Key Factors of Manufacturing Operations Successfully Applying Lean Manufacturing

LIN, CHIEH-YU [1], Dr.Kang, Cathay Kuo-Tai [2]

[1]Chang Jung Christian University, Tainan City, Taiwan

[2]College of Management, Chang Jung Christian University, Taiwan

Abstract

The primary purpose of this study is to investigate how to apply lean manufacturing, which is necessary to eliminate waste, reduce cost, and improve efficiency in the production process to maintain the survival and growth of a company under the current trend of business competition. The relationship between production, marketing, human resources, development, finance, and the technology of manufacturing is not found in the literature, and it is the origin of this study to connect the two. The primary purpose of this study is to apply the Analytic Hierarchy Process to examine the critical factors of operational success in the research direction of production, sales, human resources, development, and financial components of precision manufacturing. In the initial step, after the literature study and surveys with experts in operation management and operation of lean manufacturing companies, the scientific management principles of production, sales, people, development, and finance were used to set up the five major categories and 20 subcomponents of this study. In the following step, the empirical results of the expert surveys, having applied the Analytic Hierarchy Process to the results, show that "people" is the essential component. According to the assessment components, the top 8 key components were "Voice of Customer (VOC),” "Organizational Planning,” "Talent Development,” "Quality,” "Lean Management Training,” "Lean Strategic Deployment,” "New Product Launch,” and "Succession Training.” After evaluation, this research has verified the prioritization of five critical success components out of the original eight initial components derived for applying Lean Manufacturing (LM) operations as VOC, Organizational planning, Talent development, Quality, and Lean management capability training being the key to the company's application of LM.

Keywords: The Principles of Scientific Management, Analytic Hierarchy Process (AHP), Lean Manufacturing (LM)

1.Introduction

Chase, Jacobs, & Aquilano (2005) mentioned that the father of scientific management, Fredrick W. Taylor, introduced "The Principles of Scientific Management" during the past century. The traditional managerial functions (financial, research and development (R&D), human resources (HR), marketing, and production) have evolved into the issues of today's organizational division of labor (Fang, Tsai, & Tsai, 2019). In today's business management, there are six categories: production, sales, people, development, finance, and information management, each of which is closely related to people. Lean Manufacturing (LM), otherwise known as the Toyota Production System (TPS) or Lean Thinking, is a production methodology developed in the 1950s by Taiichi Oono. LM's goal is to achieve operational excellence through continuous improvement of production processes and procedures, using standardization and the culture of worker participation and involvement (Womack & Jones, 2003).

Operations management scholars widely recognize the implementation of operations management based on scientific management principles as a lean manufacturing practice that includes safety, quality, delivery, cost, productivity, flexibility, and employee morale. Scholars' analysis also includes market growth and financial performance to assess market share, sales growth, and customer satisfaction, each closely related to operational success (Saumyaranjan, 2020).

Since many evaluation structures and evaluation components are critical factors for operational success, such as people, sales, and production, they are complex to study and cover a wide range of layers, and therefore fall under the purview of Multi-Criteria Decision-Making (MCDM). The Analytic Hierarchy Process (AHP) is a decision-making methodology that systematizes problems with complexity and is suitable for decision problems with multiple variable attributes (Saaty, 1980). Therefore, this study aims to answer the above-mentioned key factors of operational success for different management and to lead to a set of functional success components to explore the critical elements of operational success for companies, to explore further the integration of the critical factors of operational success, which is the main motive of this study.

From the above, it is crucial to construct a suitable measurement criterion to assess the critical factors of operational success. Therefore, in this study, we collected academic literature on the factors that influence the success of lean manufacturing implementation in domestic and foreign companies and then used expert interviews to obtain various evaluation categories and subcomponents suitable for this study in applying lean manufacturing operations. Overall, this study aims to use the AHP model to evaluate the critical indicators of operational success. The structure of this study is segmented into five sections. In addition to this initial section, the following section reviews the top five management categories, the middle section introduces the AHP research methodology, the continuing section processes an empirical analysis to

examine the critical factors of operational management success, and the final section presents recommendations and conclusions as per the final results.

