied, such as ensuring anonymity to key informants, and using a semi-structured interview guide. All interviews were recorded with key informants' permission, freeing up the researchers to observe and take notes (Braunscheidel *et al.*, 2011; Ralston and Blackhurst, 2020). Due to the then ongoing COVID-19 restrictions, interviews were conducted online through the Microsoft Teams platform. Interviews lasted between 45 and 75 min and were conducted in Dutch or English, depending on the interviewee's native language. The interviews were transcribed verbatim, resulting in 276 pages of transcripts and 179 pages of notes. The transcripts and notes were analysed using the software Atlas.ti by applying the steps of thematic analysis as recommended by Braun and Clarke (2006) first to identify the internal and contextual factors affecting CI implementation processes (Section 4.2) and subsequently link these factors to implementation patterns (Section 4.3). The full analysis process is visualized in Figure 1.

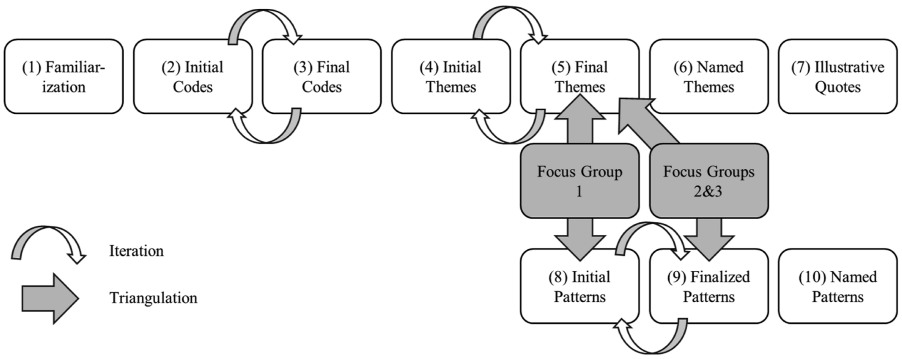

Figure 1. Data analysis procedure. Source: Authors' own work

To identify themes pertaining to internal and external factors, we (1) first familiarized ourselves with the data and (2) secondly generated initial codes inductively. We coded extracts inclusively to ensure that context was not lost. Some extracts of data were coded into more than one theme if applicable. The initial codes were iteratively revised and finalized (3). We subsequently searched for themes (4) keeping in mind that themes should capture something important in relation to the research questions. This resulted in several themes and sub-themes that were then reviewed (5) to ensure that there was sufficient data across the dataset to support them, leading to several themes being merged. After several iterations between steps (4) and (5), and discussion of the (preliminary) findings with the participants of the first focus group (validation of the emergent findings by triangulation), the set of themes and sub-themes was finalized, and the themes were defined and named (6). To report on the findings, illustrative quotes were selected (7). These steps were documented in Atlas.ti and spreadsheets, thereby building a logical chain of evidence to allow for accurate and imitable data analysis and to support the evidence presented (Yin, 2014).

In parallel to the themes being finalized, the patterns of the archetypical implementation processes emerged (8). These patterns were, similarly, reviewed iteratively and presented to the participants of the second and third focus group for validation and triangulation purposes. This led to the emergence of a final set of implementation patterns (9) and their naming (10).

3.4 Robustness assessment

A systematic approach to data collection and analysis, in combination with meticulous documentation and subsequent triangulation, was used in order to ensure construct validity, internal validity, external validity and reliability (Gray, 2014; Ralston and Blackhurst, 2020).

Triangulation of the findings emerging from individual semi-structured interviews was executed through focus groups. During each of the three focus group meetings, a group of employees of a single participating organization were asked to comment on the success and failure factors identified through the interviews and were asked to reflect on the implementation pattern that emerged to be predominantly associated with their company's CI trajectory.

Finally, the number of conducted interviews was retrospectively assessed as sufficient following Lincoln and Guba's (1985) theoretical guidelines for ending research data collection processes, namely (1) category formation was saturated (i.e. no new categories emerged in the coding and organizing and structuring of themes) and (2) regularities had emerged (i.e. confirmatory coding of observations, with ongoing absence of extraordinary observations that did not fit in the emergent structure of themes). This means that the responses recorded at some point were no longer complemented, contradicted or nuanced by the newly recorded responses analysed, signalling the emergence of information saturation in the responses per interview question (Saunders *et al*., 2018). The strengths and limitations of this study's research design are summarized in Table 1.

4. Results

In the presentation of results, the brackets [A – Dutch] refer to the key informant (see Table 2) and the language in which the interview was conducted. For RQ2 and RQ3, a more extensive list of illustrative quotes per theme can be found in Appendix.

