International Journal of Science, Strategic Management and Technology
Volume **02** Issue **03** March-**2026** | ISSN: **3108-1762 (Online)** | Impact Factor: 3.8
An International, Peer-Reviewed, Open Access Scholarly Journal Indexed in recognized academic databases

Streamlining Efficiency: Integrating Lean Principles in Agile Supply Chain

Submitted by
Mathew Ebi

BBA Logistics and Supply Chain Management Batch – (2023– 26)
Roll No.: 2302010240

System ID: 2023291441
Under The Guidance Of
Prof. Sandeep Kumar Anand

https://doi.org/10.55041/ijsmt.v2i3.379

Cite this Article: Ebi, M. (2026). Streamlining Efficiency: Integrating Lean Principles in Agile Supply Chain. International Journal of Science, Strategic Management and Technology, *02*(03). https://doi.org/10.55041/ijsmt.v2i3.379

ABSTRACT

This work focused on finding the most effective ways to achieve efficiency in modern supply chain management by combining lean and agile methods the correct way. This work is also, qualitative, descriptive and exploratory; it reviews secondary literatures from 2020 to 2024 in order to grasp the understanding of operations, technologies and factors that are related around the implementation of lean-agile. The results demonstrate that combining lean processes and waste reducing methods with the agile and flexible strategies improves the performance, adaptability, robustness of supply chains. Digital technologies like AI, Big Data Analytics, and IoT contributes to this by allowing for real-time decision-making. This entails addressing of the management, and investing in the technological infrastructure. Industry differences are mentioned; for example, manufacturing is concerned with standardization, as healthcare wants flexibility, thus the frameworks should be developed with particular industry in mind. In conclusion, the results of this research indicate how a complete integrated lean and agile supply chain, supported by technology and proper organizational practices is required for sustainable performance of operations in an ever ending complex and uncertain global market.

INTRODUCTION

In the world of fast-paced and highly competitive business market, supply chain is the core part of entire business universe, companies have been facing pressure to operate efficiently while also meeting the needs of the customers as it keeps on changing. To have and maintain that current position in the market, businesses must focus on streamlining efficiency within their supply chains, which is the pillar of their operations. A key way to achieve this involving integrating lean principles, which emphasizes reducing waste and completely improving the entire processes, while agile supply chain practices, which enables quick reaction to the market changes and shifts of customer demands. This combination will allow business to run not only enhancing their operational performance but also build a strong resilience and adaptability against the dynamic market environment.

Lean methods play huge role in eliminating unnecessary steps in supply chains, which at the end increases their speed and reducing the costs. These principles focus on by optimizing resources, improving the entire flow of processes, also boosting its effic iencies. By cutting off the wasteful practices and reworking the operations, lean

strategies help business achieve cost - effectiveness and improves productivity. On another note, agile supply chain strategies approach by introducing the flexible adaptation to uncertainties and evolving customer needs. Agile practices allow the companies to have first hand mover advantages where quick responses to disruptions, such as shift in demands, supply shortages, or global events, ensuring that customer needs are met on point and efficiently Consistently, the research has shown that supply chain performance be significantly enhanced by combing lean and agile approaches. Companies which have successfully integrated these strategies before have mentioned among their advantages, fast delivery times, high customer satisfaction and better operational efficiency. This combination result in a supply chain that is not effective but also able to react to certain market changes, thus making it a winner in today's market.

Nevertheless, these advantages of combining lean and agile practices are very evident but the implementation of these approaches will, however, cost a lot. Such cases being the latest use of technologies, like AI, Big Data Analytics and IoT, which requires not only capital but also skilled personnel. Moreover, the issue still occurs as the change resistance within the company is another challenge that every organization has to deal with. Workers and directors might not be willing to accept and support the changes when it comes to new methods, processes, or even technologies.

If companies deal with these issues and make the most of both lean and agile practices, they will and be able to create a solid foundation that not only just efficient but also very responsive, resilient and competitive in the market. The integration provides organizations with the weapons to fight to be the best in a ever ending changing business world while keeping up to the customer needs and even surpassing it all time.

LITERATURE REVIEW

Author	Year	Title	Key Findings	Gaps Identified
Rossini, M., Powell, D.J. and Kundu, K.	2023	Lean supply chain management and Industry 4.0: a systematic literature review	Explores synergies between lean management and Industry 4.0 technologies	Limited focus on broader supply chain implications outside individual plants
Oliveira-Dias, D., Moyano-Fuentes, J. and Maqueira- Marín, J.M	2022	Understanding the relationships between IT and lean and agile SC strategies: a systematic literature review	IT enhances both lean and agile strategies, improving responsiveness.	Need for empirical studies on the interplay of IT in lean-agile contexts.

