Mitigating the Sustainability Challenge in Lean Healthcare

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Abstract

Although the Lean Management System has helped healthcare facilities improve their bottom-line performance, many remain transitional and have not yet fully transformed into Lean organisations. In order to provide workable ways to counteract these typical trends, this mixed method study investigates the sustainability challenges undermining Lean healthcare to decipher what is restraining South African healthcare institutions from fostering, sustaining and spreading Lean. The study involved a survey of 620 clinicians and 20 key informant interviews - with Lean champions, clinical operations managers and Lean experts involved in Lean initiation in South African hospitals. As indicated in the quantitative findings, the participants' rating of significant obstacles to healthcare quality improvement shows that resource and budget constraints and supply chain inefficiencies are the most predominant challenges. Further, healthcare institutions' management must adopt a strategic approach to Lean; the challenges of leadership style and commitment, staff shortages, information technology resources, and supply chain inefficiencies must be mitigated to make Lean sustainable. The study offers practical solutions to improve the traditional trends.

Keywords
Lean, Healthcare, Sustainability challenges, South Africa.

1. Introduction
Recently, Lean has been arguably the most predominant operation improvement paradigm (Buer et al. 2018). Lean supports manufacturing and service organisations to enhance competitiveness in many areas – improving quality, reducing operational cost (Bhamu and Sangwan 2014), reducing waiting time, reducing waste, and improving employee and patient satisfaction (Zepeda-Lugo et al. 2020; Mutingi et al. 2017; Naidoo 2015). Although Lean has enabled organisations to improve bottom-line performance, many remain in the transition mode, failing to sustain the initiation momentum and fully transform into a Lean organisation (Buer et al. 2018). Henrique and Godinho Filho (2020), in a review of 118 empirical articles on Lean and Six Sigma in healthcare, emphasised a gap in studies describing critical aspects of Lean implementation challenges and lessons learnt on sustaining the implemented improvements.

This paper seeks to decipher what is constraining South African (S.A.) healthcare institutions implementing Lean from sustaining and spreading Lean. The empirical evidence experienced by Lean implementers will provide

stakeholders – practitioners, policymakers, and those whose authority gives jurisdiction over organisational quality improvement, with an insight into understanding the efficacy, real-time prospects, and challenges of Lean in the S.A. context. This information will help hospital administrators and other interested parties make well-informed decisions to address sustainability issues and ensure Lean is successful.

1.1 Objectives

The study objectives are to (1) explore the potency of Lean in the South African context. (2) investigate the challenges of Lean implementation and sustainability in the South African healthcare scenery. (3) Identify interventions that will facilitate successful implementation and sustainability of the Lean Management system in healthcare organisations.

2. Literature review

Lean, a continuous improvement methodology from the Toyota production system, has been extensively applied in various sectors. However, organisations implementing Lean are not recording the prosperity consistent with Toyota's outstanding success. Seemingly, the reason is because of constraining forces, most of which are internal, while others are external beyond the control of the implementing organisations. This section briefly expounds on the healthcare literature on Lean prospects and challenges, concluding with an overview of the South African perspective.

2.1 The Efficacy of Lean: Potentials and Benefits

The application of Lean management in healthcare settings has produced positive outcomes, including high practitioner satisfaction (Boronat et al. 2018; Matt et al. 2018), improved staff morale and general commitment among staff to the organisation's continuous quality improvement agenda (Radnor et al., 2012; Matt et al. 2018), fervent project acceptance, and favourable teamwork environment. (Matt et al. 2018). Antony et al. (2019) reviewed 101 articles and found improved process efficiency as the prime reason for Lean adoption. The study indicated removing unnecessary non-value-adding work, transforming organisational culture, improving client satisfaction, staff job satisfaction, service quality, and operational efficiency, and reducing cost, waste, operating loss, errors, and complaints as regularly cited benefits of Lean management in healthcare literature. Notably, Lean can deliver on its promise when effectively implemented.