4.1 Continuous improvement methodologies (RQ1)

A review of the CI methodologies used by the participating organizations showed that the majority most closely resembled Lean with some Six Sigma aspects, or a hybrid LSS methodology, yet this was not always consistent with the name organizations used to refer to their programme (Table 2). For example, organization N had started by implementing an extensive Six Sigma programme, including the Belt system, project charters and project selection. Yet, as the programme matured, the company realized that Lean would be more

Table 1. Strengths and weaknesses of research design

	Strengths	Limitations
Construct validity	• Concepts operationalized through extensive literature review a priori • Measurement instruments developed using previous research and pre-tested • Use of carefully selected key informants • Feedback from key informants on preliminary findings • Feedback from focus groups on intermediary and final findings	• Use of single key informant per organization • No or limited use of secondary sources of data (e.g. company documents)
Internal validity	• Comparison of patterns identified empirically to patterns identified in previous studies (pattern matching) • Verification of the emerging insights by alternative perspectives from the two organization independent consultants • Verification of insights by focus groups	• Methodological inherent inability to fully control for omitted variable biases
External validity	• Large number of companies ($n = 25$) • Sample selection to include a diversity of organizations	• Inability to systematically sample
Reliability	• Documentation of research protocols (including field procedures) • Documentation of analysis steps	• Relatively small size of research team

Source(s): Authors' own work

appropriate, as it entailed broader employee involvement and more accessible tools, and thus a better fit with the organization. Other organizations started with Lean, but as the organization progressed in measuring and monitoring metrics, more Six Sigma elements were incorporated, turning the implementation into a hybrid LSS variant. Some organizations (e.g. organizations D and Q) evolved their Lean implementation to incorporate Six Sigma elements purposefully. Other organizations (e.g. organization A) did so less explicitly and more organically.

Conversely, some organizational programmes identified as LSS contained few Six Sigma aspects. This was particularly true for organizations that had started recently or had not yet progressed in their implementation. For example, the key informant from organization F explained "*the experience is that the Six Sigma tools are very hard to adopt, it quickly becomes too technical*" [F-Dutch]. For other companies (F, V and Y) that had started implementing LSS, Lean tools were implemented first as they were considered easier.

4.2 Internal and contextual factors affecting CI implementation processes (RQ2)

The analysis of the codified interviews led to the emergent themes covering internal or contextual factors presented below (Table 3) (see Appendix 1 for elaborate displays of evidence).

4.2.1 Emergent theme 1: goal of implementation. CI implementations were perceived to be more successful when they adopted a long-term orientation and were explicitly linked to the organization's strategy. These long-term strategic goals of the implementation provided guidance and context to employees and other stakeholders. A key informant in contract logistics explained: "*Customer first in everything. [. . .] If you are looking for support, cooperation, culture and people to engage, it starts with the customer. This is the only thing that connects everyone. It is also a big ice breaker to get things done.*" [U – Dutch]. This was repeated by a key informant working for a governmental organization who said "*the core is thinking from the customer's perspective. Because if you link it to the customer, you can get any employee along*" [T–Dutch]. Conversely, CI implementations aiming at cost reductions not

Table 2. Characteristics of key informants and participating organizations

Respondent characteristics				Company characteristics				
ID	Years of experience	Trainings and certifications	Years at the company	Company industry	Reported methodology implemented	CI governance	Years since implementation started	Reported status of implementation
A	10	MBB	1	Aerospace	Lean	Centralized	1 (restarted)	Beyond foundational CI, after a restart causing cultural issues
B	14	MBB	6	Business travel industry	Lean Six Sigma	Centralized	8	Towards systemic CI, despite changes in leadership
C	15	BB	5	Lighter production	Lean	Centralized	5	Disintegration, concerns about changes in leadership
D	14	MBB	2	Industrial food production	Six Sigma	Mixed	5	Towards systemic CI, started as World Class Manufacturing 10 years ago
E	12	MBB	7	Chemicals	Lean Six Sigma	Centralized	8	Disintegration, replace by Operational Excellence
F	13	BB	7	Waste processing	Lean Six Sigma	Decentralized	3 (restarted)	Ceremonial CI, several restarts causing issues with acceptance
G	16	MBB	2	3rd party contract logistics company	Lean Six Sigma	Centralized	10	Towards systemic CI, upgrading and redirecting from Six Sigma to Lean
H	14	MBB	4	Global food production	Lean Six Sigma	Mixed	8	Towards systemic CI, working on centralizing more
I	15	BB	5	Flower and plant trade and logistics	Lean/Agile	Centralized	5	Foundationless CI, different departments at different stages
J	6	BB	6	Financial services company	Lean Six Sigma	Dismantled	6	Disintegration, some elements remain, replaced by agile
K	20	MBB	18	Global chemical company	Lean Six Sigma	Mixed	16	Beyond foundational CI, but following a bumpy road
L	10	BB	3	Wholesaler	Lean	Decentralized	5	Foundationless CI, no standardization
M	12	BB	2	Supermarket chain	Lean	Decentralized	5	Ceremonial CI
N	14	BB	20	Professional logistics services	Lean Six Sigma	Mixed	14	Towards systemic CI, evolving from Six Sigma to Lean

(*continued*)

Table 2. Continued

Respondent characteristics				Company characteristics				
ID	Years of experience	Trainings and certifications	Years at the company	Company industry	Reported methodology implemented	CI governance	Years since implementation started	Reported status of implementation
O	13	BB	13	Global warehousing and distribution	Lean Six Sigma	Mixed	14 (restarted)	Towards systemic CI
P	13	MBB	18	Logistics	Lean Six Sigma	Mixed	12	Towards systemic CI
Q	10	BB	1	Production safety equipment	Six Sigma	Centralized	10	Towards systemic CI, getting a new impulse
R	5	BB	5	Temporary staffing solutions	Lean Six Sigma	Centralized	2	Foundationless CI, lack of investment from top
S	3	BB	2	Wholesaler stainless steel products	Lean Six Sigma	Decentralized	2	Ceremonial CI, early but poor progress
T	12	MBB	15	Government organization	Lean	Mix	12	Towards systemic CI
U	18	MBB	4	Global contract logistics	Lean Six Sigma	Centralized	10	Towards systemic CI, mature Six Sigma programme getting boost from Lean
V	8	BB	24	Healthcare	Lean Six Sigma	Decentralized	8	Beyond foundational CI
W	10	BB	14	Education	Lean	Decentralized	3	Foundationless CI, bottom-up
X	5	BB	32	Education	Lean	Decentralized	4	Foundationless CI, bottom-up
Y	7	BB	2	University	Lean Six Sigma	Decentralized	5	Foundationless CI
AA	20	MSc. Operational Excellence	n/a	Consultant SMEs	n/a	n/a	n/a	n/a
AB	4	MBB	n/a	Consultant	n/a	n/a	n/a	n/a