Sharma, V., Raut, R.D., Mangla, S.K., Narkhede, B.E., Luthra, S. and Gokhale, R	2021	A systematic literature review to integrate lean, agile, resilient, green and sustainable paradigms in the SCM	Identifies frameworks for integrating lean and agile methodologies.	Insufficient focus on real-world applications and case studies.
Raji, I.O., Shevtshenko, E., Rossi, T. and Strozzi, F	2021	Industry 4.0 technologies as enablers of lean and agile supply chain strategies: an exploratory investigation	Highlights the role of digital tools in merging lean and agile practices.	Lack of clarity on best practices for implementation

Nikneshan, P., Shahin, A. and Davazdahemami, H.	2024	Proposing a framework for analyzing the effect of lean and agile innovation on lean and agile supply chain	Proposes a framework that combines lean and agile principles.	Limited exploration of sector-specific challenges and opportunities.

Almutairi, A.M., Salonitis, K. and Al-Ashaab, A	2020	A framework for implementing lean principles in the supply chain management at health-care organizations: Saudi's perspective	Reviews the impact of lean practices on supply chain efficiency.	Need for more focus on agile responses within lean frameworks.
Manzoor, U., Baig, S.A., Hashim, M., Sami, A., Rehman, H.U. and Sajjad, I.	2022	The effect of supply chain agility and lean practices on operational performance	Lean practices enhance supply chain agility and flexibility.	More research needed on the barriers to achieving this synergy.
Oliveira-Dias, D.D., Maqueira Marín, J.M. and Moyano-Fuentes, J.	2022	Lean and agile supply chain strategies: the role of mature and emerging information technologies	Digital technologies facilitate lean- agile integration, enhancing efficiency.	Gaps in understanding how different industries adopt these technologies.
Lee, K.L. and Qi, T.X.	2021	The effect of supply chain agility and lean practices on operational performance: a resource-based view and dynamic capabilities perspective	Lean practices improve performance metrics in agile contexts.	Insufficient exploration of the relationship between performance outcomes and lean practices.

Raji, Ibrahim Oluwole, et a	2021	Industry 4.0 technologies as enablers of lean and agile supply chain strategies: an exploratory investigation.	Identifies key barriers to integration and enablers for overcoming them.	Lack of empirical data on successful integration strategies.
Sadeghi Asl, Ramin, et al	2023	A systematic literature review on supply chain approaches	Analyzes literature on combining lean and agile practices.	Limited case studies that demonstrate practical implementation.
Moi, L. and Cabiddu, F.	2022	Navigating a global pandemic crisis through marketing agility: evidence from Italian B2B firms	Examines disruptions from COVID-19 and responses from lean-agile frameworks.	Need for frameworks addressing future disruptions beyond the pandemic context.
Masi, A. and Pero, M.	2023	Integrating lean, agile, resilient and green supply chain management in engineer-to-order contexts: insights from expert interviews	Proposes a holistic approach combining multiple management strategies.	Lack of practical implementation guides for businesses.

RESEARCH OBJECTIVES

Use of technology:

The combination of lean-agile approaches is completely transformed into cutting-edge technologies such as AI, Big Data, IoT and machine learning. These technologies power companies to deliver faster responses while tackling the disadvantages of traditional techniques.

AI and machine learning are the main sources for decision-making by giving real-time operational data analysis. Predictive analytics, which uses AI, gives out the possible inefficiencies and, thus the companies can take the proper actions to remove and make the operations more efficient even before anything happens. It is possible to apply AI in the improvement of forecasting, the enhancement of inventory levels, and the reduction of risk of having too much stocks piled up or not having enough stock to meet the demands. This in lines with lean principles of removing wastes and quick responses to the dynamic market.

The Combination forms a strong ecosystem where the efficiency and responsiveness promote at the same time. Implementation of these Technologies would give the business an idea not only enhance their performance, satisfy customers, but even gain first mover advantage as a result of being competitive in the ever-changing business environment.

Long-Term Benefits:

The Combination gives variety of long-term benefits that are not only limited to cost savings and efficiency improvements. The short-term benefits of less wastes and faster response are commonly recognized. The short-term benefits being reduce waste, fast responses and lowers the cost but the long-term effects leading to understanding how the combination of practices can make supply chain more sustainable and robust.

The supply chain's one of the main long-term advantage is utilizing both Lean and Agile methods. Supply chain resilience is a process that allows to absorb and rebound from any events, i.e., Natural disasters, Supply chain disruptions, political confits. Lean approach are very important to this aspect as they help in process optimization, inventory reduction and better resource allocation. The agile approach is on flexibility. In that way allowing companies react
quickly to any customer demands and market changes. This, in the long run can give to major competitive advantage through resilience and companies would be able to keep on delivering their products and service and thus, building customer trust.

RESEARCH METHODOLOGY

The research design of this paper is descriptive and exploratory, as it'll provide exhaustive knowledge concerning the integration of lean and agile principles in our current modern supply chain management areas. The descriptive identifies and assesses implantation of lean-agile practices, the frameworks that results and the implications for efficiency, responsiveness, flexibility, and overall performance of the business (Rossini, 2023). It also explains the main methods of the operational core of lean-agile system: value stream mapping, Just-in-time, Total quality management, and adaptive logistics planning. Moreover, it evaluates the approaches that enable organizations to maintain a balance between cost efficient and market response.