Lean potency tested in South African hospitals.

The efficacy of Lean has been tested and proven in the South African healthcare system. Several experimental South African studies (Faull and Booysen 2007; Price 2013; Naidoo 2015) found that applying Lean improved patient flow, lead time for healthcare services, and employee attitudes. Following a Lean encounter, people are motivated, and staff morale increases as they experience the system improvements, effective resource utilisation and better healthcare outcomes from their work. A recent study with S.A. hospitals (Toussaint 2021) reported that applying Lean principles (using the Shingo organisational model) in Gauteng hospitals saw a drastic drop in infant mortality from 23.6 to 12.4 per thousand in one year. Specifically, the Charlotte Maxeke academic hospital intervention saw neonatal I.C.U. infection fall from 17% to 2.5% in two years (2017-2019). Toussaint (2021) argues that resources are not a major constraint to improving patient outcomes; instead, significant improvement can be achieved when hospital executives and managers are dedicated to excellence through sound practices. Healthcare managers who are supportive and committed to empowering and engaging with clinicians are essential for Lean to flourish.

2.2 Lean Sustainability Challenges: An Overview

Extant literature has recorded Lean implementation challenges, especially in healthcare, that lead to suboptimal achievement of expected healthcare outcomes. Many factors have been identified as contributing to unsustainable Lean implementation: internal factors like leadership style and commitment, organisational culture, shortages of skilled human resources, and other critical resources. A longitudinal assessment of Lean execution in Quebec's public hospitals revealed a lack of comprehension of the organisational context. (Fournier and Jobin 2018). Other constraining factors are managing institutionalised forces that complicate and constrain reform (Radnor 2012), the absence of adaptation strategies (Narayanamurthy et al. 2018), healthcare professionals' resistance to Lean (Patri and Suresh 2018), the lack of systems approach to Lean, management support, lean training, shortage of human resource; measurement criteria, performance metrics and goal precision (Langabeer et al. 2009; Patri and Suresh 2018). Porter (2010) notes that it can be difficult for clinicians to switch their focus from a volume to a value orientation.

Managerial ignorance as to the potential of Lean:
Previous studies have shown that top management of healthcare institutions, who ought to advocate the introduction and implementation of Lean, are hesitant to buy in due to their lack of exposure (Mutingi et al. 2015). A lack of lean awareness fundamentally hampers lean acceptability and execution. Due to a lack of management expertise, senior management has justified the Lean push, focusing on short-term rather than long-term benefits. Further, practitioners lack cognate knowledge and experience, breeding irrational expectations about the benefits of Lean in healthcare (Mutingi et al. 2015).

The human resource predicament:
As a management philosophy, Lean depends on low-level managers' involvement, top management's political will to allocate resources, and teamwork. The scarcity of human resources, which typically affects public health enterprises, is another issue. Human capital development is vital for business expansion and organisational efficiency because it sets an organisation apart from rivals and propels an industry toward innovation. In a recent quantitative study with participants from 50 countries that sought to identify barriers to clinicians' development and involvement in quality improvement, Shaikh et al. (2020) found a lack of developmental resources, access to professional training in quality improvement, organisational support, and a lack of dedicated time were found to be the main challenges. The study by Shaikh et al. (2020) discovered that a culture of openness and understanding the worth of quality improvement initiatives before implementing them are crucial challenges for implementing new quality systems.

Lack of systems approach
The correlation between Lean project focus, project success, and sustainability has been noted. Success depends on whether the project's goal is to increase resource efficiency or workflow efficiency (Tay 2016). The lack of success is typically attributed to covert resource optimisation efforts without enough consideration of the linkages between the resources and other elements in the system's value chain. A short-term focused, fragmented approach to implementation instead of institution-wide could be detrimental (Narayanamurthy et al. 2018). Companies select spotted specific units or processes and apply a few Lean tools, yielding positive results that are not sustainable. Hence, lean efforts should be geared towards workflow optimisation rather than individual resource optimisation.