Source(s): Authors' own work

Table 3. Emergent themes mapped to CI implementation patterns identified, and corresponding important (SF) success- and (RF) risk factors[a]

Emergent themes	Foundationless CI	Interview ID	Ceremonial CI	Interview ID	Disintegration	Interview ID	Towards systemic CI	Interview ID
Theme 1 Goal of implementation	*RF:* Cost-cutting objectives	F, L, R, S	*SF:* Link to customer	A, B, E, G, R, U, T	*RF:* Programme not evolving with strategy	D, E, K	*SF:* Programme objective evolving with strategy	A, D, H, N, P, Q, T, U
	RF: Link to strategy missing	F, I, L, M, W, X	*RF:* Lack of patience for ROI	O, R, S				
Themes 2–3 Organization of implementation	*RF:* Lack of resources	F, L, M, R	*RF:* Bottom-up direction, needs leadership support	M, O, I, R, V, W, X, Y	*RF:* Programme fatigue	E, J, N	*SF:* Programme content evolving with strategy	G, H, T
	RF: Poor fit with Organization	I, L, R					*RF:* Programme fatigue	B, P
Theme 4–5 Leadership related factors	*SF:* Stimulation by leadership	A, B, D, M, S	*SF:* Keeping the savings (benefit tracking)	O, Q, T, V	*SF:* Leadership by example	A, L, O, P, Q	*SF:* Continued leadership support	G, H, L, P, Q, T, U
	SF: Prior experience of senior leadership	A, C, I			*RF:* Change in leadership	B, C, G, K, R		
Theme 6 Employee and learning related factors	*SF:* Using Lean to involve employees	C, E, Q	*RF:* Role of consultants	F, I, K, M, R, S	*RF:* Frustrated employees	J, O, P	*RF:* Changes in personnel	C, G, N, O, U
					RF: Reduction in training	H, J, U		

Note(s): [a]SF: Success factor contributing to increasing CI maturity, RF: risk factor inhibiting progress towards CI maturity
Source(s): Authors' own work

linked to the organization's immediate survival were perceived to be ineffective. This was nuanced when cost-reduction benefitted customers directly or indirectly as a key informant mentioned: "*Lean Six Sigma should be linked to what is important to the customer. They pay our salaries and bills, so we need to listen to them first. There are many cases that we just want to save money. The product [customers] get is the same, but we give it to them with less error or less process time, and that is saving us money. So, most of the cases is for the customer* [B-English]." In several cases, there was no clear rationale or objective linked to strategy for the organization to implement CI. This lack of strategic orientation for the CI implementation led to difficulties in determining the way in which processes needed to be improved, and who the stakeholders for the improvement were.

4.2.2 Emergent theme 2: choice of CI methodologies. The degree to which the selection of CI methodology was intentional was found to be linked to implementation success. A frequently used argument to explain the choice of CI methodology was previous experience of a key decision-maker (e.g. key informants C and I). In those organizations, less or no attention was paid to whether Lean was the right fit for the organization. In other organizations, as CI implementation progressed adjustments were made in such a way that the methodology fitted the needs of the organization better. This resulted in CI implementations that consisted of an amalgamation of methods and tools. For example, a key informant described the CI programme at their organization as "*the programme is very much directed at executing projects and it is very much data driven. According to the book, it would be towards Six Sigma, but there are also projects that gear more towards Lean"* [D – Dutch]. Consequently, the name used by organizations to describe their organization's implementation was not always consistent with its content (see RQ1).

4.2.3 Emergent theme 3: organization of the implementation – structure follows strategy. In our sample, most implementations were initiated top-down ($n = 22$), following a decision by senior management, and were governed by a centralized Lean, CI or "Centre of Excellence" department ($n = 9$). This separate department was responsible for training, coaching and providing expertise to the rest of the organization. There was variation amongst participating organizations in how rigidly the programme developed centrally was expected to be applied to the subsidiary. One approach was that the subsidiary was expected to participate in activities (e.g. training and problem-solving teams) according to a timeline imposed on them. Headquarters also imposed KPI improvements to motivate the subsidiary to participate. For example, a key informant explained "*when the top management tells the internal [stakeholder] I need this KPI to move from here to here*" [B–English].

A different, less coercive approach was a mixed approach consisting of providing the subsidiary with the programme information and tools and access to support from the central department but allow the responsible manager to decide whether to make use of these resources. Key informants describing this approach recognized that this approach yielded a good fit between the programme and the subsidiary's culture, but whether the implementation went ahead was too dependent on the whims of the responsible manager (e.g. key informant O).

