

## Documents

Ahmed, S.<sup>a</sup>, Islam, R.<sup>b</sup>, Ashrafi, D.M.<sup>c</sup>, Alqasmi, I.<sup>d</sup>, Choudhury, M.M.<sup>e</sup>, Rahman, M.<sup>f</sup>, Dhar, B.K.<sup>g</sup>

**Effects of lean and six sigma initiatives on continuous quality improvement of the accredited hospitals**  
(2024) *International Journal of Healthcare Management*, 17 (4), pp. 889-901. Cited 1 time.

**DOI:** 10.1080/20479700.2023.2255424

<sup>a</sup> Department of Business Administration, World University of Bangladesh, Dhaka, Bangladesh

<sup>b</sup> Department of Business Administration, International Islamic University Malaysia, Kuala Lumpur, Malaysia

<sup>c</sup> ULAB School of Business, University of Liberal Arts Bangladesh, Dhaka, Bangladesh

<sup>d</sup> Public Health School of Health Sciences, Saudi Electronic University, Riyadh, Saudi Arabia

<sup>e</sup> Department of Management, University of Dhaka, Dhaka, Bangladesh

<sup>f</sup> Lincoln International Business School, University of Lincoln, Lincoln, United Kingdom

<sup>g</sup> Business Administration Division, Mahidol University International College, Mahidol University, Salay, Thailand

### Abstract

The main purpose of this study is to investigate the role of Lean and Six Sigma initiatives on continuous quality improvement in the Malaysian Society for Quality in Health (MSQH) accredited hospitals. In particular, it investigates the relationship between top management support and teamwork. It also examines the influence of teamwork on Lean and Six Sigma initiatives. In this study, 450 survey questionnaires were distributed to twelve MSQH-accredited hospitals' staff using the Stratified Random Sampling method and received 251 useable responses constituting a 55.78 per cent response rate. The reliability and validity of the research variables were tested based on internal consistency, construct validity and discriminant validity by applying the SmartPLS 3.3.4 software. The relationships among various variables in the model were tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). Overall, the study's findings reveal that Lean and Six Sigma initiatives positively and significantly impact the continuous quality improvement of MSQH-accredited hospitals. The findings also indicate that top management support has a positive and significant relationship with teamwork and vice versa, i.e. teamwork significantly affects Lean and Six Sigma initiatives. © 2023 Informa UK Limited, trading as Taylor & Francis Group.

### Author Keywords

continuous quality improvement; hospitals; lean initiatives; six sigma initiatives; teamwork; Top management support

### Index Keywords

article, construct validity, discriminant validity, human, human experiment, internal consistency, partial least squares regression, questionnaire, reliability, six sigma methodology, software, structural equation modeling, teamwork, total quality management

### References

- Chua, K.C., Henderson, C., Grey, B.  
**Evaluating quality improvement at scale: a pilot study on routine reporting for executive board governance in a UK National Health Service organization**  
(2023) *Eval Program Plann*, 97, p. 102222.
- Tezel, A., Koskela, L., Tzortzopoulos, P.  
**Implementation of continuous improvement cells: a case study from the civil infrastructure sector in the UK**  
(2023) *Prod Plan Contr*, 34 (1), pp. 68-90.
- Gardner, K., Sibthorpe, B., Chan, M.  
**Implementation of continuous quality improvement in aboriginal and Torres Strait islander primary health care in Australia: a scoping systematic review**  
(2018) *BMC Health Serv Res*, 18 (541), pp. 1-21.
- Rice, C.M., Singh, P.P., Judd, N.S.  
**Protocol for the IMPACT trial: improving healthcare outcomes in American transplant recipients using culturally-tailored novel technology**  
(2022) *J Ren Nutr*, 32 (3), pp. e1-e12.