3. Methods
The research gathered both qualitative and quantitative data on the research problem. Notably, the qualitative study clarifies and extends the general view gathered from the survey, providing in-depth insight. We used purpose sampling to ensure that those interviewed had solid awareness of the organisation's quality improvement approach, were actively involved in Lean implementation and were familiar with the corporate culture (Brink et al. 2018).

4. Data collection
From the various Gauteng healthcare organisations, 30 key informants were interviewed, including nurses, infection, and quality control managers who champion Lean, Lean experts who have participated as consultants in introducing Lean in public and private hospitals, and clinical operations managers. However, due to data saturation, the analysis included 20 interviews. Survey data was collected from 620 participants from more than ten clinical departments across different Gauteng hospitals and Primary healthcare clinics, 53.2% of whom are professional nurses, managers (12.5%), doctors (6.2%), pharmacists (3.1%), other clinicians accounts for 25%. Ethical clearance was obtained from the researchers' university (University of Johannesburg), the management of all the participating institutions and other relevant authorisation bodies like the Gauteng Department of Health. The researcher engaged in reflective conversation with the interviewees to confirm the accuracy of the information, and participants' verbatim statements were captured.

5. Results and discussion
5.1 Data Analysis
The quantitative analysis used frequencies. In the qualitative data analysis, we followed Braun and Clarke's six thematic analysis steps (Clarke and Braun, 2021; Scharp and Sanders, 2019): audio-recorded interviews were transcribed, organised in themes using a coding frame of related ideas, and themes were reviewed confirming connectivity. Further, advocative descriptors were identified and annotated using related literature.

5.2 Discussion of results

Recent South African studies (Maphumulo and Bhengu 2019; Nwobodo-Anyadiegwu 2021) argue that obstacles: resources and budget constraints, management/leadership commitment, employee resistance to change, lack of understanding of the benefits of new quality improvement, lack of expertise (skills) required to implement quality improvement, lack of employee involvement at the early stage of quality improvement, organisational culture and leadership style, supply chain inefficiencies can impede healthcare quality improvement projects' effectiveness and sustainability. The study participants were asked to indicate how these factors have hindered implementing and sustaining the new Lean quality management system in their hospital/clinic.

Figure 1 x-axis depicts the number of participants who indicated the named challenges (y-axis) as Not an obstacle, Minor obstacle,   Moderate obstacle, and Major obstacle, respectively.
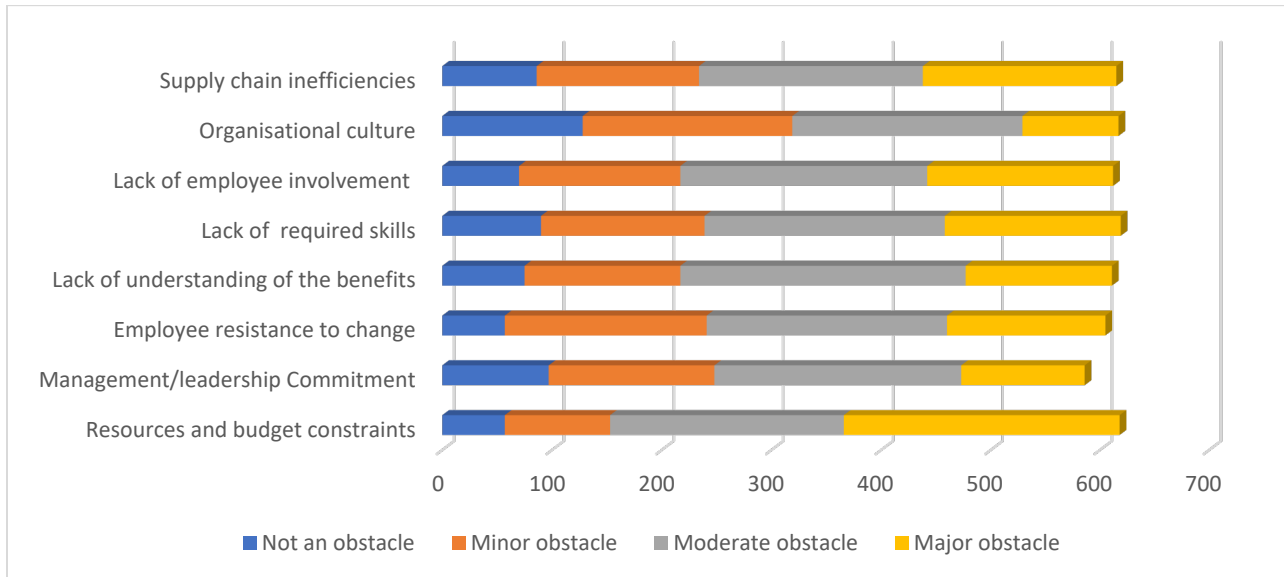