Its exploratory design allows descriptive analysis, which deep dives into the conceptual linkages and theoretical relationships between lean, agile and technologies as per Sharma (2021). This looks into the development of these ideas that in context of Industry 4.0, automation, and data- powered supply chains. This choice of Design is very fitting to combination of lean and agile methods is the subject of an ever-evolving research areas that require both structured evaluation and open-ended inquiry to be effectively communicated regarding to dynamic nature and future potential, as stated by Creswell (2014). Its duality gives confidence that the research will not only describes the existing trends but also attempts to discover a new pathway.

Therefore, mention of goals are being achieved by qualitative and secondary research methods, which is basically worries with understanding the concepts and thematic synthesis instead of just numerical or statistical analysis.

Through systematic review of existing literature, data were collected using targeted words like "Lean supply chain", "Agile supply chain", "Industry 4.0", and "Supply chain performance". The relevance of research has been filtered from academic databases like Emerald Insight, ScienceDirect, SpringerLink and such other journals as The International Journal of Lean Six Sigma, the International Journal of Logistics Management b y Oliveria-Dias D (2022) and Nikneshan (2024).

These methodological frameworks presented here is solid foundation for the research in order to critically appraise the latest evidence regarding lean-agile integration. It points out the major technological enablers those being automation, AI, Big Data Analytics, besides the organizational barriers such as Cultural resistance, lack of cross-functional collaboration, and the technological constraints. By brings these together, this study is able to establish a strong conceptual base for the future empirical researches and it also helps understanding the full picture of contribution of lean-agile principles to the maximum performance and sustainability of global supply chains.

SAMPLE DESIGN

The sampling design of this study is aimed at the identification, evaluation, and synthesis of the most relevant and credible secondary data sources which are considered to be main sources of the information about application of lean principles in agile supply chains. The research does not include "Primary" sources like managers or organizations since its based only on qualitative approach and secondary data. The sample comprises a set of scholar contributions, peer- reviewed academic papers that were selected by a specific criterion. The selected sources represent all types of knowledge in the area of studies and provides a summary of theoretical developments, empirical findings, and practical applications. The studies from various sectors like manufacturing, logistics, healthcare, and engineering contributes this study in terms of diversity and transferability thus making the findings more valid and generalizable. The proposed method is a well in-depth analysis of the interrelationship between lean and agile, factors that either promote or obstruct their integrations, and the role of new technologies like IoT, AI, and industry 4.0 tools in the integration process.

A purposive (judgmental) sampling technique was applied to pin and pick literature sources that would be most conductive to the proposed research objectives. There are certain data sources are chosen in purposive sampling with intentions to providing relevant studies focusing insights of high quality. The qualitative secondary research approach is well suited for this study because it enables the concentration of high quality, contextually sources instead of random sources. A prior number of studies have pointed out that the appropriateness of purposive sampling for systematic and integrative supply chain researches. For instance, Sharma (2021) used purposive selection for integration review of lean, agile, resilient and green supply chains; Oliveria-Dias, (2022) conducted judgmental samples to select those studies that believes to have an influential role in linking IT with lean and agile strategies; and Rossini (2023) employed that a systematic but purposive literature review to earmark lean supply chain management has connection with Industry 4.0 technologies. Such already acknowledged practices are a guarantee for consistency with previous scholars, on top of that they provide the supportive filed for the analytic depth that research projects makes use of.

The entire literature consisting of academic and professional publications regarding Lean-Agile supply chain, Framework integration, Technological enablers etc. The first step for the sampling process was to establish a frame with top-tier journals as the International Journal of Lean Six Sigma, The International Journal of Logistics management, Business Strategy and Environment,

Academic databases like Emerald Insights, SpringerLink, and Google Scholar were very helpful in the process of identifying literature. Moreover, the collection includes industry reports and case studies that illustrates the real work application of Lean-Agile integration. By having such diverse and comprehensive sampling frame; it will be able

to source data that is not only reliable but also credible and timely thus ensuring the academic standards for research-based inquiries. The sample criteria's are very detailed and very carefully which makes the data analysis limited to high quality and relevant studies only. The selected works had to fulfill the inclusion criteria as following:

1. The topics were lean principles, agile supply chains or their integration.
2. The publication date was perioded between 2020 to 2024, which makes the authors very much up to date with industries.
3. The works of research appears to be peer-reviewed in nature, proceedings of conferences or magazines of the industry that were considered important.
4. The papers were discussing the main issues of the field such as frameworks of Lean-Agile, Integration methods, Technological enablers like IoT and AI, Obstacles to implementation or even providing evidence of performance for improvements.
5. The paper was in English and full researches were accessible for reading.

On this exclusion criteria disqualified studies that were pure theoretical, had no link to application of supply chain, dealt solely with the Lean or Agile concepts without full integration, came from non-academic or non-peer-reviewed sources such as blogs or opinions, or were published before than 2015 except for those works that were considered to be important for development of lean or agile frameworks. This research guarantees that by through rigorous inclusion and exclusion criteria, its sample is not just reliable but the very recent and very influential researches in this field.

This sampling design basically on comprehensive synthesis of secondary data that is focused on at the same time, which guarantees that this study using most up-to-date, trustworthy academic and industrial sources. The application of purposive samples with clearly defined criteria hands supports to the methodological rigor, thus the resulting insights of significantly help in understanding the integration of lean principles into agile supply chain amid digital transformation times.