- Jamieson, S.  
**State of the science: quality improvement of medical curricula—how should we approach it**  
(2023) *Med Educ*, 57 (1), pp. 49-56.
- Dzidowska, M., Lee, K.K., Wylie, C.  
**A systematic review of approaches to improve practice, detection and treatment of unhealthy alcohol use in primary health care: a role for continuous quality improvement**  
(2020) *BMC Fam Pract*, 21 (1), pp. 1-22.
- Litvaj, I., Drbúl, M., Bůžek, M.  
**Sustainability in small and medium enterprises, sustainable development in the Slovak Republic, and sustainability and quality management in small and medium enterprises**  
(2023) *Sustainability*, 15 (3), p. 2039.
- Yapa, H.M., De Neve, J.W., Chetty, T.  
**The impact of continuous quality improvement on coverage of antenatal HIV care tests in rural South Africa: results of a stepped-wedge cluster-randomised controlled implementation trial**  
(2020) *PLoS Med*, 17 (10), p. e1003150.
- Ahmed, S., Manaf, N.H.A., Islam, R.  
**Measuring lean six sigma and quality performance for healthcare organisations**  
(2018) *Int J Qual Serv Sci*, 10 (3), pp. 267-278.
- Antony, J., Lancastle, J., McDermott, O.  
**An evaluation of Lean and Six Sigma methodologies in the national health service**  
(2023) *Int J Qual Reliab Manag*, 40 (1), pp. 25-52.
- Rana, J.A., Jani, S.Y.  
**An integrated Industry 4.0-Sustainable Lean Six Sigma framework to improve supply chain performance: a decision support study from COVID-19 lessons**  
(2023) *J Global Oper Strateg Sourc*,
- Rathi, R., Vakharia, A., Shadab, M.  
**Lean six sigma in the healthcare sector: a systematic literature review**  
(2022) *Mater Today Proc*, 50, pp. 773-781.
- Aggarwal, A., Aeran, H., Rathee, M.  
**Quality management in healthcare: the pivotal desideratum**  
(2019) *J Oral Biol Craniofac Res*, 9 (2), pp. 180-182.
- Moody-Williams, J.  
**Pursuing continuous quality improvement**  
(2020) *A journey towards patient-centered healthcare quality*, pp. 29-36.  
Cham: Springer,. In:.. p
- Niñerola, A., Sánchez-Rebull, M.V., Hernández-Lara, A.B.  
**Quality improvement in healthcare: Six Sigma systematic review**  
(2020) *Health Policy*, 124 (4), pp. 438-445.
- Abu, F., Gholami, H., Saman, M.Z.M.  
**The implementation of lean manufacturing in the furniture industry: a review and analysis on the motives, barriers, challenges, and the applications**  
(2019) *J Clean Prod*, 234, pp. 660-680.
- Khana, M.P., Talibb, N.A., Kowangc, T.O.  
**The development of a sustainability framework via lean green six sigma practices in**

**SMEs based upon RBV theory**

(2020) *Development*, 12 (5), pp. 135-156.

- Butt, M.M., de Run, E.C.

**Private healthcare quality: applying a SERVQUAL model**

(2010) *Int J Health Care Qual Assur*, 23 (7), pp. 658-673.

- Ahmed, S., Hawarna, S., Alqasmi, I.

**Role of Lean Six Sigma approach for enhancing the patient safety and quality improvement in the hospitals**

(2022) *Int J Healthc Manag*,

- Trakulsunti, Y., Antony, J., Edgeman, R.

**Reducing pharmacy medication errors using lean six sigma: a Thai hospital case study**

(2022) *Total Qual Manag Bus Excell*, 33 (5-6), pp. 664-682.

- Ong, K.Y., Zailani, S., Kanapathy, K.

**Determinants of effectiveness of lean healthcare performance in Malaysian public hospitals**

(2022) *TQM J.*,

- Tzadok, B., Ben Tov, O., Vaispapir, V.

**Lean six sigma and stroke in rural hospital—the case of Baruch Padeh Medical Center**

(2022) *Int J Health Care Qual Assur*, 35 (1), pp. 21-37.

- Singh, A., Pradhan, S., Ravi, P.

**Application of six sigma and 5S to improve medication turnaround time**

(2021) *Int J Healthc Manag*, 14 (4), pp. 1279-1287.

- Leite, H., Bateman, N., Radnor, Z.

**Beyond the ostensible: an exploration of barriers to lean implementation and sustainability in healthcare**

(2020) *Product Plann Contr*, 31 (1), pp. 1-18.

- Vaishnavi, V., Suresh, M.

**Modelling of readiness factors for the implementation of lean six sigma in healthcare organizations**

(2020) *Int J Lean Six Sigma*, 11 (4), pp. 597-633.

- Ahmed, S., Abd Manaf, N.H., Islam, R.

**Effect of lean Six sigma on quality performance in Malaysian hospitals**

(2018) *Int J Health Care Qual Assur*, 31 (8), pp. 973-987.

- Gaikwad, L., Sunnapwar, V.

**An integrated lean, green and six sigma strategies: a systematic literature review and directions for future research**

(2020) *TQM J*, 32 (2), pp. 201-225.

