# Skills Development to Reduce Process Improvement Failures

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## Abstract

Process improvement is a critical endeavor for organizations seeking to achieve sustainable performance in today's competitive market. However, a high failure rate of about two-thirds of process improvement projects remains a significant concern, negatively affecting organizational resources and undermining performance. Leadership emerges as one of the most vital factors influencing the success or failure of these initiatives. This study explores the role of leadership in contributing to process improvement project failures and highlights the technical and non-technical skills essential for reducing such failures. To achieve this objective, we conducted semi-structured interviews with 12 process improvement practitioners from the manufacturing and service sectors. The findings reveal key leadership roles in failures, including lack of interest and support, ineffective communication, poor understanding of team dynamics, and inappropriate leadership styles. Additionally, the study identifies skills such as statistical analysis, structured problem-solving, communication, adaptability, and emotional intelligence, which are critical to driving process improvement teams toward success. Organizations can use the insights from this study to assess the competencies of their process improvement teams and design skills development training programs to bridge any gaps, focusing on the specific skills needed for successful improvement outcomes.

## Keywords
Process improvement, Lean Six Sigma, Leadership, Skills development, Failure

## 1. Introduction
Process improvement methodologies, such as Kaizen, Total Quality Management (TQM), Lean, Six Sigma, and Lean Six Sigma, are widely recognized for their ability to enhance organizational efficiency, reduce waste, and improve

quality (Naik et al., 2024). Despite these recognized advantages, achieving consistent success with process improvement projects remains a significant challenge for many organizations (Bader et al., 2023). High failure rates frequently reported across industries have prompted researchers to investigate the underlying challenges and compile extensive lists of failure causes. Common reasons for process improvement project failures include inappropriate methodology selection, misuse of statistical tools, insufficient resources, inadequate training, and poor communication (Bader, Jayaraman, Antony, et al., 2024; Kumar et al., 2024; Sony et al., 2019).

To date, scholars have highlighted a series of drivers toward successful process improvement implementation and critical success factors (Flor Vallejo et al., 2020; Knol et al., 2018; Kuvvetli et al., 2016; Lameijer, Antony, et al., 2021; Lameijer, Pereira, et al., 2021). There is consensus that top management support and commitment, training, and employee participation are the most important critical success factors (Netland, 2016) in addition to cultural change, communication, and organizational resources (Dora et al., 2016; Netland, 2016; Singh and Singh, 2020).

Leadership is one of the most vital aspects in shaping the successful implementation of process improvement projects. While technical expertise and robust methodologies such as Lean and Six Sigma are essential, they cannot guarantee sustained success without proper leadership. Effective leadership in process improvement projects extends beyond mere oversight; it involves adopting the right leadership style to steer teams in the right direction, fostering shared responsibility for team effectiveness, and ensuring alignment with organizational goals (Gjøystdal and Karunaratne, 2020). Process improvement projects are inherently collaborative and require cross-functional coordination, making leadership behaviors and styles critical for overcoming challenges and driving results. However, poor leadership behaviors, such as a lack of interest, misalignment with organizational priorities, or insufficient collaboration, can derail these initiatives, even when technical aspects are adequately addressed. Conversely, leaders who adopt the appropriate mix of skills and styles can enable teams to thrive, take ownership, and sustain improvements over time (Motiani and Kulkarni, 2021).

Six Sigma and Lean Six Sigma are typically utilized to address complex problems that require in-depth data analysis and thorough investigations. Achieving the desired level of improvement relies on a well-trained team of technical specialists, commonly referred to as the "Belt Hierarchy." This hierarchy comprises five key levels: Yellow Belt, Green Belt, Black Belt, Master Black Belt, and Six Sigma Champion (Antony et al., 2021; Kumar et al., 2008; Linderman et al., 2003). These specialists are critical in effectively applying Six Sigma and Lean Six Sigma tools and techniques to ensure project success. This demands a broad range of skills. In a global survey with 105 responses by Antony and Karaminas (2016), "Analytical skills" were ranked as the most important for Black Belt practitioners, followed by expertise in the Six Sigma method (DMAIC), tools, and techniques. "Customer advocacy," "Project management skills," and "Result-oriented leadership" ranked lower on the list, with general agreement for the need to mix between technical and nontechnical skills. Another study highlighted planning skills, statistical skills, teamwork skills, and technical skills as the four types of skills considered important for applying the design of experiments in the service sector (Antony et al., 2020).