DATA ANALYSIS

The twelve key papers integrating lean and agile principles in supply chain were reviewed carefully and analytically coded for to perform data analysis. Study was on basis of research type, theoretical contribution by researchers, and empirical relevance to the topic. In support of these interpretations, visual aiding such as The Timeline of Technology Adoption (Figure 1.2) and Lean-Agile Impact (Figure 1.1) were made for both developments and performance effects cleaners.

For example, the researches conducted by Rossini, 2023 is an analysis of writing on the subject of digital technologies like IoT, CPS and Big Data Analysis, which is main modernizers of lean monitoring and real-time process optimizations. The discoveries are presented visually via (Figure 1.2) to show how digital enablers up scaled the studies. Like, Oliveria-Dias 2022 brough the proof that IT is the main factors that enables lean link between lean practices and supply chain agilities. The IT's role will be either as integrator or emergent through digital capability layering as shown in (Figure 1.1).

Sharma's work, which was on basis of insights relating to technology and presents as multi-paradigm review, opened up to integration of lean, agile, resilient, and green frameworks in one review. Their conclusions were based on the oppositions between cost efficiency and sustainability is being illustrates by strategic trade-offs, which are visually given in (Figure 1.3). Another Researcher Raji, 2021, which lines with sharma's founded that modern-day technologies enabling decentralized decision makings which takes place with a short delay in getting important information. This

development affirms Timeline of Technology Adoption indicates the beginning of very responsive enabled through technology. In addition to Nikneshan (2024), discussed innovative methods in terms of dynamic capabilities and learning processes claimed that organization learning is main factor to connecting of Lean-Agile innovation.

In healthcare sectors, Almutairi (2020) focuses on the human factors, safety, and staff involvement when discussion of lean-agile integration and points to the different approaching methods among sectors. Manzoor (2022) provided empirical evidence of The Resource-based View, as Manzoor demonstrated visually the association between lean-Agile practices with outcome being on performance, which summarized in The Lean-Agile Impact (Figure 1.1), Timeline of technology Adoption (Figure 1.2). Lead time, quality, and delivery improvements were identified. The IT levels to the stronger performance gains were identified more by Oliveria-Dias (2022), a pattern that shows visually through the performance comparison.

Lee (2021) founded same outcomes with the help of survey among the manufacturing companies in Malaysia, which shows even though resources are limited the Lean and Agile practices could be led to better performance. A conceptual synthesis by Sadeghi Asl (2023) shows further clarity of the overlaps among Lean, Agile, and Resilient supply chains practices. Moi (2022) offered qualitative evidence pointing towards use of market agility for demand sensing, thus suggesting the interrelation between operational and market responses. Masi (2023) performed interview analysis in the ETO context, giving attention towards the importance of modular governance structures and cross- functional teams.

Cross-study produced six major analytical themes,

1. The first being Technology and Digital Enablers which was visually supported by Timeline of Technology Adoption (Figure1.2) That showing how IoT, AI and Big Data analytics gives faster information process and allowing real-time decision making.
2. The second being IT, visually presented in Lean-agile Impact (Figure 1.1) where organization is better with IT skills getting high lean-agile performance.
3. The third one is Organizational Culture and Leadership highlighting leadership support, employee empowerment and collab among different departments.
4. The fourth, strategic Alignment and Governance, relating to integration of KPIs, modular structures, and governance mechanisms, which are illustrated in Figure 1.3.
5. The fifth, Sectoral and Contextual variations, suggesting that the application of lean and agile principles is different in different sectors, and researchers had documented in Healthcare, Manufacturing and ETO contexts.
6. The last, Performance Metrics and Operational Effects, is presented in Figure 1.1, which leads to decrease in lead time, quality, and delivery are identified.

Concerns stem from trade-offs between efficiency of lean and agile responses, as well as the growing focus towards sustainability and resilience, are conceptual but they find their way into visual comparisons.