- Farrukh, A., Mathrani, S., Sajjad, A.

**Managerial perspectives on green-lean-six sigma adoption in the flexible packaging industry: empirical evidence from an emerging economy**

(2022) *J Manuf Technol Manag*, 33 (7), pp. 1232-1255.

- Persis, D.J., Sunder, M.V., Sreedharan, V.R.

**Improving patient care at a multi-speciality hospital using lean six sigma**

(2022) *Product Plann Contr*, 33 (12), pp. 1135-1154.

- Noronha, A., Bhat, S., Gijo, E.V.

**Performance and service quality enhancement in a healthcare setting through lean**

**six sigma strategy**

(2023) *Int J Qual Reliab Manag*, 40 (2), pp. 365-390.

- Habib, M.A., Rizvan, R., Ahmed, S.

**Implementing lean manufacturing for improvement of operational performance in a labeling and packaging plant: a case study in Bangladesh**

(2023) *Res Eng*, 17, p. 100818.

- Thakur, V., Akerele, O.A., Randell, E.

**Lean and Six Sigma as continuous quality improvement frameworks in the clinical diagnostic laboratory**

(2023) *Crit Rev Clin Lab Sci*, 60 (1), pp. 63-81.

- Malaysian society for quality health, 2023; [cited on 28 January 2023]

- Sohal, A., De Vass, T., Vasquez, T.

**Success factors for lean six sigma projects in healthcare**

(2022) *J Manag Contr*, 33 (2), pp. 215-240.

- Juran, J.M.

(1989) *Juran on leadership for quality: an executive handbook*, New York: Free Press

- Ahmed, S., Manaf, N.H.A., Islam, R.

**Assessing top management commitment, workforce management, and quality performance of Malaysian hospitals**

(2021) *Int J Healthc Manag*, 14 (1), pp. 236-244.

- Dubey, R., Gunasekaran, A., Helo, P.

**Explaining the impact of reconfigurable manufacturing systems on environmental performance: the role of top management and organisational culture**

(2017) *J Clean Prod*, 141 (1), pp. 56-66.

- Gözükara, İ., Çolakoğlu, N., Şimşek, Ö.F.

**Development culture and TQM in Turkish healthcare: importance of employee empowerment and top management leadership**

(2019) *Total Qual Manag Bus Excell*, 30 (11-12), pp. 1302-1318.

- Henry, L.A., Buyl, T., Jansen, R.J.

**Leading corporate sustainability: the role of top management team composition for triple bottom line performance**

(2019) *Bus Strat Environ*, 28 (1), pp. 173-184.

- Graves, L.M., Sarkis, J., Gold, N.

**Employee pro-environmental behavior in Russia: the roles of top management commitment, managerial leadership, and employee motives**

(2019) *Resourc Conserv Recycl*, 140 (1), pp. 54-64.

- Vainieri, M., Ferre, F., Giacomelli, G.

**Explaining performance in health care: how and when top management competencies make the difference**

(2019) *Health Care Manage Rev*, 44 (4), pp. 306-317.

- Lin, C.P., Liu, M.L., Joe, S.W.

**Predicting top management approval and team performance in technology industry**

(2017) *Pers Rev*, 46 (1), pp. 46-67.

- Giudici, M., Filimonau, V.

**Exploring the linkages between managerial leadership, communication and**

**teamwork in successful event delivery**

(2019) *Tour Manag Persp*, 32 (10), p. 100558.

- Adu, E.T., Opawole, A.

**Assessment of performance of teamwork in construction projects delivery in South-Southern Nigeria**

(2019) *J Eng Design Technol*, 18 (1), pp. 230-250.

- Adil, M.S., Ab Hamid, K.B.

**Effect of teamwork on employee performance in high-tech engineering SMEs of Pakistan: a moderating role of supervisor support**

(2020) *South Asian J Manag*, 14 (1), pp. 122-141.

- Leong, T.-W., Teh, P.-L.

**Critical success factors of six sigma in original equipment manufacturer company in Malaysia**

(2013) *Int J Synergy Res*, 1 (1), pp. 7-21.

- Sweis, R.J., Elhawa, N.A., Sweis, N.J.

**Total quality management practices and their impact on performance: case study of Royal Jordanian Airlines**

(2019) *Int J Bus Excell*, 17 (2), pp. 245-263.

- Dhar, R.L.

**Service quality and the training of employees: the mediating role of organizational commitment**

(2015) *Tourism Manag*, 46 (2), pp. 419-430.