2. Success Factors for Lean Manufacturing Operations: A Literature Review of Five Management Categories

In this paper, we adopt the five management categories of scientific management principles as the structure of this study, which are 1. production, 2. sales, 3. HR, 4. R&D, and 5. finance. These five management categories are used as the evaluation framework, and the evaluation components for the implementation of precision manufacturing are as follows.

2.1 Production: Operational managers are responsible for allocating available resources from each department to the entire company to achieve efficient and profitable operations (Almoslehy and Alkahtani, 2021). The fundamental role of operations management in a company is the transformational role in converting raw materials and other inputs into services and finished products (Chang, Chang, and Yu, 2021). The primary task of manufacturers is to reduce defects and control emissions to maintain corporate sustainability (Sarkar et al., 2021; Khalfallah and Lakhal, 2021). The primary goal of Just-In-Time(JIT) implementation is reducing and ultimately eliminating waste, reducing inventory and production costs through LM processes, and continuously improve global LM methods. The LM methods focus on corporate performance, including cost reduction, delivery cycle time, product defect reduction (zero defects), and quality through continuous improvement of operations (Khalfallah and Lakhal, 2021; Maware et al., 2021). Market share, sales, profitability, cost, labor productivity, and delivery time. The international research collaboration in LM has helped to gain more scientific knowledge and technological innovation among academicians and industrialists in developed and developing countries (Maware et al., 2021).

2.2 Sales: A sales approach to ensure customer satisfaction and value of new and existing products through Quality Function Deployment (QFD) designed from different levels and perspectives according to the most important customer requirements (Ivars and Philippov, 2021). One way to understand customer needs is to listen to VOC (Pandya, Ismoyowati and Suharno, 2020). JIT is used in material supply, and the impact of JIT not only is in the cost of logistics processes (inventory and transportation) but also from sales. Sales will also increase if customer orders improve due to JIT implementation (Milewski, 2022). The price influences customer demand and competitive pricing are helpful to increase the sales of the product (Roy and Sana, 2021). Consumers use big data to search for new products on the Internet, which can boost the sales of new products (Kim et al., 2019).

2.3 HR: the HR factor, its enterprise specificity, the type of organizational solution, the Human Resource Management (HRM) approach used, the potential of employees, and, most importantly, related to the company's ability to train employees. Using this potential, HRM is crucial for the company’s efficiency in acquiring, disseminating, and using knowledge (Prusa and Jursová, 2019).

Strategic HRM is the study of people, which plays a vital role in managing an organization because human resources are the core of any organization. Acquiring strategic HR practices is essential to ensure that the people known as employees are an asset to any company and ensure that the organization's performance is at its peak (Abdulraqeb and Jeefenn, 2020). People management includes strategies and thinking based on attracting resources, selecting, training, developing, nurturing, promoting, and transferring employees within the organization (Das and Sailaja, 2021). Basu et al. (2018) developed a scalar model that serves as guidelines for aligning HRM with lean methods. The projection includes traits required for successful implementation such as customer satisfaction, organizational goal satisfaction, strategic process control, quality governance, management roles, integrated planning and scheduling, and HRM. Ng and Ghobakhloo (2018) suggested that before instructing lower-level employees and officials to follow, the lack of understanding of implementing LM, especially in high-level employees and business successors, is the main reason for their operational failure.