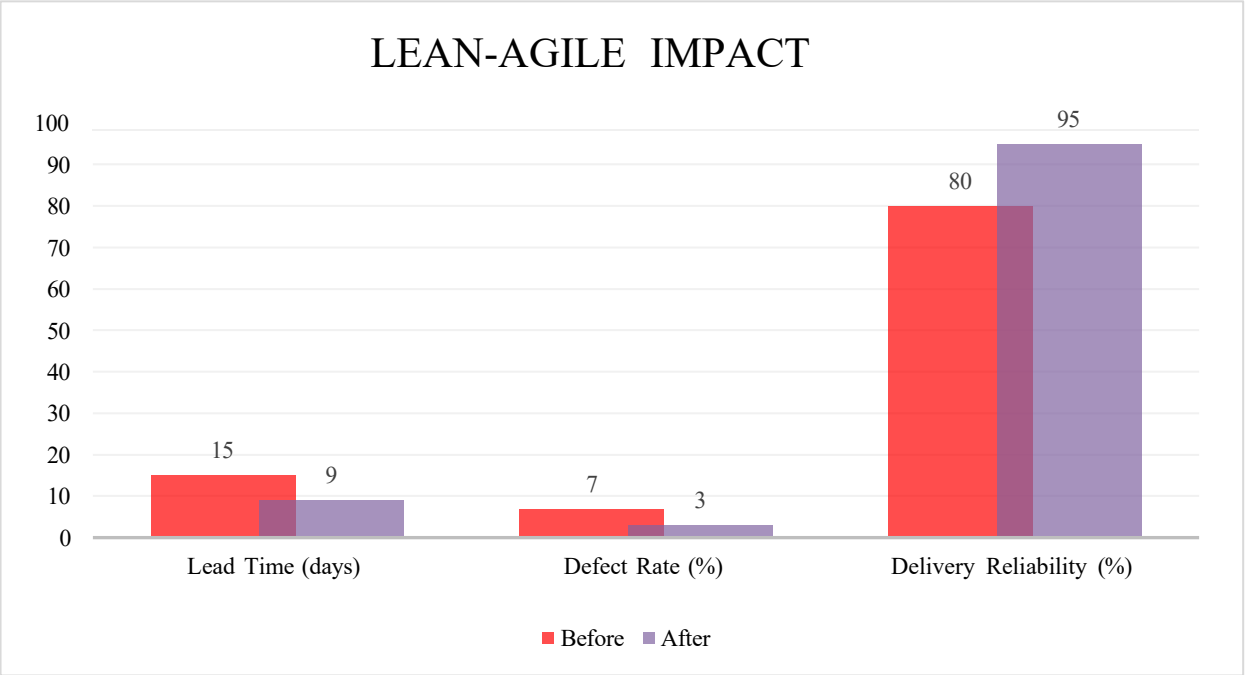

Figure 1.1: Lean-Agile Impact

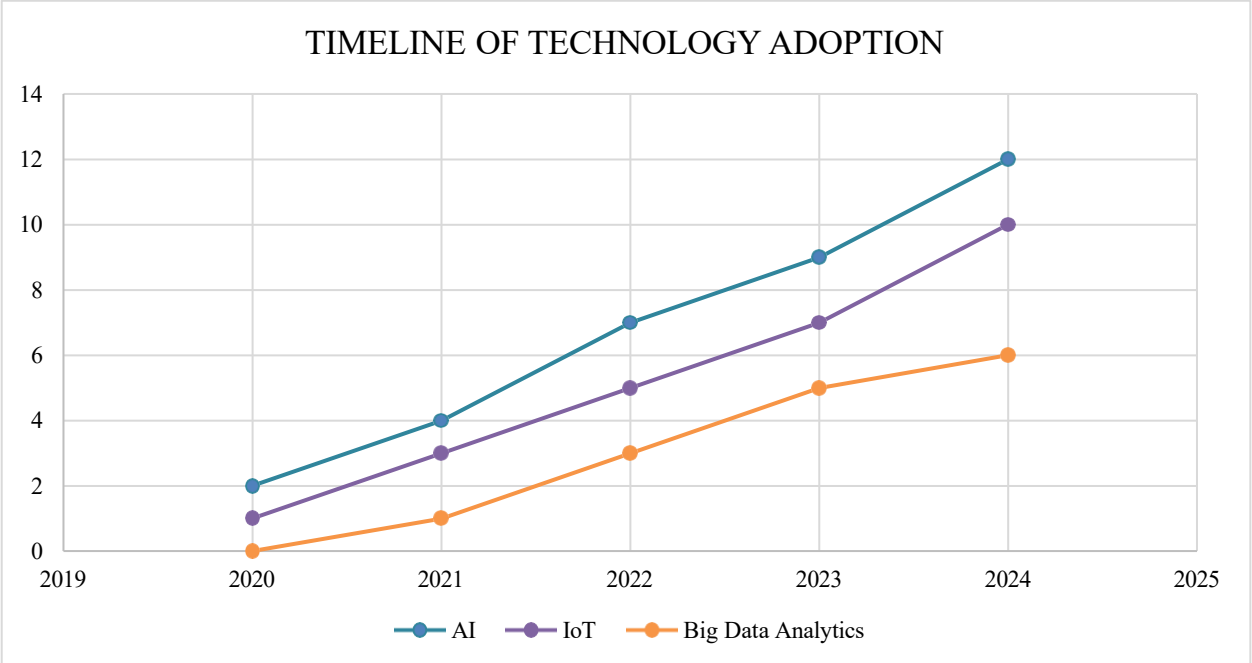

Figure 1.2: Timeline of Technology Adoption

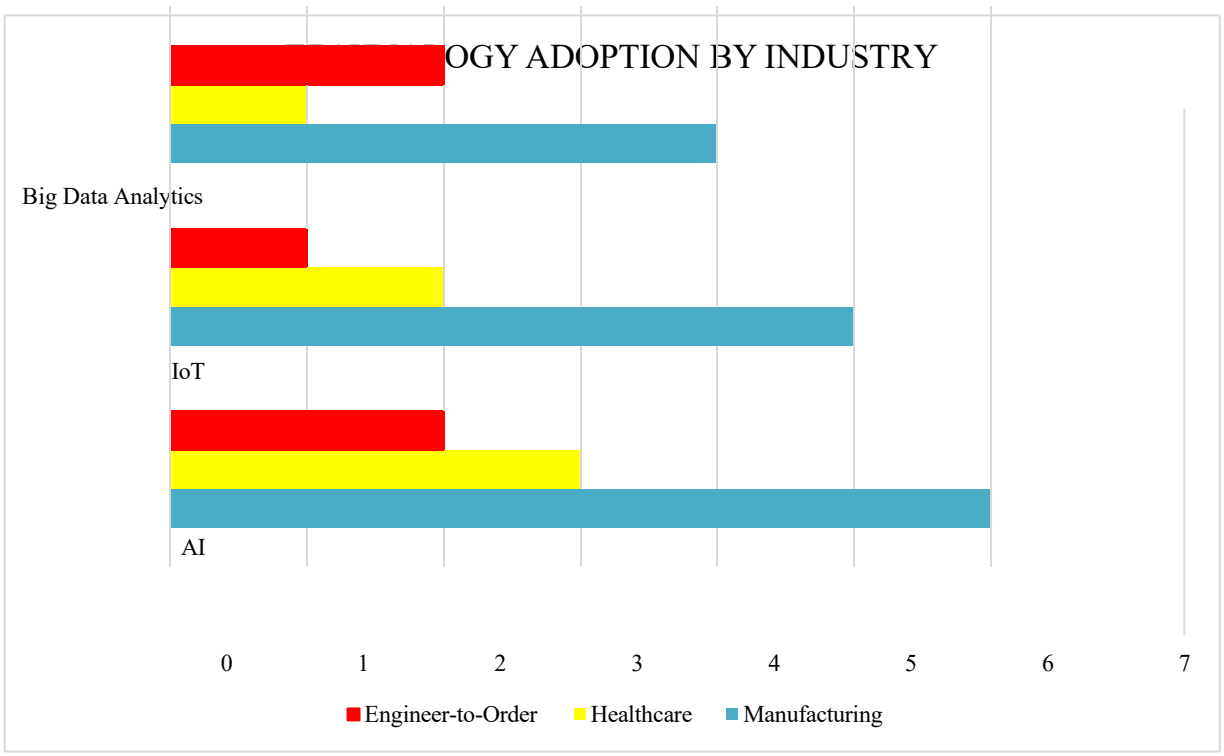

Figure 1.3: Technology Adoption by Industry

FINDINGS

In every way this work emphasizes that the lean and agile principles to supply chain management is very important to cope with the challenges of dynamic and highly competitive business world. Lean methods are the root for eliminating the actives that doesn't give any value, optimization, and the improvements to operational efficiency: and these factors contributes to faster supply chain processes, lowering costs, and at the end high productivity. On the other hand, Agile methods are reinforcement of the lean philosophy by adds to flexibility and quick reactions allowing them to be affected by uncertainty such as demand increases, scarcity, or economic crises. The synthesis of Lean and Agile practices are gateway to establishment of a versatile, high productive, and quick responsive supply chain system that will be majorly benefit in the competitive and unstable markets. Rossini, Powell, & Kundu (2023); Oliveria-Dias, Moyano-Fuentes, & Maqueria-Marin, 2022.

The adoption of technologies such AI, Big Data analytics, and IoT is the main factor supporting which has been increasing more and more. All these technologies combined with give opportunity for real time monitoring, predictive analysis and data-driven inventory management – and after all of these things that are factors vital for finding balance between efficiency of lean and