Various studies have often ranked unsupportive top management and lack of leadership engagement among the top major failure factors (Albliwi et al., 2014; Bader et al., 2024; Sreedharan et al., 2018; Swarnakar et al., 2020, 2021). Moreover, prior research has recognized the role of human resources in causing failures (Albliwi et al., 2014; Bader et al., 2023). However, the specific influence of leadership behaviors and styles remains underexplored. Furthermore, there is a notable gap in identifying the essential skills required to avoid such failures. In this response, the novelty of this study lies in exploring the role of leadership in contributing to process improvement project failures and identifying essential technical and non-technical skills required to avoid these failures. This research is a subset of a comprehensive investigation into process improvement project failures aimed at equipping organizations with strategies to reduce process improvement project failures and enhance their effectiveness. As a specific focus within this broader framework, this study examines the role of leadership behaviors and styles in causing process improvement project failures, along with the technical and non-technical skills required to mitigate such issues. Drawing on insights from practitioners through semi-structured interviews, the findings support organizations striving

to enhance the success rates of process improvement projects by equipping leaders with practical guidance to effectively lead process improvement initiatives and advance the outcomes of process improvement efforts.

Following the introduction in Section 1, the paper progresses with the research methodology outlined in Section 2. In Section 3, we present the findings, and finally, Section 4 discusses and concludes the paper, addresses its limitations, and proposes avenues for future research.

## 2. Methods

Figure 1 presents the research methodology followed. This study employs a qualitative research approach, leveraging semi-structured interviews to capture in-depth insights from experienced practitioners actively involved in process improvement initiatives. The qualitative method was chosen due to the exploratory nature of the study, where there is limited knowledge about the phenomena under consideration in the existing literature. The interactive nature of semi-structured interviews enables participants to elaborate on their experiences and provide richer and more detailed data than other qualitative methods, such as open-ended surveys, due to their flexibility and consistency (Saunders et al., 2019).
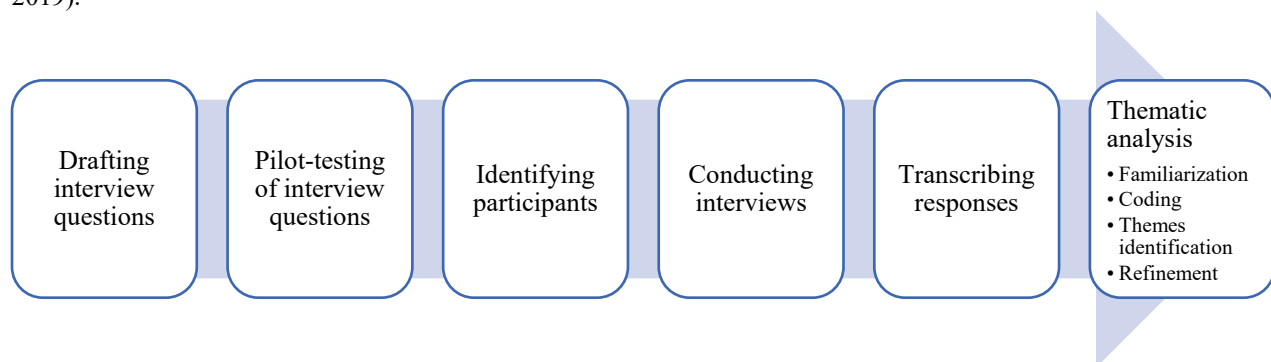


Figure 1. Research Methodology

Participants were selected using a purposive sampling technique to ensure the inclusion of individuals with substantial knowledge and practical experience in process improvement projects. The participants had to be certified with Black Belts or Master Black Belts and have at least five years of experience in process improvement execution. Ethical approval was obtained prior to conducting the study. Participants were informed of the study's purpose, their right to withdraw at any time and the confidentiality of their responses. Informed consent was obtained before the interviews, and all data were anonymized to protect participants' identities.

Interviews were conducted and transcribed using Microsoft Teams and lasted approximately one hour. During interviews, we asked participants, "*In your experience, what are the leadership behaviors/styles contributing to failure?*" to gain insights into the critical role leaders at different levels contribute to process improvement failures. Furthermore, we asked interviewees, "*What are the essential technical/non-technical skills required to mitigate failure?*" to identify the required skills needed to reduce the risk of failures.