4.2.4 Emergent theme 4: evolving and essential role of leadership and senior management. Senior leadership commitment was described as a determining factor for the success of the implementation yet took different forms depending on the implementation stage. In the initial stages, senior leaders were described as the initiators of the implementation, and providers of financial and other resources. Once the implementation became more mature, it was expected that senior leadership would step back operationally but maintain interest and enthusiasm. However, once the CI programme was perceived as being part of "daily work", senior leadership did not feel the need to emphasize its strategic importance. Without this message from senior management, "programme fatigue" occurred. As a key informant explained*: "I would say that a program has a lifespan of around 6 years. That is when the Lean Six Sigma programme was intended to deliver. At a point they [management] push the flag, or they get into something else.* [E–English]*."*

4.2.5 Emergent theme 5: changes in leadership. Changes in leadership and waning interest from existing leaders were identified as jeopardizing continued organizational commitment to the CI programme. This was particularly nefarious in the early years of implementation when the benefits of implementation had not yet become visible. It was also a concern for organizations with mature CI implementations where the implementation was tied to a strong "father-like" leader figure. For example, key informant C whose organization had successfully implemented Lean five years prior was concerned that the upcoming retirement of the CEO and Lean manager would lead to the demise of the Lean implementation (see Appendix 1).

4.2.6 Emergent theme 6: role of employees – informal role of opinion leaders. In addition to senior leadership, other CI champions or "agents of change" were seen as critical to the success of the implementation. These were middle-managers or employees who strongly embraced the CI vision and went beyond what was expected of them in terms of commitment and effort. Key informants also recognized that the organization did not always sufficiently acknowledge these individuals' contribution which resulted in frustration and even the departure of the individual. As their contribution was not formally recognized, their knowledge and experience were also at greater risk of being lost. The following situation, explained by key informant O was particularly illustrative. His organization, a large multinational, had adopted the approach that each division was free to adopt the CI programme developed centrally. One employee at one of the subsidiaries was very motivated for his division to embrace CI but was facing resistance from the division manager who did not see the added value of CI for his division. This resulted in the departure of this experienced employee.

4.2.7 Emergent theme 7: project selection as tool for organizational change. A mismatch was found between the theoretical framework and the empirical data on the topic of project selection and specifically on who should select projects and on which criteria. A top-down view was identified that stipulated that project selection should be done by senior managers. From this perspective, projects should always have objectives aligned with the organization's strategy and have an impact on operational or financial goals. The underlying assumption, in the words of a key informant was that "*when teams or middle management select the projects it can lead to sub-optimization because of silo thinking*" [E – English]. A different view voiced by key informants was that well-trained employees, equipped with information about the organizational strategy, and empowered to make decisions, were more than capable of selecting projects that would be beneficial to the organization. A yet different, but complementary view, was that some "fun" projects were needed, to generate buy-in from employees and would allow employees to "*remove frustration on the shopfloor*" [D – Dutch]. This in turn was expected to increase their feeling of empowerment and make them appreciate the potential of CI.

4.2.8 Emergent theme 8: rewards and recognitions. The consensus amongst key informants was that rewards and recognitions were undesirable. A thought commonly expressed was that the motivation to use CI should be intrinsic, and that managers and employees should embrace quality improvement as part of their job and to satisfy customers. Monetary rewards were rejected as potentially causing conflicts of interest. Other non-monetary recognitions were less forcefully rejected but their applicability was seen as limited. For example, key informant C recounted initial attempts to reward highly involved and intrinsically motivated employees through large gifts. The employees felt uncomfortable and returned the gifts. Another implicit reward that was mentioned was allowing departments to reinvest the savings they achieved through CI projects in discretionary projects. Consultant Z recounted the experiences of a university where the facilities department was able to reinvest the savings into innovation projects. The internal publicity that this generated contributed to a positive perception of the CI programme. Similarly, key informant T described the decision that departments who achieved significant financial savings were stimulated to re-invest them in improving quality as a catalyst for the organization to embrace Lean. Overall, key informants were more in favour of sharing success stories within the organization to increase organizational buy-in and as a form of knowledge sharing.

4.3 Emergent CI implementation patterns (RQ3)

The success factors and external events described above did not operate independently. Our analyses revealed that four implementation patterns can be distinguished. These patterns were affected by the factors specified above, as illustrated in Figure 2 and Table 3. For the labelling of the pattens identified, the CI implementation meta-model by Lameijer *et al.* (2023) was followed for inspiration. The first pattern, labelled as "Foundationless", referred to implementations that were initiated but never further developed. Three situations were identified as leading to this outcome. First, when the organization's primary goal for implementation was to cut costs without this being urgent for its continuity, employees balked and refused to participate (e.g. key informants L and R). Second, when insufficient resources were allocated at the start, the implementation could not gain enough momentum. Furthermore, employees interpreted this as a lack of commitment from the organization and refused to continue (e.g. key informants R, L and Y). Third, and related to the previous point, bottom-up implementations with no commitment from top management also resulted in implementations not taking off. This was particularly visible in institutes of higher education (key informants W and X).