flexible agile organizations. Technology integration to progresses gives organization huge power to identify inefficiencies beforehand, controlling inventories, and quickly responding to market changes leading to performance improvement across different industries such as manufacturing, healthcare, and ETO sectors. Raji, Shevtshenko, Rossi, & Strozzi, 2021; Olivera-Dias, 2022.

A plethora of empirical evidences has been docume0nted that the combination of lean and agile practices beings out huge improvement in operational metrics, decrease in lead time, increase in product quality, sped up delivery time while at the same time satisfying customer through quick and flexible responses to market changes and demands. This was illustrated by recent studies, Manzoor (2022), Lee & Qi (2021) and Masi & Pero (2023).

However, the successful integration still presents organizations with hurdles such as change of attitude from the company, cooperations across different departments, and funds for training programs and dig ital infrastructure. This has been pointed by Almutatiri, Salonitis and Al-Ashaab (2020), and Nikeshan, Shahin, Davazahemami (2024).

The work also points a trend that is gaining momentum of infusion of sustainability and resilience in supply chain management processes. This strategy will not tackle only the problem short term cost but also efficiency guaranteeing the flexibility of supply chain and resistant to dynamic environment and market challenges while being line with long term goals of environmental responsibility and business continuity (Sharma, 2021; Sadeghi asl, 2023).