Ultimately, a total of 12 interviews were conducted, including practitioners from manufacturing and service industries, across multiple countries to capture varied perspectives to enhance generalizability(Polit and Beck, 2010). The detailed characteristics of participants are presented in Table 1. It is worth mentioning that a minimum of 9 to 17 interviews are likely to capture almost all the recurring themes, indicating that our sample adequate for analysis (Hennink and Kaiser, 2022).

Thematic analysis was used to analyze the interview data. Firstly, transcripts were read multiple times to gain an understanding of the data. Initial codes were assigned to segments of text reflecting leadership behaviors/styles, technical and non-technical skills, and their influence on process improvement project outcomes. Subsequently, codes were grouped into broader themes representing key leadership factors and skill requirements. Themes were reviewed and refined to ensure coherence and alignment with the research objectives (Nowell et al., 2017).

Table 1. Participants characteristics

| Participant | Position | Experience | Sector |
|---|---|---|---|
| P1 | Operations Manager | 15 | Manufacturing |
| P2 | Data scientist | 15 | Service |
| P3 | Senior process improvement engineer | 12 | Service |
| P4 | Senior director | 23 | Healthcare |
| P5 | Process improvement manager | 12 | Service |
| P6 | Professor | 20 | Academic |
| P7 | Professor | 25 | Academic |
| P8 | Process improvement manager | 10 | Manufacturing |
| P9 | Director | 25 | Banking |
| P10 | Professor | 37 | Academic |
| P11 | Operations Manager | 17 | Manufacturing |
| P12 | LSS trainer | 17 | Manufacturing |

## 3. Results
### 3.1 Role of Leadership in Process Improvement Failures

The thematic analysis has identified key themes about the critical role of leadership in causing failure, as presented in Table 2. Participants emphasized the importance of active and visible leadership support for process improvement projects. Additionally, clear and consistent communication is essential for ensuring alignment among leaders, teams, and stakeholders. When communication breaks down, it leads to misunderstandings, misaligned goals, and project delays. Interestingly, P10 called for a balanced approach between top-down and bottom-up to ensure both strategic alignment and employee engagement.

Notably, leadership's interest and commitment to achieving financial targets through process improvement initiatives directly influence the project's success. Leaders need to show a clear interest and align process improvement goals with organizational targets to ensure their support. In this context, leadership requires a balanced combination of financial performance improvements and efforts to build a supportive culture to ensure that economic objectives are met without compromising employee morale, engagement, or long-term sustainability.

Interviewees highlighted that different leadership styles affect project outcomes. Participants suggest that transformational and servant leadership styles contribute to project success. According to P3:
*"The best leadership that would work is a servant kind of leadership where you let the team take it over and ensure that they come up, they take the initiatives they designed the solution. So, they are motivated, and you are just providing them with whatever they need, the help and the guidance required. You can't just be a boss."*

On the other hand, participants see that commanding and autocratic styles may hinder progress. P12 stated:
*"I know what the problem is, this is how we're going to solve it. But for some people, give us the senior manager who comes in and starts telling you where you need to go. Then a lot of people sort of back off because of that relationship in the hierarchical structure."*

Table 2. Leadership role in contributing to process improvement failures

| Theme | Description | Relevant Quotes |
|---|---|---|
| **Lack of interest and support** | • Leaders who do not take active and visible support or fail to demonstrate a genuine interest in the project lead to failure. | *"The most significant responsibility for top leaders is that they're leading the effort and not supporting the effort... If they're passively supporting it and saying, 'Oh yeah, it's a good thing, but I'm too* |