A second pattern was one of "Ceremonial" CI implementation. These were implementations where actions were visibly taken by the organization, but where the project was abandoned prematurely, mostly due to a lack of patience to achieve Return on Investment (ROI) by management (e.g. key informant O prior to restart). This was frequently due to a change in leadership before the CI initiative had enough time to be embedded in the organization. Another reason was when insufficient resources were invested in the CI project, delaying achieving the desired ROI. A severe downside was that CI remained in the organization's memory as an unsuccessful project. For example, key informant A recalled that his organization had sought to implement Lean unsuccessfully, by focusing on hard skills and tools. When he was tasked with reintroducing Lean five years later with a stronger focus on soft skills, he had to overcome employees' reluctance to try again something that had failed them before.

The third and fourth paths that were identified were those of implementations that started well, with visible progress, until a plateau was reached. In some cases, the degree of implementation remained stalled at this plateau, and the organization kept searching and moving "Towards systemic CI". In other cases, a gradual decrease became apparent ("Disintegration"). These were the examples presented above where "programme fatigue" occurred. Leadership assumed that CI was now fully embedded in the organization and

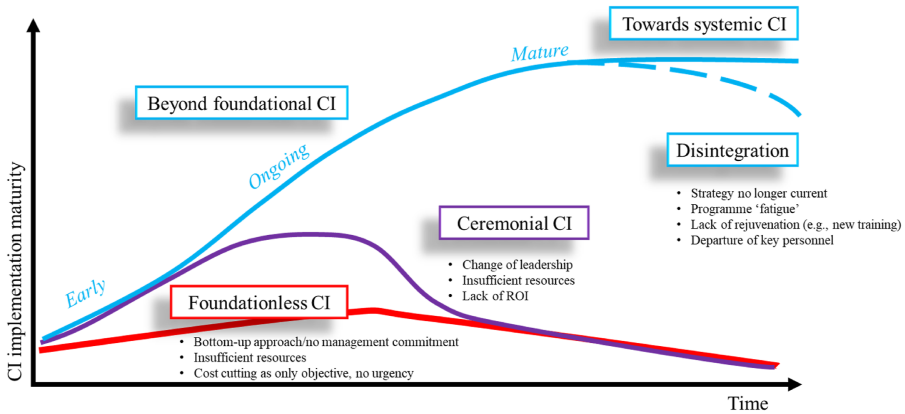

Figure 2. CI Implementation patterns. Source: Authors' own work

therefore did not need to be given extra attention. In these organizations, the initial implementation was well planned and executed, but less attention and fewer resources were devoted to maintaining programme momentum (e.g. organizations J and E). Furthermore, during the years since the programme's inception, the organization's strategy had evolved in response to changes in the external environment, but the CI programme had not kept up with these developments (organization J). Several organizations in our sample were still navigating and "Beyond foundational CI". These key informants recounted experiencing the effect of the factors and events described here but being able to navigate around them. For example, key informant K described their implementation as "*not a straight line, it went a bit as a bumpy road, changes of management, so it is like how you develop in life*" [K-English].

5. Discussion and theoretical contributions

Prescribing theories and management guidance are typically scoped for a particular CI methodology, such as Lean (Marodin and Saurin, 2013), Six Sigma (Kumar *et al.*, 2011), LSS (Lameijer *et al.*, 2017; Manville *et al.*, 2012) and TQM (Hietschold *et al.*, 2014). Our findings showed that, in practice, organizations were either developing organization-specific hybrid programs that combined aspects and tools of different CI methodologies (Netland, 2013), or adopting a recognized CI methodology yet implementing it differently than prescribed. More concerning was the finding that in some cases, organizations did not make rational choices and at best "satisficed" (Rijnders and Boer, 2004) or chose to adopt the latest fashion and thereby jeopardized CI implementation success due to a potential misfit between the CI implementation and the organizational context (Bhuiyan and Baghel, 2005). While this convergence of CI methodologies has been implicitly apparent in the academic literature (Sunder *et al.*, 2018; Sunder and Prashar, 2020), our findings demonstrate that distinguishing between CI methodologies is becoming simultaneously more challenging and less relevant. The convergence of CI methodologies is a natural evolution of each CI methodology evolving from a more practical/hard skills focus to a broader and more comprehensive managerial approach that also encompasses soft skills (Bortolotti *et al.*, 2015). A few sources of tension remain that can be attributed to philosophical and practical differences between CI methodologies. These include the issues of project selection (top-down management led or bottom-up employee driven) and changes to the organizational structure (centralized vs decentralized CI expertise). Our findings show that future studies can view CI implementation processes as independent from the CI methodologies it aims to implement. Empirical studies that are clearly scoped for a specific CI methodology need to incorporate control measures to ensure that the sampled organizations are indeed implementing the CI focal methodology as defined, similarly to Knol *et al.* (2022).

Regarding the success factors and external events (RQ2), our empirical findings extended previous research, by confirming the importance of leadership commitment and support for the success of CI implementation (Laureani and Antony, 2017, 2019; Nonthaleerak and Hendry, 2008), by further clarifying the mechanisms by which this success factor affects CI implementation, and its interlinkages with other factors. Unlike previous research that emphasized the role of leadership in the initial stages of implementation (Sunder and Prashar, 2020), our empirical findings showed that vocal leadership commitment was also needed in the latter stages of implementation for the CI implementation to be sustained (Lameijer *et al.*, 2025). Furthermore, as CI implementation is a long-term project, it is the responsibility of the organization's leadership to ensure that CI implementation remains aligned with a potentially changing strategic direction of the organization. This contributes to the call for more research beyond what CSFs are important, and instead focusing on how they operate (Knol *et al.*, 2022).