Figure 2. Challenges of adopting the new continuous improvement system.

In descending order, the participants' rating of challenges as significant obstacles to healthcare quality improvement in Figure 1 indicates resource and budget constraints as the most predominant, followed by supply chain inefficiencies. Inadvertently, the inadequacies of the supply chain affect the accessibility of resources already obtained. In the following section, the survey and interview results are triangulated and integrated with literature reflection:

Staff shortages and Limited training resources:

A recent study (Toussaint, 2021) signalled staff shortages as a barrier to achieving clinical outcomes and a key driver of neonatal mortality in Gauteng hospitals. Overstretched workers are likely to make mistakes compromising patient safety. Verbatim statements of participants on human resource shortages are presented. (*P1, P2, P3*…are interview participants):

P1(quality manager): "*Looking at resources, I will say it is human resources. Remember that when we appoint, we need to have a person who will be dedicated to overseeing Lean.   We do not have that staff, meaning that we have to extract somebody to go and oversee Lean.. Where we take that staff member, we introduce a gap because now the extracted staff, instead of doing a rotational shift, that person must now do straight shift, and now you create a gap on the other side*".

P19 (a pharmacist): Staff are not trained, so they don't understand the whole purpose of Lean, although you explained to them what is it all about? There is this 'I don't get attitude'... it's not my baby. That has nothing to do with me. You guys sort out your stuff. Also, we sit with a lot of temporary staff, students that go to classes; if you don't have permanent staff, it will have an impact on performance".

Interview participants lamented human resource shortages and excessive workload. They indicated that the work of training most of the staff members was left in the hands of a few who already have their regular workload not adjusted, so, in addition to staffing, a lack of training resources is a significant challenge.

P1: " When we started Lean in 2017, there were not many who attended the Lean management training, so it became a little bit difficult or a challenge because we had to utilise the very same people in the hospital who had been assigned to do other tasks at the same time to show people about Lean. So, the challenge here was the issue of knowledge in terms of the implementation for people who were not trained".

Most participants articulated the level of Lean awareness to be low because initial training was provided for a small cohort, and there was no mechanism for continuous training to spread the awareness of Lean. The lack of Lean awareness and expertise, even at the management level, because of no training will affect people's understanding of the Lean Culture and potential benefits as managers cannot sell (facilitate) what they did not buy (having a complete understanding).   Hence, some managers adopt the default approaches by not communicating the urgency of Lean with strategic intent, involving employees at the early stage, and keeping staff motivated.

Infrastructure and Information Technology resources:
A computerised information system is needed for adequate medical data storage, accessibility, and security. All the data necessary for patient care and assessing quality improvement efforts should be provided in an integrated electronic database. A dependable information management system is essential to make recorded data available for well-informed healthcare process improvement decision-making (Umar et al. 2020) and an efficient information-sharing platform (Lancharoen et al. 2020). Participants indicated a deficiency of information technology resources needed to deploy Lean effectively.