| | | |
|---|---|---|
| | • Leaders fail to align process improvement initiatives with organizational strategy or prioritize quality and long-term goals over short-term gains. | *busy, I can't get involved with it,' that sends a message."* (P7) |
| | | *"The leadership behavior is nothing but interest, which is an interest in the Lean Six Sigma."* (P2) |
| **Lack of motivation and involvement** | • Passive or inconsistent involvement from leaders undermines team motivation and accountability. <br> • Lack of follow-up or getting regular updates on the progress of the project <br> • Leaders fail to empower teams to make decisions, limiting their creativity and independence. | *"They know that somebody's watching, somebody's getting involved. Therefore, they'll get more and more motivated."* (P6) |
| | | *"If the leaders are not motivated, that's a big driver by itself. If the leaders are motivated but have their own vision of things, or they have a more dominating style of leading people, people will be afraid to speak up or share their thoughts, which is another driver for failure. "*(P11) |
| | | *"One would be lack of follow up or getting regular updates on the progress of the project."* (P9) |
| **Lack of communication and coordination** | • Lack of clear and consistent communication between leadership, teams, and stakeholders can lead to misalignment and project delays. | *"Lack of communication between the Project leader and the stakeholders to coordinate resourcing whether that's financial, resources, equipment time."* (P9) |
| **Failure to understand team dynamics** | • Leaders who fail to understand the skill levels, capabilities, and values of their teams may struggle to effectively guide and support them, leading to project inefficiencies or failure. <br> • Leaders should develop skills like power negotiation, communication, and decision-making | *"A leader has to understand his team, their skill level, their capabilities, even their value system because all these things can help to decide the project, decide the targets, and decide where you have to intervene or where you have to support your team and where you have to train your team."* (P1) |
| **Inappropriate leadership styles** | • Excessive use of certain leadership styles, such as pace-setting or commanding, without considering the situation or followers can lead to failure. <br> • Leaders who are overly autocratic may fail to motivate teams, resulting in poor performance and project failure. | *"Excess use of any style or if the leadership styles are not used as per situation and followers than it can contribute to failure, especially the Pace setting and commanding. These two styles should be applied in some very specific situations, with caution."* (P1) |
| | | *"If a leader is trying to control the decision-making or is just doing things the way he wants to do things, then they would definitely somewhere not get the kind of results they want or would ultimately fail."* (P3) |
| | | *"In today's business environment, autocratic leadership might work in the short term as people act out of fear or pressure, but in the long term, once the focus shifts, the project won't sustain because it was done out of fear."* (P5) |

| | | |
|---|---|---|
| **Leadership behavior and values** | • Bias in problem-solving<br>• Leaders who fail to uphold values like respect and integrity can harm the project's success.<br>• Lack of belief in project objectives<br>• Lack of flexibility and adaptability | *"It's 90% about people and 10% about technical skills. If you don't have people skills, if you don't know how to influence people and work with people to get things done, no one with a technical skill will be helpful to you."* (P4) |
| | | *"The main factor from the leadership is we need to be aware, or they should believe in the objective of the project. If they believe 100%, they can contribute to success. If they feel that the project has a 50% or 40% chance of success, it will affect badly."* (P8) |
| | | *"Servant leadership, where leaders let the team take over it and ensure that they take the initiative and design the solution."* (P3) |

## 3.2 Skills to Avoid Process Improvement Failures

Qualitative data analysis revealed a comprehensive set of essential skills needed to prevent process improvement project failures (Figure 2). Concerning technical skills, most participants emphasized the importance of having a conceptual understanding along with the proper level of statistical analysis and technical expertise with SS/LSS methodologies for successful project implementation. Data is the backbone of SS/LSS, and statistical tools are at the core of these methodologies, used to analyze data, validate hypotheses, and identify root causes. Misunderstanding or misusing these tools can lead to invalid conclusions and poor decision-making. Hence, developing such skills avoids failures stemming from the misusage of statistics and incorrect methodology selection. In this context, some participants highlighted the ability to make data-driven decisions as essential to avoid failure. This also necessitates the ability of modern software such as Minitab and SPSS.

On the other hand, a range of non-technical skills is pivotal to the success of process improvement projects, as they directly address potential failure points relevant to human and organizational challenges. Skills such as effective communication, teamwork and collaboration, and adaptability to change foster alignment and cohesion within project teams, ensuring smoother execution. Equally important, leadership, change management, and stakeholder management are critical for promoting team engagement, navigating resistance, and maintaining enthusiasm throughout the project lifecycle.