Our empirical findings also underscored the outsize positive influence that individuals can play in CI implementation. Opinion leaders, defined as "those individuals whose beliefs, practices and behaviours are noticed and imitated by others" (Ming Yu, 2002), play an

important yet frequently informal role. Thus, to the existing body of knowledge on success factors, we added the importance of the role that opinion leaders play therein.

On the topic of project selection, we identified several perspectives which contradicted each other. Project selection was viewed as a tool to ensure alignment of projects with the organization's strategy and thus took place top-down. This perspective concurs with existing research that views project selection as an objective process aiming to maximize an outcome (Kornfeld and Kara, 2011). Nevertheless, project selection was also viewed as a mechanism to generate employee buy-in and empowerment, more consistent with the subjective approaches documented in the literature (Kornfeld and Kara, 2013; Lam *et al.*, 2015).

Similarly, our empirical results showed a limited application of rewards and recognitions, even though they are considered an important part of the post-implementation phase (Bhamu and Singh Sangwan, 2014; Nonthaleerak and Hendry, 2008). This gap between theory and practice could be partially explained by the fact that few of the organizations had reached the equivalent of post-implementation. However, even the organizations that were classified as having a plateauing or disintegrating implementation vocally rejected rewards and recognition.

The empirical findings also corroborate that CI implementations deviate from prescribed theories and management guidance for CI implementation by being non-linear and company and context specific (RQ3). We found further support for Rijnders and Boer's (2004) finding that implementations are not likely to succeed if they are too modest or if insufficient resources are allocated at the onset. However, this was mostly the case for implementations instigated bottom-up (Kokkinou and van Kollenburg, 2021), equivalent to the first level in Bessant *et al.*'s (2001) framework. The vast majority of CI implementations reviewed were instigated top-down, and there was little evidence that they had gone through levels 2 and 3 of Bessant *et al.*'s (2001) framework. Instead, Kumar *et al.*'s (2011) framework was a better fit, as it assumed a strong leadership commitment from the onset. The findings also support the notion that implementation patterns are changing and more recent frameworks (Kumar *et al.*, 2011; Lameijer *et al.*, 2023) are better representations thereof.

The desired end state of CI implementation has frequently been described as the learning organization (Bessant *et al.*, 2001; Garcia-Sabater *et al.*, 2012; Kumar *et al.*, 2011). Consequently, the end phases or levels of existing CI implementation frameworks describe processes to institutionalize the learnings of CI projects (Garcia-Sabater *et al.*, 2012). However, we identified a pressing need for organizational learning from the onset, supporting Knol *et al.* (2022). The long timespan typical for successful CI implementation makes it vulnerable to external events such as changes in key actors (Rijnders and Boer, 2004). We propose that the robustness of the CI implementation process is directly linked to the organization's ability to capture and disseminate the learnings from CI projects, making it less vulnerable to changes in key personnel. Concretely, this requires organizations to implement from the onset a process where projects are evaluated, and the learnings thereof are shared with the rest of the organization as best-practices. The most effective way to do so is by updating the content of training (Kokkinou and van Kollenburg, 2021). Training should furthermore not cease after the early stages of implementation but should remain the primary way of transferring knowledge throughout the organization (Paneerselvam *et al.*, 2024).

Finally, none of the organizations that we investigated had reached the maturity equivalent of level 5 (Bessant *et al.*, 2001) or phase 5 (Lameijer *et al.*, 2023), even though several of the organizations sampled were publicly celebrated for their successful implementations. Yet, the organization with the most mature CI implementations was experiencing declining enthusiasm, commitment and results. This was mostly linked to the organization's lack of ability to rejuvenate the CI implementation (Rijnders and Boer, 2004) or keep it abreast of developments in the organization's strategy. The findings contribute to the stream of research that theorizes that implementations do not have to be complete for the organization to derive benefits (Bamford *et al.*, 2015).

6. Conclusion

Organizations often inconsistently apply CI methodologies and instead adapt them or create hybrid approaches that better fit their unique organizational context. This process is not always intentional, but reflects a broader convergence of CI methodologies, making distinctions between them increasingly blurred and irrelevant. This evolution is supported by a shift from hard skills to more comprehensive managerial approaches that are better supported by soft (i.e. change managerial) skills. Our findings show that the role of leadership remains critical throughout the entire CI implementation approach, not only at the start, as leadership must ensure the continued alignment with evolving strategic objectives. Furthermore, informal influencers and opinion leaders significantly impact the success of CI implementation and thus need to be recognized for their efforts. Finally, despite the large sample of companies interviewed, none had achieved the highest level of CI maturity. Even implementations that successfully navigate challenges show signs of stagnation, often due to a failure to rejuvenate efforts or adapt to organizational changes, highlighting the need for sustained commitment to CI implementation over time.

6.1 Implications for practice

Our findings suggest that organizations embarking on a CI implementation need to recognize that CI implementation is a long-term project that will require sustained and attentive leadership efforts. Concrete ways to achieve this are to link the CI implementation to the organizational strategy and define long-term goals beyond ROI. Rather than focusing a specific CI methodology, carefully attention needs to be given to the organizational context and current capabilities before selecting a single CI methodology or tailoring several CI methodologies into a hybrid CI methodology that fits the organization's unique context, capabilities and needs. We also recommend that the strategic importance of CI remains at the forefront of the organization's internal communication both formally through training programmes and informally through the celebration of success stories. It is essential that a long term plan is formulated. The CI implementation and corresponding initiatives need to be rejuvenated frequently to prevent program fatigue and ensure the implementation remains aligned with organizational changes.