RESEARCH IMPLICATIONS

The revelations were given through the combination of agile and lean principles in supply chain management, particularly improving efficiency and adaptiveness in this current dynamic market. The study points to the enterprises which skillfully merge the lean approaches which eliminates non-value adding activities and improves processes, with the agile practices allowing for adaptability and quick responses can improve performance. This both approaches allowing company to change according to customer requirement while also using the resource efficiently. (Rossini, Powell, & Kundu, 2023; Oliveria-Dias, Moyano Fuentes, & Maqueria-Marin, 2022)

One of most important things that technology advance has to be integrating any type of goods and service. The use of AI, Big Data Analytics, and IoT has been giving real-time monitoring, foresight, and decision making based on data's which has been pushing companies to take actions managing supply chains challenges to be more efficient (Raji 2021, Oliveria-Dias, 2022). The companies have to invest in digital technologies strategically if they want full access to benefits of Lean-Agile supply chains that come with faster delivery, better inventory management, and be more transparent.

The research, also indicates that, among others resisting to organization and leadership commitment to cultural change will be more difficult to overcome. Through continuous improvement, employee empowerment, and cross functional collaboration within the firms, it should become the core operating principle getting efficiency and flexibility. Almutairi, Salonitis, Al-Ashaab (2020) argue that Manzoor (2022) had similar view points and suggested that leaders should create suitable structures that will allow mix of standardization and adaptability. In addition, the performance metrics has to be set in a way that provides support for cost efficiency and fast response in case of disruptions. (Nikneshan, Shahin, and Davazdahemami (2024).

The results conveys that Lean-Agile integration isn't a universal method and, in fact the factors related to reach industry affects decision of approaches and results. For example, the manufacturing industries puts emphasis more on standardization processes and controlling costs, while healthcare industries even though being service oriented would require more flexible and faster responsiveness, which results that Lee & Qi (2021) and Masi & Pero (2023) support. This method is tailored to specific challenges faced by different sectors in order to fully gain the benefits.

One of the most of important consequences is related to sustainability and resilience of the supply chain. Companies can maintain resilience and adaptability to the dynamic environments as it can absorb and recover from external factors such as the decline of the economy, disasters and even economic crises (Sharma, 2021, Sadeghi Asl, Bagherzadeh Khajeh, Pasban & Rostamzadeh, 2023). Such enablers in a firm not only cope with increasing sustainable supply chain operations but also get full potential of Lean-Agile practices for businesses destined to survive in future.

RESEARCH LIMITATIONS AND FUTURE SCOPE OF STUDY

The combination of Lean-Agile principles gives a comprehensive view but also has little drawbacks should be taken into consideration. The study relies mainly on secondary data and systematic literature review that allowing any empirical validation or observation of real-world application by companies of Lean-Agile strategies. Besides, Theres general restriction between industries like manufacturing, health care, ETO, as they all have, they're on respective operations, technologies, and factors influencing humans on the integration results.

Besides the technology changes, especially in IoT, AI and Big Data Analytics, the use of digital enables have challenges since they could get outdated as time changes, new and new technologies come, which means there should be continuous research on this filed and make this relevant to the present day. Theres more problems in organizations like cultural resistance, lack of leadership, and difficulties between department inside the organizations will not improve the situation but they are still not well researched according to scientist's empirical reports. No one can't tell how to practically overcome such problems (Nikneshan, Shahin & Davazadahemami 2024; Manzoor, 2022). Another problem is between efficiency of lean and flexibility of agile is a complex one that always involves some risks. There is always the risk that will has to lose its characteristics to gain the other, a contextual and empirical analysis will require further research (Sharma 2021, Sadeghi Asl, Bagherzadeh Khajeh, Pasban & Rostmazadeh, 2023).

The future of this research has to solve previous limitations y adding primary studies like longitudinal research and case studies in specific industries that has worked and gives theoretical models proposed. The comprehensive research on the sectorial adaptations opens ip the possibilities to create custom frameworks that will address the unique problems and focuses on operational context. It is very important to carry out more research on changing the management and leaderships training which will make easier for organizations to implement cultural change and at the same time supporting Lean-Agile framework.

CONCLUSION

In conclusion, Integrating Lean-Agile principles can have huge impact on supply chain management in this new and modern business environments, which also is dynamic, fast paced and very competitive in nature. Lean principles aiming to make the best use of inputs, i.e., by reducing wastes, smoothing the process, and enhancing the productivity to very extent that they reduces cost and improves productivity. While on another hand, Agile methods in supply chain management adds flexibility and quick responsiveness to ever changing market demand, and uncertain supply chain problems. Through the combinations of these two methods, companies can have the power to develop supply chain not only be economical but also robust and responsive to sudden changes, which at the end, giving the organization competitive advantage in this dynamic market.

This research points the use of digital technologies such as IoT, AI, Big Data Analytics has big advantage to Lean-Agile integration. These technology makes it possible for companies to make decisions based on real-time data, and spot the problems, but also, organizations not only need to implement these technologies but also The Lean-Agile principles to take the challenges of leadership, culture, and collaboration required for changes.

Research also indicates that agile and lean methods are not universally accepted among other different industries, with manufacturing, healthcare, and ETO sectors being diverse areas. An organization has to resort different strategies depending the specific sectors where the operations, technology and human factors are highlighted to get most out of hybrid model. This combined method, have to be well integrated to the supply chain giving the company ability to maintain their operations and customers happy even if there's any global crisis or disruption in supply chain.