A culture of continuous learning and innovative thinking equips teams to respond effectively to challenges and drive sustained improvements. Strategic planning and active involvement help in defining clear goals and ensuring consistent engagement from all participants. Moreover, agility, emotional intelligence, and negotiation skills are indispensable for handling uncertainties, managing conflicts, and driving collaborative decisions.

| Technical Skills | Non-technical Skills |
|---|---|
| • Conceptual methodology understanding<br>• Statistical analysis skills<br>• Technical expertise with process improvement methodologies, SS/LSS in particular<br>• Data-driven decision-making approach<br>• Industry familiarity<br>• Structured problem solving<br>• Risk management and analysis<br>• Data visualization<br>• Ability to use analysis software such as Minitab and SPSS in the context of SS/LSS<br>• Experimental design | • Communication<br>• Teamwork and collaboration<br>• Adaptability to changes<br>• Leadership<br>• Change management<br>• Continuous learning culture<br>• Team building and management<br>• Critical and innovative thinking<br>• Strategic planning<br>• Active involvement<br>• Stakeholder management<br>• Agility<br>• Emotional intelligence<br>• Negotiation Skills |

Figure 2. Essential skills to prevent process improvement failures

## 4. Discussion and Conclusion

This study highlights the critical role of leadership in shaping the success or failure of process improvement projects. The findings highlight several leadership deficiencies contributing to failure, including lack of active involvement and visible support, misalignment of process improvement initiatives with organizational strategy, and insufficient alignment of process improvement and long-term goals. This aligns with (Antony et al., 2022; Bader et al., 2023), who identify such deficiencies as critical failure factors. Inadequate communication and a failure to empower teams were identified as critical leadership shortcomings that undermine motivation, creativity, and accountability. Hence, effective leadership extends beyond simply guiding teams; it involves aligning organizational priorities, fostering collaboration between operational and improvement teams, and ensuring sustained interest in process improvement initiatives. Leaders need to adapt their leadership styles according to the situations and challenges they face. This underscores the need for leaders to be dynamic, aware, and responsive, ensuring their approach aligns with both the immediate challenges and long-term objectives of their organization.

To address these challenges, the study emphasizes developing technical skills such as statistical analysis and problem-solving and non-technical skills such as communication, collaboration, and team building for effective process improvement implementations in accordance with (Netland, 2016). Still, our findings underscore a shift towards more holistic, adaptable, and people-centric skills in process improvement roles. The study emphasizes the importance of understanding the specific industry in which process improvement project is applied to tailor the methodologies to the unique challenges and processes within a sector. Proficiency in software tools like Minitab and SPSS is essential for data-driven decision-making, allowing practitioners to conduct advanced statistical analysis, monitor process performance, and generate actionable insights to drive improvements. As process improvement projects often involve uncertainty, the ability to assess, mitigate, and manage risks is becoming increasingly important to anticipate potential issues, create contingency plans, and minimize the impact of unforeseen challenges. Adaptability is crucial in today's fast-paced business environment. A mindset of continuous learning is essential for both personal and organizational growth. Process improvement practitioners must be committed to staying updated on new methodologies, tools, and best practices to drive ongoing process improvements and ensure long-term success. Beyond problem-solving, practitioners need the ability to think critically and innovatively. This allows them to approach complex challenges from multiple angles, find creative solutions, and drive forward-thinking improvements.

This study serves as part of a larger effort to address process improvement project failures, contributing to the broader field by offering insights into the intricate relationship between leadership and project success. By integrating these findings, organizations can focus on equipping leaders with the necessary competencies to overcome common failure factors, enhance team performance, and achieve sustainable improvements. However, the study's findings are based on qualitative data from interviews that are subjective and may reflect participant biases. The limited sample size and

the absence of quantitative validation limits the generalizability of the results. Thus, a survey to validate the identified leadership roles and skills across a larger and more diverse sample is recommended for future work.

## References

Albliwi, S., Antony, J., Lim, S.A.H. and van der Wiele, T, "Critical failure factors of lean Six Sigma: A systematic literature review", *International Journal of Quality and Reliability Management*, Emerald Group Holdings Ltd., Vol. 31 No. 9, pp. 1012–1030, 2014. doi: 10.1108/IJQRM-09-2013-0147.

Antony, J. and Karaminas Harry, "Critical Assessment on the Six Sigma Black Belt Roles/ Responsibilities, Skills and Training: A Global Empirical Study".2016.

Antony, J., Lancastle, J., McDermott, O., Bhat, S., Parida, R. and Cudney, E.A, "An evaluation of Lean and Six Sigma methodologies in the national health service", *International Journal of Quality and Reliability Management*, Emerald Group Holdings Ltd., 2021. doi: 10.1108/IJQRM-05-2021-0140.