2.4 R&D: is described as a rigorous methodological framework through which organizations can meet people's rapidly changing needs and new services through inventing, improving, adapting, and learning (Mulgan, 2019; Schulman,2017). R&D includes systematic and creative work undertaken to increase the stock of knowledge and to design viable new applications of existing knowledge" (Canada. 2019). Policy and strategy tools focus organizations on important priorities that need coordination, development, and deployment across the organizational structure (Tortorella, Cauchick-Miguel, and Gaiardelli, 2019). Global markets force manufacturing organizations to pursue operational excellence and improve performance to deliver higher quality products and reduce costs in shorter lead times. A lot of scholars are developing new paradigms for role flexibility in the supply chain (Rad, Mojtahedi, and Ostwald, 2021). The Enterprise Resource Planning (ERP) system was used to create a model based on the validity of demand forecasting data by questioning and surveying the sales force and customers based on the current corporate situation of market demand (Zhao and Tu, 2021).

2.5 Finance: this can be seen in the company’s available free cash flow and whether it is a healthy company (Oktariyani & Hasanah, 2019; Lapsley & Rekers, 2017). Lean manufacturing costs are closely related to productivity. For a company to succeed and significantly achieve its primary goal, which is more free cash flow via earnings, finance management and operations management need to consider incorporating the accounting department for lean operational parameters (Ribalko, Varlamova, & Yevtushenko. 2021); throughout the global financial crisis after 2008, the dominant force of systemic risk in the Chinese stock market was the financial sector (Wu, 2019). The valuation of brand assets has become one of the utmost critical prioritizations in economic research because the brand value is one that maximizes value by ensuring the efficient allotment of assets, especially leading to an optimal brand portfolio that can embody the corporate value effect from the financial side (Mousa, Sági, and Zéman, 2021). Velte (2021) points out that all corporate management components, including the shareholders and directors, are not just interested in proper Corporate Social Responsibility (CSR) reports.

These people also require a sufficient level of financial results to ensure the company's continuity of operations, and corporate reputation can only be achieved through economic and CSR-related corporate strategic success. Climate change, energy security, green consumers, alternative fuel diversification, and innovating technologies are potent motivations driving interest in increasing financial investment for specialist companies in clean energy (Sadorsky, 2021).

Therefore, this paper will use the five components as the basis for the study, further explain the indicators and add the viewpoints of this paper. The evaluation components, indicators and indicator descriptions, and references are summarized in Table 2-1.

Table 2-1. Critical Factors for Operational Success in Applied Lean Manufacturing and Their Explanations

Category	Subcomponent	Explanation and descriptions of special functions
A. Operation Management	A1 Quality	Total Quality Management (TQM) and its functions are important mainly as part of the cycle to improve consumer satisfaction through increasing production quality
	A2 Delivery	Maximum process participation helps everyone understand that the customer metric's most important point is on-time delivery which leads to stronger consumer loyalty.
	A3 Cost	Lowering production cost through kaizen and reduction of non-value waste. Sales Price is the sum Production Cost and Profit, so lowering production cost to increase profit is the methodology.
	A4 Production innovation	Keep asking the 5 Whys to promote a inquisitive attitude, understanding the manufacturing process, and proving again the innovative knowledge incorporated into the process.
B. Marketing Management	B1 Voice of Customer (VOC)	"Customer Satisfaction" is listening to consumer feedback, measured through delivery time, cost, and quality. There is no room for negotiation without quality.
	B2 JIT Delivery	JIT is the key factor in maintaining customer loyalty. A model example is providing to the consumer at the right time the right amount of high-quality products to complete the transaction.
	B3 Low price	Successful sales hinges on comparing prices, because pricing has an ascending effect on consumer satisfaction and a low price makes it easier to sell to more buyers.
	B4 New product launch.	Product innovatiing is completing what the customers think they desire as the "next step", allowing both sides to gain from the "new" innovation.
C. HRM	C1 Talent development	For an enterprise to have stable and continous growth, such as the succession of leadership transferring, there must be a system for training to develop talent in personnel.
	C2 Organizational planning	Group growth must have a unified target goal, setting a lofty objective for the group to work towards as well as presenting a high bar to the group in the form of future company direction.
	C3 Lean management ability training	Top management capability has a clear effect on the corporate landscape. It is possible to have management learn a higher-level thinking method.
	C4 Successor training	Who is the successor and how do we train them? Setting a proper direction for training Professional skills assists both corporate development and individual learning.
D. R&D Management	D1 Lean policy deployment	A mindset that less is more for future direction, making corporate focus on two to three key goals to achieve in three years
	D2 Lean operating system	Implementing TPS where there is none to remove the 8 wastes. Conversion to LM.
	D3 Lean Sales System	Putting the consumers as first priority using the 4P core values of marketing: Promotion, Place, Price, and Product. Increasing sales from the 6 sales funnels via