Attention needs to be given not only to employees who resist change but also to employees actively supporting and engaged in the CI implementation. Informal influencers and opinion leaders need to be identified and empowered to champion CI efforts and influence their peers. Through regular gemba walks, senior leadership and management need to actively seek the feedback of these opinion leaders. Their tacit knowledge needs to be recognized as essential to CI implementation as these employees are an asset, especially when changes in leadership occur. Extending on this, CI implementation should not rely on a single charismatic leader, but instead should be embraced by leaders and managers at all levels of the organization. Furthermore, mechanisms need to be created that capture and share learnings from CI projects so that learning is institutionalized from the onset.

6.2 Limitations and future research

Our research findings highlighted that success factors and external events interacted and may jeopardize the progress of CI implementation. Further research should explore more in-depth which combinations of factors are more threatening to the progress of CI implementation, and which preventative actions organizations can build into their implementations to minimize their effects. Our findings suggest that further research should focus on the role of opinion leaders and on developing organizational learning processes early on to capture their tacit knowledge. Further research should examine whether these actions can stave off the negative impacts on CI implementation brought about by changes in leadership.

The study also suffers from methodological limitations, mostly arising from sampling issues. First, it is important to note that key informants are not perfect representations of

organizations. As Netland (2016) pointed out, key informants may be predisposed because of their cumulative experiences and may not be able to distinguish between their opinion and the policies of their organization. Second, a selection bias needs to be recognized towards organizations with an ongoing implementation process. While several organizations were included that had experienced failed implementations in the past, organizations with aborted or failed CI implementations were under-represented in our sample. Conversely, none of the organizations sampled had reached the final stage of CI maturity, leading to the question whether this is a sampling issue or representative of the elusiveness of such a maturity stage. Future research could extend this study's findings by using extreme case purposive sampling, focusing on failed and highly successful CI implementations.

Our sample was also limited to organizations operating in the Netherlands and Western Europe, whether they be Dutch organizations operating in the Netherlands, Dutch multinationals or the Dutch subsidiary of an international organization (Lameijer and Does, 2022). As national context is often intertwined with organizational context and affects factors such as leadership (Kokkinou and van Kollenburg, 2021), future research should examine CI implementation processes in a broader cultural context.

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(The Appendix follows overleaf)

Appendix

Table A1. Emerging themes and corresponding illustrative sample quotes

Emerging themes	Emerging sub-themes and corresponding illustrative sample quotes [RESPONDENT – Language]
Research questions 2: display of evidence for the vital few internal success factors and events external to CI implementation	
Theme 1 Goal of implementation	*Risk of cost-cutting* I want to prevent that the implementation becomes only about how we can cut costs. That is sometimes a negative side taste while it should be about creating extra value [L – Dutch]. I think the strategy at first was reducing cost. I am pretty certain because the international floor of our building, there was a banner saying how much fulltime equivalents the reduction had been so far. And that blows the whole mission out of water if you ask me. [R – English] *Link to customer* We have always linked Lean to our service quality, so to our customers. We never linked it to cost cutting. And we see that linking it to customers creates support amongst stakeholders [T–Dutch] In my experience Lean Six Sigma is always about the customer, what is important for the customer. As far as I am concerned, this must always bet the starting point. [Respondent AA – Dutch] *Link to strategy missing* The long terms goals are unclear. That makes it very difficult to even start with the implementation, because you don't know what you are doing it for [M–Dutch]
Theme 2 Choice of CI practices	*Initially Six Sigma progressing to include Lean* We need to have a good Sigma there. But now we see more and more that if we are working with factories, of course quality is important, but we need to go to some more Lean tools and get people involved [Q – English] *Pure Lean* We think that for us most benefits will be from using pure Lean, by eliminating waste [. . .] We change the factory layout regularly based on new insights that we develop and changes in demand. We reconfigure the machines to reduce waste [C – NL] *Prior experience of senior leadership* The CEO that initiated the Lean implementation had a lot of experience with Lean. You need to have a director or manager that has experience in Lean [C – Dutch] When I started we had a new CEO that had been there for just a year, and had 15 years of experience with continuous improvement from his previous job, and said we are going to introduce it here too [I – Dutch]
Theme 3 Organization of implementation	*Centralized organization* We own the materials for the lean deployment, we own the training and certification curriculum, and we support expert problem-solving. So, in fact, we have centralized six sigma problem-solving. We will train Green Belts and Black Belts in the sites to do expert problem-solving, but we will stay closely connected with our master Black Belts that report into me into the [central department]. [A – English] *Mixed organization* We have a three layer organization. Each site has its own Continuous Improvement Team Our business team supports the site Continuous Improvement Teams and we have a corporate team that takes care of the standards [D – Dutch] *Bottom-up needs leadership support* If you want to keep the implementation going, eventually you will need senior leadership to find it important [L – Dutch] *Formal top-down and resources* A new, more formal programme, driven by the global strategy, and with a broad organizational setup. And then you see that when something is imposed top-down with longer term resources, everyone needs to go along [O – Dutch] When we started the program in the company, the business unit management team came up with the project. So it was the most senior people in the business unit. And that was very good because it ensured that they were supporting the project, it was on their own invest, and it ensured that all people below were enforced to do it whether they liked it or not. [D – English]