P19: "We don't have a computerised system; that's one of our challenges. It's still hand-written stuff."
P1: "I can say it is Information Technology resources that we really need, which is also not available and is a challenge. Lean is all about visuals. You need to visualise, and we need to have graphs that must be displayed in a colourful manner. You might find that sometimes the colour toner is not available. We do not have printers, printers are not functional most of the time."

P3: "Unless you actually visualise performance, you won't know how it's going".
Failure to adopt a strategic approach to Lean:
We observed a trend where hospital management implemented Lean in selected clinical units to solve specific problems. This select-focused implementation lacks a holistic approach (as deployed by Toyota), leading to pockets of excellence. By prioritising current needs, management may achieve the target; however, growth and long-term sustainability still suffer because the bigger picture was not considered in today's decision. When asked to indicate what would facilitate Lean in the hospital, participants said:

P15(Clinical Operations Manager): "I am very happy about this lean now…and everybody is happy. But it must not only appear in an I.C.U., let's go forward…it must also be done in other units".
P1 (a quality manager): "We are targeting the areas that we really need to improve services".
The selective implementation approach, which adopts Lean in isolated events driven by performance targets, is potentially detrimental to Lean healthcare (Naidoo, 2021; Antony et al., 2019; Fournier and Jobin, 2018). The limited scope of implementation minimises "the benefits that could be leveraged from Lean implementation in the healthcare sector" (Antony et al. 2019:1373). Additionally, Lean techniques and principles must be consistently applied if corporate-wide hospital performance is to be improved (Rundall et al. 2021). Most institutions studied continue to lack this holistic approach that enables efficient Lean healthcare.

Employee relations
Other major obstacles related to employees are Absenteeism, 'lack of employee involvement at an early stage of new quality improvement' and 'lack of required skills, ' leading to staff resistance to change.

P19:" Absenteeism is a lot, people get sick. I'm not even talking about the COVID. Because even before the COVID came in, we already had that problem".
P5(a pharmacist): "You have that resistance from staff… another challenge is sometimes resources."
Although many studies attribute the lack of Lean acceptance to staff resistance to change, a quality manager, based on in his experience, disagrees:

P1: "Yes, the issue of change is a challenge as well; however, it is not necessarily resistance to change. It is just accepting Lean as a new project and with the load of work that we already have in the hospital you are introducing Lean, as a new programme, people were feeling that it is a waste of time, it's a lot of work to them. , they feel that it is additional work and those were the challenges"

Leadership support and organisational culture

According to Kotters (2012), managerial complacency and ignorance of critical criteria are the leading causes of organisational innovation programs failing. Leadership commitment to quality, employee support, initiating, guiding, and maintaining the transformation process, including Lean in the corporate agenda, and institutionalising the Lean Culture are all necessary components of Lean thinking. Leadership commitment is demonstrated by a strong political will to source and provide resources needed to roll out Lean effectively. However, in the public sector, where the budget is limited, the management can only do so much with what is available.

In addition to resource constraints, participants alluded that staff participation in quality improvement projects was hampered by ineffective leadership. The participants' direct statements from the interview highlight how leadership behaviour affects organisational progress in the Lean initiative. Some Lean champions stated that when they began implementing Lean in their units, their line managers did not support them.

P 7 (Assistant Director): "The support has not been consistent."

P19: "We didn't get a lot of support from management. Because how I understood what's supposed to happen is if there's a crisis, you need to come and check. It's not for us to go and say, listen, we have a crisis; get someone other people to come in, assess. But it is your section, just do whatever you can."

P15: "if the management can support the staff, that is very important…In our hospital, we have a clinical teaching department, but...the staff end up not going for those training because now if they go, who is going to be in the unit."
While most of the factors are internal, others reported on external influence, like undue intrusion of politicians in the management of public healthcare institutions. According to the Lean sensi, lack of persistence and management focus is a challenge, as hospital managers are consistently distracted by political interference. He lamented:
P4 (Lean Sensi):"The political interference even at the hospital C.E.O. level, again, you say who do these people (hospital executives) work for? Are they there to serve the public, the party, or the government? Because of the way their senior leadership treats them, they are not there to treat the patients…" management is distracted by many other things, including their own bosses".