effective time management.

	D4 Lean Innovation System	Advocating Value Analysis Value Engineering (VAVE) and Production Preparation Process (3P) to innovate manufacturing R&D, marketing and tools to create new products.
E. Financial Management	E1 Stock growth	Preserving stockholder profits is an economic obligation of corporates as operations generate revenue, fulfilling duties to stockholders and repaying them with interest.
	E2 Brand value	A brand is a company's most valuable intangible asset, capable of creating a foundational function gap with rivals and helps increase profits.
	E3 CSR	Enterprises have a minimum legal and moral duty to maintain a societal environment. Maintaining CSR will sustain profits.
	E4 Clean energy	The long-term process of creating production facilities with up-to-date clean energy specifications, allowing coexistence between nature and man.

3. The AHP Technique

This AHP method helps analyze multi-variable complex problems through a format of a hierarchy of components by drawing considerations for developing subcomponent weights or priorities. It also combines the strengths of feelings and focused logic on various issues and then aggregates the diverse considerations into results that intuitively match our expectations. The structure of an AHP model is that of an inverted tree, with a single purpose at the top of the tree that represents the purpose of the decision making problem and each end branch tabulates up to a one hundred percent decision weight at the end. Just below the goal is a leaf point indicating the component weight, both qualitative and quantitative (Tscheikner-Gratl, etc. 2017).

4. Evidence Analysis

4.1 Key Influencing Factors Questionnaire Results

The AHP expert questionnaire was completed by operational managers of lean manufacturing companies and operational experts at the level of vice president or higher at the leadership level of international companies with plants in China, in various industries such as livestock equipment lines, precision machining, leisure sports, measuring instruments, electronic assembly lines, mechanical hardware, medical equipment, and automotive parts. A total of 28 questionnaires were sent out and 23 were validated for consistency (total validity rate of 82.1%). Since Robbins suggested that the number of experts required for decision-making should be 5 to 7, it shows that the valid questionnaires returned in this study represent the opinions (Robbins, 1994).

This study used Microsoft Excel to calculate the weights of five category components and 20 critical sub-components by using the "average of normalized columns (ANC) method" (Liang, DING, and Wang, 2021). The total results were finally presented in Table 4-1.

Table 4-1 Criterion weights and integration weights of key factors for successful application of lean manufacturing operations

Major categories	Major categories weight	Subcomponent	Subcomponent weight	integration weight (C)=(A)*(B)
A. Operation Management	0.1748 (3)	A1 Quality	0.4653 (1)	0.0813 (4)
		A2 Delivery	0.1949 (3)	0.0341 (12)
		A3 Cost	0.1406 (4)	0.0246 (16)
		A4 Production innovation	0.1993 (2)	0.0348 (11)
B. Marketing Management	0.2675 (2)	B1 VOC	0.4949 (1)	0.1324 (1)
		B2 JIT Delivery	0.1758 (3)	0.0470 (9)
		B3 Low price	0.1206 (4)	0.0323 (13)
		B4 New product launch	0.2087 (2)	0.0558 (7)
C. HRM	0.3145 (1)	C1 Talent development	0.2648 (1)	0.0833 (3)
		C2 Organizational planning	0.3187 (3)	0.1002 (2)
		C3 Lean management ability training	0.2445 (4)	0.0769 (5)
		C4 Successor training	0.1720 (2)	0.0541 (8)
D. R&D Management	0.1736 (4)	D1 Lean policy deployment	0.4310 (1)	0.0748 (6)
		D2 Lean operating system	0.2441 (2)	0.0424 (10)
		D3 Lean Sales System	0.1440 (4)	0.0250 (15)
		D4 Lean Innovation System	0.1809 (3)	0.0314 (14)
E. Financial Management	0.0695 (5)	E1 Stock growth	0.3008 (1)	0.0209 (17)
		E2 Brand value	0.2980 (2)	0.0207 (18)
		E3 CSR	0.2040 (3)	0.0142 (19)
		E4 Clean energy and environmental protection	0.1972 (4)	0.0137 (20)