- Lin, C.P., Liu, C.M., Liu, N.T.

**Being excellent teams: managing innovative climate, politics, and team performance**

(2020) *Total Qual Manag Bus Excell*, 31 (3-4), pp. 353-372.

- Fadnavis, S., Najarzadeh, A., Badurdeen, F.

**An assessment of organizational culture traits impacting problem solving for lean transformation**

(2020) *Proc Manuf*, 48 (1), pp. 31-42.

- Akmal, A., Greatbanks, R., Foote, J.

**Lean thinking in healthcare—findings from a systematic literature network and bibliometric analysis**

(2020) *Health Policy*, 124 (6), pp. 615-627.

- Lima, R.M., Dinis-Carvalho, J., Souza, T.A.

**Implementation of lean in health care environments: an update of systematic reviews**

(2020) *Int J Lean Six Sigma*, 12 (2), pp. 399-431.

- Mazur, L., Stokes, S.B., McCreery, J.

**Lean-thinking: implementation and measurement in healthcare settings**

(2019) *Eng Manage J*, 31 (3), pp. 193-206.

- Protzman, C., Mayzell, G., Kerpchar, J.

(2010) *Leveraging lean in healthcare: transforming your enterprise into a high quality patient care delivery system*,

New York: CRC Press

- Alkhaldi, R.Z., Abdallah, A.B.

**Lean management and operational performance in health care**

(2019) *Int J Product Perform Manag*, 69 (1), pp. 1-21.

- Gowen, C.R., McFadden, K.L., Settaluri, S.  
**Contrasting continuous quality improvement, six sigma, and lean management for enhanced outcomes in US hospitals**  
(2012) *Am J Bus*, 27 (2), pp. 133-153.
- Randhawa, J.S., Ahuja, I.S.  
**5S-a quality improvement tool for sustainable performance: literature review and directions**  
(2017) *Int J Qual Reliab Manage*, 34 (3), pp. 334-361.
- Ishijima, H., Nishikido, K., Teshima, M.  
**Introducing the “5S-KAIZEN-TQM” approach into public hospitals in Egypt**  
(2019) *Int J Health Care Qual Assur*, 33 (1), pp. 89-109.
- Barnabè, F., Guercini, J., Perna, M.D.  
**Assessing performance and value-creation capabilities in Lean healthcare: insights from a case study**  
(2019) *Public Money Manage*, 39 (7), pp. 503-511.
- Ahmed, S.  
**Integrating DMAIC approach of lean six sigma and theory of constraints toward quality improvement in healthcare**  
(2019) *Rev Environ Health*, 34 (4), pp. 427-434.
- Wilson, W.J., Jayamaha, N., Frater, G.  
**The effect of contextual factors on quality improvement success in a lean-driven New Zealand healthcare environment**  
(2018) *Int J Lean Six Sigma*, 9 (2), pp. 199-220.
- Impronta, G., Balato, G., Ricciardi, C.  
**Lean six sigma in healthcare: fast track surgery for patients undergoing prosthetic hip replacement surgery**  
(2019) *TQM J*, 31 (4), pp. 526-540.
- Niñerola, A., Sánchez-Rebull, M.V., Hernández-Lara, A.B.  
**Quality improvement in healthcare: Six sigma systematic review**  
(2020) *Health Policy*, 124 (4), pp. 438-445.
- Yadav, N., Mathiyazhagan, K., Kumar, K.  
**Application of six sigma to minimize the defects in glass manufacturing industry**  
(2019) *J Adv Manage Res*, 16 (4), pp. 594-624.
- Bakti, C.S., Kartika, H.  
**Analysis of ice cream product quality control with six sigma method**  
(2020) *J Indus Eng Manage Res*, 1 (1), pp. 63-69.
- Condé, G.C.P., Martens, M.L.  
**Six sigma project generation and selection: literature review and feature based method proposition**  
(2020) *Product Plann Contr*, 31 (16), pp. 1303-1312.
- Honda, A.C., Bernardo, V.Z., Gerolamo, M.C.  
**How lean six sigma principles improve hospital performance**  
(2018) *Qual Manag J*, 25 (2), pp. 70-82.
- Gonzalez-Aleu, F., Van Aken, E.M., Cross, J.  
**Continuous improvement project within Kaizen: critical success factors in hospitals**  
(2018) *TQM J*, 30 (4), pp. 335-355.
- Sunder, M.V., Kunnath, N.R.  
**Six sigma to reduce claims processing errors in a healthcare payer firm**

(2020) *Product Plann Contr*, 31 (6), pp. 496-511.