The study states that the complete integration of Lean-Agile supply chain together with modern technologies and

efficient organizational practices will enhance performance, responses, and sustainability. The combination is essential strategies necessary for companies wanting to survive and thrive in this fast-paced, competitive, dynamic market.

REFERENCES

Rossini, M., Powell, D.J. and Kundu, K. (2023), "Lean supply chain management and Industry 4.0: a systematic literature review", *International Journal of Lean Six Sigma*, Vol. 14 No. 2, pp. 253-276. https://doi.org/10.1108/IJLSS-05-2021-0092

Oliveira-Dias, D., Moyano-Fuentes, J. & Maqueira-Marín, J.M. Understanding the relationships between information technology and lean and agile supply chain strategies: a systematic literature review. *Ann Oper Res* 312, 973–1005 (2022). https://doi.org/10.1007/s10479-022- 04520-x

Sharma V, Raut RD, Mangla SK, Narkhede BE, Luthra S, Gokhale R. A systematic literature review to integrate lean, agile, resilient, green and sustainable paradigms in the supply chain management. *Bus Strat Env*. 2021; 30: 1191–1212. https://doi.org/10.1002/bse.2679

Raji, I.O., Shevtshenko, E., Rossi, T. and Strozzi, F. (2021), "Industry 4.0 technologies as enablers of lean and agile supply chain strategies: an exploratory investigation", The International Journal of Logistics Management, Vol. 32 No. 4, pp. 1150- 1189. https://doi.org/10.1108/IJLM-04-2020-0157

Nikneshan, P., Shahin, A. and Davazdahemami, H. (2024), "Proposing a framework for analyzing the effect of lean and agile innovation on lean and agile supply chain", *International Journal of Quality & Reliability Management*, Vol. 41 No. 1, pp. 291-323. https://doi.org/10.1108/IJQRM-04-2022-0143

Almutairi, A.M., Salonitis, K. and Al-Ashaab, A. (2020), "A framework for implementing lean principles in the supply chain management at health-care organizations: Saudi's perspective", *International Journal of Lean Six Sigma*, Vol. 11 No. 3, pp. 463-492. https://doi.org/10.1108/IJLSS-01-2019-0002

Manzoor, U., Baig, S.A., Hashim, M., Sami, A., Rehman, H.-U. and Sajjad, I. (2022), "The effect of supply chain agility and lean practices on operational performance: a resource-based view and dynamic capabilities perspective", *The TQM Journal*, Vol. 34 No. 5, pp. 1273- 1297. https://doi.org/10.1108/TQM-01-2021-0006

Oliveira-Dias, D.d., Maqueira Marín, J.M. and Moyano-Fuentes, J. (2022), "Lean and agile supply chain strategies: the role of mature and emerging information technologies", *The International Journal of Logistics Management*, Vol. 33 No. 5, pp. 221-243. https://doi.org/10.1108/IJLM-05-2022-0235

Lee, K.L. and Qi, T.X., 2021. The effect of lean and agile practices on supply chain operational performance in Malaysia manufacturing industry. *International Journal of Industrial Management*, *12*, pp.319-340.

Raji, I.O., Shevtshenko, E., Rossi, T. and Strozzi, F., 2021. Industry 4.0 technologies as enablers of lean and agile supply chain strategies: an exploratory investigation. *The International Journal of Logistics Management*, *32*(4), pp.1150-1189.

Sadeghi Asl, R., Bagherzadeh Khajeh, M., Pasban, M. and Rostamzadeh, R., 2023. A systematic literature review on supply chain approaches. *Journal of Modelling in Management*, *18*(2), pp.372-415.

Moi, L. and Cabiddu, F., 2022. Navigating a global pandemic crisis through marketing agility: evidence from Italian B2B firms. *Journal of Business & Industrial Marketing*, *37*(10), pp.2022- 2035.

Masi, A. and Pero, M., 2023, September. Integrating lean, agile, resilient and green supply chain management in

engineer-to-order contexts: insights from expert interviews. In *IFIP International Conference on Advances in Production Management Systems* (pp. 112-125). Cham: Springer Nature Switzerland.

PLAGIARISM REPORT

RBL 003 - Copy.docx

ORIGINALITY REPORT

9%	7%	8%	5%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www-emerald-com-443.webvpn.sxu.edu.cn Internet Source	2%
2	dspace.lib.ntua.gr Internet Source	1%
3	www.emerald.com Internet Source	1%
4	ruja.ujaen.es Internet Source	1%
5	www.verifiedmarketresearch.com Internet Source	1%
6	ijcscm.com Internet Source	<1%
7	Dharmendra Hariyani, Poonam Hariyani, Sanjeev Mishra. "A Literature Review on Enablers for the Adoption of Integrated Sustainable Green Lean Six Sigma Agile Manufacturing System (ISGLSAMS)", Next Research, 2025 Publication	<1%
8	emeraldgrouppublishing.com Internet Source	<1%
9	pure.jgu.edu.in Internet Source	<1%
10	www.mdpi.com Internet Source	<1%
11	www.researchgate.net Internet Source	<1%