Note: The numbers after the weight numbers are sorted

In this study, it is considered each theoretical weight of individual subcomponents must be greater than the mean weight of all subcomponents (1/20 or 0.05) to be more meaningful in the selection of key indicators. Thus, for selecting key indicators, the weight of eight evaluation subcomponent was greater than 0.05, and the sum percentage of the eight key subcomponents was 0.6589 (nearly 66%).

In addition, the relative weights of the first five of the top eight key subcomponents are more than 1.5 times the mean of 0.05 and more than 0.075 because most industries have two to six key elements that determine success (Daniel, 1961). Chase (2004) proposed the principle of ABC classification of items, where A items consist of about the top 15%-20% items, and 20% of 20 items are four items. After combining the 1.5 times mean weight and the principles of two to six factors, the study selected the top five evaluation subcomponents as the key indicators of success in applying lean manufacturing operations. The top 5 critical subcomponents are particularly important to the success of lean manufacturing operations: 1. B1 VOC, 2. C2 Organizational Planning, 3. C1 Talent Development, 4. A1 Quality, and 5. C3 Lean Management Competency Training.

4.1 Key influencing subcomponents and management implications

From the results of the above study, five key indicators were identified as critical to the success of lean manufacturing operations: " VOC," "Organizational Planning," "Talent Development," "Quality," and "Lean Management Capability Training." This section is explained as followed:

4.1.1 VOC: From the customer's point of view, the most concerned about quality, the ultimate purpose of the product is to enable customers to use it happily, so customer satisfaction is the ultimate measure of indicators. The total quality management function focuses on customer satisfaction by improving quality. The customer is the final judge of quality. Good quality customer satisfaction enhancement will also enhance customer management and maximize customer loyalty (Masaaki, 1986; Abu, Gholami, Saman, Zakuan, Streimikiene, and Kyriakopoulos, 2021).

4.1.2 Organizational Planning: The lean organizational structure includes lean development systems, lean manufacturing systems, and lean sales and service systems. Consideration of administrative processes (Lean Management) and Leadership and culture (Lean Leadership) are important to implementing a Lean organization. This leadership and culture (lean leadership) training lead to the transfer of the LM system concept from the manufacturing company to other colleagues (Sasmita and Pradhan, 2020).

4.1.3 Talent development: Character development requires the enrichment of one's moral cultivation, the cultivation of good character, and a mindset of respect for God and love for people. Therefore, to impress the importance of front line workers, Toyota often cites the Toyota principle: "Before we build cars, we build people" (Liker, 2004). The development of managerial skills, like the development of the A3 management concept of using an 11x17-inch A3 sheet of paper to clearly document the key elements of the problem-solving process and other methods like Plan-Do-Check-Act (PDCA), is used to train problem solving in upcoming management personnel (Shook, 2008). Through review and reflection, learn how to improve the organization or performance deficiencies in a continuous improvement approach. Practicing the "pass-along" type of succession management skills training "first lead for three years, help for three years, and let him/her do it by himself/herself for three years" can show the existence of leadership successors. Both the leader and those being led are the key point of leadership learning and cultivation to enhance competitiveness. (Chen, and Liao, 2021; Zhao, 2021).