In addition to a lack of focus, failure to persist is a challenge, as people, including leaders, give up on pushing the Lean agenda after some time. Additionally, succession in leadership, especially when the new administration is not clued on Lean, is problematic:

P4: "It's failure to persevere…Management of a hospital is like malaria. It has no vaccine, but you must use your mosquito net every night. You've got to put on the cream during the day, you've got to wear long sleeve shirts and long trousers to protect yourself. And if people say: "well, I've been using my mosquito net every night, it's a real hassle to use it and you know, I haven't had malaria, so I stopped using It". Well, my mosquito nets now got holes in it. But I don't have the time to repair them. Well, you'll get malaria; and you will say: "well, these things don't work". And go back to firefighting. So, the challenge is that people think, well, we've tried."

Supplier Management

The supply chain inefficiencies indicated in the quantitative study resonate with interview participants' comments. The lack of a reliable computerised system for ordering, quality of supplies and supply chain inefficiency is a challenge.

P5: 'Sometimes you may have a supplier that is going to give you a product, it's a reasonable price, he's willing to supply the quantities, and then you come to find there is no quality in that product, you going to use one hundred bandages instead of one bandage from an alternative supplier, so those are some of those challenges.

P15:" I can say with the quality of supplies, the standard is very low".

P5: *"With regard to timeous deliveries from suppliers, I think whether it is medicine, whether its dry dispensary items, we always experience challenges with that."*

P15: *"We have been having challenges ordering electronically because now the computers are there but are not functioning. Or you find that the computers are there, but the app for ordering, called Naledicom, is not working on those computers. So, you end up struggling. And lastly, we also had an issue whereby all the computers were not accepting the orders. We had to do it manually. If they are done on the computer, the order will go straight away, and the delivery will be faster".*

5.2.2 Proposed Improvement Strategies to Mitigate Key Sustainability Challenges:
In terms of strategies to mitigate the challenges, participants annotated:

Dedicate resources:
Participants echoed that dedicated resources are needed for continuous Lean training:
P1: *'The recommendation is that if we can have a proper staff establishment, we can have dedicated staff members who can look at Lean. For instance, we need Lean champions who can be allocated to various departments and make sure that they oversee and manage the implementation of Lean. For example, I am the manager of the hospital. I have to go and implement Lean. At the same time, I must go and give support, and at the same time, I have to do monitoring; if we have people who are dedicated and assigned to permanent positions to do Lean, those people will be the ones to help us roll out Lean from one area to the other. So, suppose we can have dedicated people who will be able to do roll out. In that case, there will be proper implementation, and the very same people will be the ones to give Staff awareness and training in the hospital regarding Lean implementation.*

Change the culture:
Rather than react negatively to revealed failure, thus unleashing a second victim syndrome (Ally 2017), leaders are encouraged to use reported failures for organisational learning. The healthcare organisation should take corrective action, reduce the likelihood that such errors will occur in the future, and widely disseminate knowledge about each event rather than hiding mistakes under the rug. According to Graban (2018), Lean Culture does not always demand absolute achievement, and such demands generate risk aversion because employees are reluctant to try new things out of fear of failing. Management must be willing to hear the bad news, prioritise and avail the needed support. Participants explained:

P3 (Lean sensi): *"A very deep change in culture around psychological safety is necessary*. The measurement system in Lean management or *a daily management system is there to, as quickly as possible tell us when we are not meeting standard so that it can trigger the necessary support and corrective action. If it is not happening right, with a very rare exceptions, there is no reason to blame them (workers). Management's task is to address the problem and fix it. But many times, management sees their job as "I have got important meetings to attend."*
P15(Unit manager): *"The culture in the organisation I can say is still closed. Because now, the staff members, they are not empowered enough, especially regarding reporting things like errors." "If we can change our leadership style, yes. If we can just consider the way we lead, the staff members, the lower category staff members, we are going to improve the way that things are, we must not be autocratic."*