- Trakulsunti, Y., Antony, J.  
**Can lean six sigma be used to reduce medication errors in the health-care sector?**  
(2018) *Leadersh Health Serv*, 31 (4), pp. 426-433.
- Zu, X., Fredendall, L.D., Douglas, T.J.  
**The evolving theory of quality management: the role of six sigma**  
(2008) *J Oper Manage*, 26 (5), pp. 630-650.
- Zailani, S., Sasthriyar, S.  
**Investigation on the six sigma critical success factors**  
(2011) *Eur J Sci Res*, 57 (1), pp. 124-132.
- El-Jardali, F., Sheikh, F., Garcia, N.A.  
**Patient safety culture in a large teaching hospital in Riyadh: baseline assessment, comparative analysis and opportunities for improvement**  
(2014) *BMC Health Serv Res*, 14 (122), pp. 1-15.
- Hair, J., Hollingsworth, C.L., Randolph, A.B.  
**An updated and expanded assessment of PLS-SEM in information systems research**  
(2017) *Indus Manag Data Syst*, 117 (3), pp. 442-458.
- Henseler, J.  
**Partial least squares path modeling: Quo vadis?**  
(2018) *Qual Quant*, 52 (1), pp. 1-8.
- Henseler, J., Ringle, C.M., Sinkovics, R.R.  
**The use of partial least squares path modeling in international marketing”**  
(2009) *New challenges to international marketing advances in international marketing*, pp. 277-319.  
Sinkovics R.R., Ghauri P.N., (eds), Bingley: Emerald Group Publishing Limited., In:, editor., p
- Hair, J.F., Howard, M.C., Nitzl, C.  
**Assessing measurement model quality in PLS-SEM using confirmatory composite analysis**  
(2020) *J Bus Res*, 109 (3), pp. 101-110.
- Hulland, J.  
**Use of partial least squares (PLS) in strategic management research: a review of four recent studies**  
(1999) *Strateg Manage J*, 20 (2), pp. 195-204.
- Chin, W.W.  
**The partial least squares approach to structural equation modeling**  
(1998) *Mod Methods Bus Res*, 295 (2), pp. 295-336.
- Shou, W., Wang, J., Wu, P.  
**Lean management framework for improving maintenance operation: development and application in the oil and gas industry**  
(2021) *Product Plann Contr*, 32 (7), pp. 585-602.
- Sarstedt, M., Cheah, J.H.  
**Partial least squares structural equation modeling using SmartPLS: a software review**  
(2019) *J Market Anal*, 7 (3), pp. 196-202.
- Kaswan, M.S., Rathi, R.  
**Green lean six sigma for sustainable development: Integration and framework**

(2020) *Environ Impact Assess Rev*, 83 (7), p. 106396.

- Gutiérrez, L.G., Bustinza, O.F., Molina, V.B.  
**Six sigma, absorptive capacity and organizational learning orientation**  
(2012) *Int J Prod Res*, 50 (3), pp. 661-675.
- Molla, M., Warren, D.S., Stewart, S.L.  
**A lean six sigma quality improvement project improves timeliness of discharge from the hospital**  
(2018) *Jt Commiss J Qual Patient Saf*, 44 (7), pp. 401-412.
- Hayes, B.J.

Assessing for lean six sigma implementation and success. I Six Sigma, 2010: [cited on 18 September 2022]

- Sunder, M.V., Mahalingam, S., Krishna, M.S.N.  
**Improving patients' satisfaction in a mobile hospital using lean six sigma—a design-thinking intervention**  
(2020) *Product Plann Contr*, 31 (6), pp. 512-526.
- Zhang, A., Luo, W., Shi, Y.  
**Lean and six sigma in logistics: a pilot survey study in Singapore**  
(2016) *Int J Oper Product Manage*, 36 (11), pp. 1625-1643.

**Correspondence Address**

Ahmed S.; Department of Business Administration, Uttara, Bangladesh; email: selim.ahmed@business.wub.edu.bd

**Publisher:** Taylor and Francis Ltd.

**ISSN:** 20479700

**Language of Original Document:** English

**Abbreviated Source Title:** Int. J. Healthc. Manage.

2-s2.0-85169897461

**Document Type:** Article

**Publication Stage:** Final

**Source:** Scopus

---

**ELSEVIER**

Copyright © 2025 Elsevier B.V. All rights reserved. Scopus® is a registered trademark of Elsevier B.V.

 RELX Group™