4.1.4 Quality: Sustained improvement is the way of our survival. The company's goal of innovation is listening to the feedback of consumers, and quality is the most essential item in the feedback of consumers, so the internal improvement of quality is the first element (Masaaki 1986). Jidoka, or Autonomation, is one of the two pillars of Toyota's production method, which automatically stops the machine when a production snag occurs to prevent the generation of defective products in large quantities due to automation (Oono, 2005).

4.1.5 Lean management competency training: from Baron's (2017) study, it is obtained that the result of training is that the participants can develop their self-competence, control the activities carried out by each work unit, develop activity plans, analyze problems, and improve and maintain the learned competencies to achieve corporate goals and HR quality improvement.. On the other hand, the leader must learn to enhance the traits of the self as he gains leadership experience, and these influences may be present in organizational and personal competencies (Nichols, 2016).

5. Conclusion and Suggestions

This research has verified the prioritization of five critical success factors out of the original eight initial success factors derived for applying LM operations: 1. VOC, 2. Organizational planning, 3. Talent development, 4. Quality, and 5. Lean management capability training is the key to the company's application of LM.

Finally, this study proposes some practical recommendations for each of the five key indicators of successful lean manufacturing applications, as described below.

VOC's advice: maintain the brand's inherent quality reputation. We must use the scientific management method of lean management to achieve stable quality by using daily management visual kanban, safety, quality, delivery, inventory, and detailed hourly records of productivity in a low-cost production line.

Suggestions for organizational planning: Formulate a strategic long-term plan spanning 3 years and segment it into annual goals that must be reached.

Suggestions for talent development: We often work with senior leaders to practice strategic planning. Learn from doing, cultivate the technical fields, and moral cultivation that the senior leaders must have.

Suggestions for quality control: Total quality control and lean manufacturing are implemented, and the weekly Quality Control Circle (QCC) meetings are utilized to identify the fundamental problems and improve them by targeting the weekly defective phenomena, focusing on service and product quality, and making full use of employees' suggestions for improvement.

Recommendations for Lean Management Competency Training: Talent development is the only way to grow, and education and training are the only way to grow. 'Before we can create a superior company, we must first train superior leadership and management.'

References

Abu, F.; Gholami, H.; Saman, M. Z. M.; Zakuan, N.; Streimikiene, D. and Kyriakopoulos, G. L. (2021). An SEM Approach for the Barrier Analysis in Lean Implementation in Manufacturing Industries, *Sustainability* 2021,13,1978. https://doi.org/10.3390/su13041978.

Abdulraqeb, A. and Jeefenn, C. (2020). The impact of strategic human resource management practices on organizational performance. *BERJAYA Journal of Services & Management* Vol. 14, July 2020, 53 – 60.

Almoslehy, S. A. M. and Alkahtani, M. S. (2021). Key Approaches, Risks, and Product Performance in Managing the Development Process of Complex Products Sustainably, *Sustainability.* 2021, 13, 4727. https:// doi.org/10.3390/su13094727.

Baron I.S and Agustina, H. (2017). The effectiveness of leadership management training, *Polish Journal of Management Studies Baron I. S., Agustina H.* Vol.16 No.2,2017.

Basu P, Ghosh I, Dan P. (2018). Using structural equation modelling to integrate human resources with internal practices for lean manufacturing implementation, *Management Science Letters* 8(1): 51–68

Canada. (2019, May 2). Annual survey of research and development of Canadian private non-profit organizations (RDNP). Ottawa, ON: Statistics Canada. URL: https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurv VariableList&Id=1243294 [January 27, 2020].