Persistence and Leadership Support:
To give people the leverage and time to participate in Lean, management must mobilise and prioritise resources for training, staff upskilling, and infrastructure. Leaders must not give up on driving Lean. Each organisation must establish its internal capabilities for continuing coaching, training, and Lean support.
P4: *"If you stop, everything collapses; you've got to continue the coaching, and you've got to change the behaviour of the leadership. To get out of firefighting mode."*

Based on their experience working with the C.E.O.s of several healthcare institutions in 19 countries around the world, including South Africa, John Toussaint and his team at Catalysis declared: "Every time we examined an organisation that was having trouble sustaining its improvement efforts, we found executives stuck in command-and-control style management." (Toussaint and Barnas 2020:5). They warned that disengaged leadership, continuous improvement programs, and authoritarianism do not work together. Notably, leaders not engaged in quality improvement carry on as usual; they do their business and issue orders from conference rooms and offices. They are not connected to the work. Thus, the movement will only be led by a few quality enhancement heroes.

Evidence of disengaged leadership can be found in the pockets of excellence, which are improvement activities across departments that never change the attitudes and behaviour of leaders (Toussaint and Barnas 2020).
Staff involvement, motivation, ownership of their job and a sense of belonging were confirmed by participants as crucial sustainability factors. A quality manager championing Lean at the regional academic hospital (P1) and another at district level (P6) alluded to staff participation as key to developing staff problem-solving skills:

P1: *"Allow staff members to identify their own problems and come up with solutions themselves without us telling them what to do. To come up with solutions and say these are the problems, and this is how we're going to deal with the problems, and we will give them a listening ear, and they'll realise they are being taken seriously. That is the method that boosted their morale".*

P6 (*Quality Manager*): *'We encourage them to say it shouldn't have to wait until the next morning* (meaning bring it forward). *It must be addressed if it is critical because we are dealing with human rights.*
P6: *Yes, the Gauteng province is actually having a lot of litigations. We also want to eliminate those litigations and complaints with the Lean model'. 'So, for facilities to sustain the Lean model is the most effective because it says that I can manage with the little I have and see the positive outcome, but with all these challenges, the facility will regress'.*

Provide Information Technology (I.T.) resources and integrate Lean 4.0
The fourth industrial revolution has ushered in a new era for organisations in the globalised, fiercely competitive commercial world. For businesses to fully utilise the improvement opportunities provided by Industry 4.0, new systems, technologies, and capabilities must be adopted and integrated into Lean, for example, human-robotic interaction (Caldwell 2018), simulation and optimisation (Uriarte et al. 2018) will enhance Lean efficiency through improved decision-making and encouragement of organisational learning. Against this backdrop, Lean Enterprise 4.0, which requires integrating Cyber-physical Systems in Lean management, is imperative to exploit existing and emerging healthcare innovations. Failure to articulate organisation assets and obtain resources needed to complement Lean practices to achieve required outcomes will undermine the sustainability and optimisation of Lean operations.

Change the discrete implementation approach.
Healthcare consists of interrelated and interdependent systems; hence, to sustain the gains of Lean implementation, a company-wide holistic approach is encouraged rather than a piecemeal approach, which does not trigger the broader organisational revolution required to sustain Lean. The holistic approach, which warrants that the transformation permeates every corporate level and facet, is advocated:

P2 (a Lean champion): *"If Lean was introduced across the whole hospital not only selected wards, but they only targeted the ward that really had more problems...I think, and I feel, if it (Lean) can be introduced to all the hospitals in South Africa, in all the wards, I am sure we will benefit. These litigations regarding the infections, I think, will be much, much less if we follow this Lean project because it helps".*