(*continued*)

Table A1. Continued

Emerging themes	Emerging sub-themes and corresponding illustrative sample quotes [RESPONDENT – Language]
Theme 4 Evolving and essential role of leadership and senior management	*Leadership by example* If quality performance is taken seriously by top management, we find this an important topic. It trickles down. If big guys think that quality performance is important, others think "let's do it". So if there is no attention for it in top management, it is not going to flow. [Q – English] *Leadership stimulates* That is when management emphasized how important it was to do something that things had to change. And that's when you see that things start moving along [S – Dutch] *Continued leadership support* A key success factor was maximum commitment from top leadership who needed to continue emphasizing it. They had to keep repeating the story that you are successful if you do things a little bit better every day [L – Dutch] As soon long as the CEO releases the grip a little bit, then [the situation] comes back to whatever it was before [D–English]
Theme 5 Changes in leadership	*Change in leadership:* We changed the regional director in the Netherlands, he changed his job and the CEO of international replaced him interim. And then we found a new one. So the problems we have is that the owner of the Lean implementation changed 3 times. The company that was helping us left, and we have a management team that does not want it [R- English] Our growth from the start was not a straight line, it went a bit as a bumpy road, also because of changes of management, so it is like how you develop in life. [K – English] *Concerns about leadership change* It [Lean] is currently part of the culture. But we are very concerned. [The director] is retiring next year and I am retiring in a few months, and we don't have anyone in the management team as involved in Lean as we are. We are trying to create awareness and excitement about Lean in the management team [C – Dutch]
Theme 6 Role of employees	*Using Lean to involve employees* we need to make it simple and practical. We need to take a practical approach, everyone needs to understand what is in there for me and how to make the world better [Q – English] *Frustrated employees* We also have frustrated employees who want to do more [with continuous improvement] but they cannot get their manager on board [P–Dutch] *Reorganization* We had quite some elements of continuous improvement embedded, but then a reorganization took place and a lot of knowledge was lost [I – Dutch] *Role of consultants* These previous programmes were also unsuccessful because consultants were flown in, did their thing and left again. It wasn't enough about what we as the organization would have to do once they left. [F – Dutch]

(*continued*)

Table A1. Continued

Emerging themes	Emerging sub-themes and corresponding illustrative sample quotes [RESPONDENT – Language]
Theme 7 Project selection	*Top-down project selection* The higher the projects are allocated, the better it is to ensure that they are linked to the company's strategy. So they should be allocated from the top. [E – English] *Sub-optimalization* [Employees selecting the projects] can lead to a misalignment of the company's strategy and then the next one is that teams need to select the product. That is the same story. It can also lead to sub-optimization, because you need to look at Lean Six Sigma through the whole value chain [B – English] Because manufacturing sites have their own limited vision of what their agenda is. It might be trying to improve the process of this product, because it gives them headaches, however, it is very limited to what the company is doing, or maybe somebody is even trying to kill this project because it is not profitable enough. So you should direct it from the top. [D – English] *Remove employee frustration* What I notice is that it is good to remove frustration on the shopfloor. And of course you cannot always measure this in money, but it will eventually improve your performance [D – Dutch] If I have a very big employee–satisfaction related issue, I can't translate it to euros. [. . .] So if you believe that happy employees lead to happy customers, you do it. [M – Dutch] *Project selection linked to customers* At the end of the day I don't think it matters who selects the projects: middle management or teams. At the end of the day it needs to be linked to the customer [P – Dutch]
Theme 8 Rewards and recognition	*Rewards linked to customer experience* I think rewards and recognitions should be linked to the customer experience, not the Lean Six Sigma programme itself. So if you use Lean Six Sigma to improve the customer experience, it will have an impact on salary and rewards [P – Dutch] *Intrinsic rewards* You want to do it for quality and you want to do it as a team, as a company. You want to service your customer. Quality comes first, speed, cost. This is a way of work, it is not some target that should be met. It should be how you reach targets. I think it is about the purpose. [Respondent R] *Keeping the savings* We noticed that managers were worried about saving too much money. And senior management noticed and quickly intervened by ordering that all savings be re-invested in further improvement projects [T–Dutch]
Research questions 3: display of evidence for the identification of archetypical patterns in CI implementation processes	
Implementation patterns	*Restart causing resistance* Before that, they have run a lean deployment in manufacturing, and that was a lot less successful [. . .] and is causing a big cultural shock to people. We run into the situation that people tell us well we know what this means because we've done this already. [A – English] *Programme fatigue* In my experience, all the Lean Six Sigma programs have a life span of around 6 years. I mean that it is no longer that exciting. People move, teams move [E – English] The basic elements of Lean are still there, but parts of it have faded and the attention switched to Agile. [J – Dutch] *Programme evolving* The program is not called Lean Six Sigma anymore. The project was called continuous improvement, and then we called it operational excellence. The scope was company-wide or business unit-wide, and now the scope is manufacturing sites. It gets restructured, it gets shuffled, it is changing. [E – English] *Lack of ROI* We were caught up by the budget-perspective. We had been at it [the implementation] for two years and it had cost a lot of money. There were no visible improvements so let's put a line through it [O – Dutch]

Source(s): Authors' own work

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