Antony, J., Sony, M., McDermott, O., Swarnakar, V., Galli, B., Doulatabadi, M. and Kaul, R, "An empirical study into the reasons for failure of sustaining operational excellence initiatives in organizations", *The TQM Journal*, 2022. doi: 10.1108/TQM-05-2022-0176.

Antony, J., Viles, E., Torres, A.F., Fernandes, M.M. and Cudney, E.A, "Design of experiments in the service industry: results from a global survey and directions for further research", *TQM Journal*, Emerald Group Holdings Ltd., Vol. 33 No. 5, pp. 987–1000, 2020. doi: 10.1108/TQM-09-2020-0223.

Bader, M., Antony, J., Jayaraman, R., Swarnakar, V., Goonetilleke, R.S., Maalouf, M., Garza-Reyes, J.A., *et al.* , "Why do process improvement projects fail in organizations? A review and future research agenda", *International Journal of Lean Six Sigma*, Emerald Publishing, 2023. doi: 10.1108/IJLSS-07-2023-0126.

Bader, M., Jayaraman, R., Antony, J., Goonetilleke, R.S., Linderman, K. and Hoerl, R, Mitigating process improvement project failures: leveraging organizational responses and lessons learned", *Benchmarking: An International Journal*, 2024. doi: 10.1108/BIJ-06-2024-0526.

Bader, M., Jayaraman, R. and Goonetilleke, R.S, "Evaluation of the Critical Failure Factors of Process Improvement Methodologies: An AHP Approach", *2024 IEEE International Conference on Industrial Engineering and Engineering Management (IEEM)*, IEEE, pp. 1209–1213, 2024. doi: 10.1109/IEEM62345.2024.10857079.

Dora, M., Kumar, M. and Gellynck, X, "Determinants and barriers to lean implementation in food-processing SMEs - A multiple case analysis", *Production Planning and Control*, Taylor and Francis Ltd., Vol. 27 No. 1, pp. 1–23, 2016. doi: 10.1080/09537287.2015.1050477.

Flor Vallejo, V., Antony, J., Douglas, J.A., Alexander, P. and Sony, M, "Development of a roadmap for Lean Six Sigma implementation and sustainability in a Scottish packing company", *TQM Journal*, Emerald Group Holdings Ltd., Vol. 32 No. 6, pp. 1263–1284, 2020. doi: 10.1108/TQM-02-2020-0036.

Gjøystdal, S. and Karunaratne, T, "Effect of inadequate self-organized teams in agile project management: A case study from the oil and gas industry", *International Journal of Information Technology Project Management*, IGI Global, Vol. 11 No. 3, pp. 95–106, 2020. doi: 10.4018/IJITPM.2020070106.

Hennink, M. and Kaiser, B.N, "Sample sizes for saturation in qualitative research: A systematic review of empirical tests", *Social Science and Medicine*, Elsevier Ltd, Vol. 292, 2022. doi: 10.1016/j.socscimed.2021.114523.

Knol, W.H., Slomp, J., Schouteten, R.L.J. and Lauche, K, "Implementing lean practices in manufacturing SMEs: testing 'critical success factors' using Necessary Condition Analysis", *International Journal of Production Research*, Taylor and Francis Ltd., Vol. 56 No. 11, pp. 3955–3973, 2018. doi: 10.1080/00207543.2017.1419583.

Kumar, M., Antony, J., Madu, C.N., Montgomery, D.C. and Park, S.H, "Common myths of Six Sigma demystified", *International Journal of Quality and Reliability Management*, Vol. 25 No. 8, pp. 878–895, 2008. doi: 10.1108/02656710810898658.

Kumar, S., Kumar, R., Phanden, R.K., Kumar, A., Bala, J., Bharath Kumar, S., Giri, J., *et al,* A study on critical failure factors for implementation of sustainable Lean Six Sigma from Indian manufacturing industries perspective using BWM technique", *Frontiers in Mechanical Engineering*, Vol. 10, 2024. doi: 10.3389/fmech.2024.1451568.

Kuvvetli, Ü., Firuzan, A.R., Alpaykut, S. and Gerger, A, "Determining Six Sigma success factors in Turkey by using structural equation modeling", *Journal of Applied Statistics*, Taylor and Francis Ltd., Vol. 43 No. 4, pp. 738–753,2016. doi: 10.1080/02664763.2015.1077375.