Supply Management
Utilise an electronic stocking system, supplier integration, and participation to address supply chain management issues. According to studies, Lean solutions that do not incorporate digital technology do not significantly improve hospital operations' competitiveness (Ilangakoon et al. 2022), computerised ordering system and supply management that provides accurate data on quantity and location of inventory. Also, inventory levels can be decreased with autonomous Kanban bins that track inventory levels and proactively order supplies (Buer et al., 2018; Kolberg and Zühlke, 2015)

The payoff of successful Lean implementation is a sustainable increase in value, flexibility, and productivity. Maintaining the benefits of any process improvement program requires sustainability. Lean does not produce sustainability by itself, but preserving the constant and ongoing incremental value generated is crucial as Lean is implemented in health organisations. Additionally, where a lack of sustainability of the Lean initiative has been associated with employee turnover, this requires training, retraining and engagement (Al-Balushi et al. 2014), especially where employee turnover is high.

6. Conclusion

Through an empirical study, this research paper has elucidated real-time prospects and specific challenges constraining healthcare institutions from spreading and sustaining Lean in South Africa. As indicated in the quantitative findings, the participants' rating of significant obstacles to healthcare quality improvement shows that resource and budget constraints and supply chain inefficiencies are the most predominant challenges. The study proposes strategies for mitigating the unsustainability trends. The experience of practitioners as they implement these strategies should be shared in further studies for collective learning.

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Annexure: Descriptive statistics on challenges of adopting the new continuous improvement system:

Item No	Challenges of adopting the new continuous improvement system	Not an obstacle (n)	%	Minor obstacle (n)	%	Moderate obstacle (n)	%	Major obstacle (n)	%	Total
C1	Resources and budget constraints	57	9.2	96	15.5	213	34.5	252	40.8	618
C2	Management/leadership Commitment	97	15.7	151	24.5	225	41.4	113	18.3	616
C3	Employee resistance to change	57	9.4	184	30.4	219	36.2	145	24.0	605
C4	Lack of understanding of the benefits of new quality improvement	75	12.3	142	23.2	260	42.6	134	21.9	611
C5	Lack of expertise (skills) required to implement quality improvement	90	14.5	149	24.1	219	35.4	161	26.0	619
C6	Lack of employee involvement at the early stage of quality improvement	70	11.4	147	24.0	225	36.8	170	27.8	612
C7	Organisational culture	128	20.7	191	31.0	210	34.0	88	14.3	617
C8	Supply chain inefficiencies	86	14.0	148	24.1	204	33.2	177	28.8	615

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Professor Charles Mbohwa is the former Pro Vice Chancellor of the University of Zimbabwe, Harare, Zimbabwe and a visiting Professor to the University of Johannesburg. He obtained B. Sc. Honours in Mechanical Engineering in 1986 from Department of Mechanical Engineering of the same University. He later bagged M. Sc. in Operations Management and Manufacturing Systems with a distinction in 1992, from Department of Manufacturing Systems Engineering, University of Nottingham, UK. He obtained PhD in Engineering (Production Systems focusing on Energy and life cycle assessment) from Tokyo Metropolitan Institute of Technology, Tokyo, Japan in 2004. Professor Mbohwa is an NRF-rated established researcher. In January 2012 he was confirmed as an established researcher making significant contribution to the developing fields of sustainability and life cycle assessment. In addition, he has produced high quality body of research work on Southern Africa. He is an active member of the United Nations Environment Programme/Society of Environmental, Toxicology and Chemistry Life Cycle Initiative, where he has served on many taskforce teams. He has published over 600 research articles in leading international Journals and Conference Proceedings. Prof Mbohwa had been keynote speaker in many international conferences and has supervised many local and international postgraduate students while playing host to several international postdoctoral fellows. He is a visiting Professor to the University of Johannesburg, South Africa, where he had served in various capacities; including Dean of Postgraduate Studies and Executive Dean of Faculty of Engineering and the Built Environment.

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