Lameijer, B.A., Antony, J., Chakraborty, A., Does, R.J.M.M. and Garza-Reyes, J.A, "The role of organisational motivation and coordination in continuous improvement implementations: an empirical research of process

improvement project success", *Total Quality Management and Business Excellence*, Routledge, Vol. 32 No. 13–14, pp. 1633–1649,2021.  doi: 10.1080/14783363.2020.1757422.

Lameijer, B.A., Pereira, W. and Antony, J, "The implementation of Lean Six Sigma for operational excellence in digital emerging technology companies", *Journal of Manufacturing Technology Management*, Emerald Group Holdings Ltd., Vol. 32 No. 9, pp. 260–284, 2021. doi: 10.1108/JMTM-09-2020-0373.

Linderman, K., Schroeder, R.G., Zaheer, S. and Choo, A.S, *Six Sigma: A Goal-Theoretic Perspective*, *Journal of Operations Management*, Vol. 21.2003.

Motiani, N.N. and Kulkarni, A, "Leadership role in implementing Lean Six Sigma – a cross case analysis of KPO/BPO service organizations", *International Journal of Innovation Science*, Emerald Group Holdings Ltd., Vol. 13 No. 3, pp. 249–267, 2021. doi: 10.1108/IJIS-09-2020-0159.

Naik, S., Sony, M., Antony, J., McDermott, O., Tortorella, G.L. and Jayaraman, R, "Operational excellence framework for sustainability in the organisation: a design science approach", *Production Planning and Control*, Taylor and Francis Ltd., Vol. 35 No. 11, pp. 1215–1231,2024.  doi: 10.1080/09537287.2023.2165188.

Netland, T.H. , "Critical success factors for implementing lean production: The effect of contingencies", *International Journal of Production Research*, Taylor and Francis Ltd., Vol. 54 No. 8, pp. 2433–2448, 2016. doi: 10.1080/00207543.2015.1096976.

Nowell, L.S., Norris, J.M., White, D.E. and Moules, N.J, "Thematic Analysis: Striving to Meet the Trustworthiness Criteria", *International Journal of Qualitative Methods*, SAGE Publications Inc., Vol. 16 No. 1,2010. doi: 10.1177/1609406917733847.

Polit, D.F. and Beck, C.T, "Generalization in quantitative and qualitative research: Myths and strategies", *International Journal of Nursing Studies*, Vol. 47 No. 11, pp. 1451–1458, 2010. doi: 10.1016/j.ijnurstu.2010.06.004.

Saunders, M.N.K., Lewis, P. and Thornhill, A. , *Research Methods for Business Students*. 2019.

Singh, G. and Singh, D, "CSFs for Six Sigma implementation: a systematic literature review", *Journal of Asia Business Studies*, Emerald Group Holdings Ltd., 7 December, 2020. doi: 10.1108/JABS-03-2020-0119.

Sony, M., Naik, S. and Therisa, K.K, "Why do organizations discontinue Lean Six Sigma initiatives?", *International Journal of Quality and Reliability Management*, Emerald Group Holdings Ltd., Vol. 36 No. 3, pp. 420–436, 2019.  doi: 10.1108/IJQRM-03-2018-0066.

Sreedharan, V.R., Gopikumar, G. V., Nair, S., Chakraborty, A. and Antony, J, "Assessment of critical failure factors (CFFs) of Lean Six Sigma in real life scenario: Evidence from manufacturing and service industries", *Benchmarking*, Emerald Group Publishing Ltd., Vol. 25 No. 8, pp. 3320–3336, 2018.  doi: 10.1108/BIJ-10-2017-0281.

Swarnakar, V., Singh, A.R. and Tiwari, A.K. , "Evaluating the effect of critical failure factors associated with sustainable Lean Six Sigma framework implementation in healthcare organization", *International Journal of Quality and Reliability Management*, Emerald Group Holdings Ltd., Vol. 38 No. 5, pp. 1149–1177, 2021. doi: 10.1108/IJQRM-07-2020-0243.

Swarnakar, V., Tiwari, A.K. and Singh, A.R, "Evaluating critical failure factors for implementing sustainable lean six sigma framework in manufacturing organization: A case experience", *International Journal of Lean Six Sigma*, Emerald Group Holdings Ltd., Vol. 11 No. 6, pp. 1083–1118, 2020. doi: 10.1108/IJLSS-05-2019-0050.