Chang, I.-C., Y.-J. Chang and Tai-Yi Yu: (2021). Exploring Automatic Document Classification of Environmental Education Research Papers Using Text Mining Manners: An Analysis on Abstracts from the International Conference on Environmental Education between 2013-2018, *Journal of Environmental Education Research* 2021 Vol 17 PP85-128. DOI: 10.6555/JEER.17.1.085

Chase, R. B., Jacobs, F. R. and Aquilano, N. J. (2004). *Operations Management for Competitive*, The McGraw-Hill Companies, USA. 2004.

Chase, R. B., Jacobs, F. R., Aquilano N. J., (2005). *Operations Management For Competitive Advantage, 10th ed., P.166,* The Mcgraw-Hill Companies, USA,2005.

Chen, Y.-F. and Liao, C.-C. (2021). Utilizing the concept of Industry 4.0 to develop leadership ability in university students, *Taiwan Education Review* 10（1）,106-116.

Das, V. T. and Sailaja, R.V.N. (2021). Role of talent development in enhancing innovations in information technology sector: an investigative study, *EPRA International Journal of Economic and Business Review* Volume - 9, Issue - 11, November 2021. https://doi.org/10.36713/epra2012

Daniel, R.D. (1961). Management information crisis, *Harv. Bus. Rev.* 1961, Vol. 39, No. 5, pp.111-121.

Fang, S. J., Tsai, D. H., Tsai Z. H., (2019). *Strategic Management 2e P.312,* Canghai Book Information Co., Ltd., Taichung City, Taiwan, 2019.

Ivars Linde and Philippov, D. (2021). What do your customers think about? To guess or know? *ACCESS Journal: Access to Science, Business, Innovation in Digital Economy* 2021, 2(1), 17-27, https://doi.org/10.46656/access.2021.2.1(2)

Khalfallah, M. and Lakhal, L. (2021). The relationships between TQM, TPM, JIT and agile manufacturing: an empirical study in industrial companies TQM、TPM、JIT, *The TQM Journal* Vol. 33 No. 8, 2021. pp. 1735-1752. doi/10.1108/TQM-12-2020-0306

Kim, D., Woo, J.R., Shin, J., Lee, J. and Kim, Y. (2019). Can search engine data improve accuracy of demand forecasting for new products? Evidence from automotive market, *Industrial Management & Data Systems* Vol. 119 No. 5, 2019 pp. 1089-1103. https://DOI 10.1108/IMDS-08-2018-0347

Lapsley, I., and Rekers, J.V., (2017). The relevance of strategic management accounting to popular culture: the world of West End musicals, *Manag. Account* Res. 35 (June), 47–55.

Liang, G. S., DING, J. F. and Wang, S. N. (2021). *Quantitative Research Methods: Theory and*

Applications, Yong Xu Printing Co., Ltd. Keelung Taiwan. P.5
Liker, J.K. (2004). *The Toyota way: 14 management principles from the world's greatest manufacturer,* McGraw- Hill, New York, USA.
Masaaki Imai (1986). Kaizen. Kaizen Institute, Ltd., Japan. 1986.
Maware, C., Okwu, M. O. and Adetunji, O. (2021). A systematic literature review of lean manufacturing implementation in manufacturing-Developing and developed countries based sectors of the developing and developed countries, *International Journal of Lean Six Sigma* 28 June 2021. https://DOI 10.1108/IJLSS-12-2020-0223
Milewski, D. (2022). Managerial and Economical Aspects of the Just-In-Time System"Lean Management in the TiMe of Pandemic", *Sustainability* 2022, 14, 1204. https:// doi.org/10.3390/su14031204
Mousa, M., Sági, J. and Zéman, Z. (2021). Brand and Firm Value: Evidence from Arab Emerging Markets, *Economies* 9: 5. https://doi.org/10.3390/economies9010005
Mulgan, G. (2019). *Social innovation: How societies find the power to change (1st ed.)*. Park Hill, Bristol, UK ; Chicago, IL, USA: Policy Press. doi:10.2307/j.ctvs89dd3
Ng,T.C. and Ghobakhloo,M. (2018). What Determines Lean Manufacturing Implementation? A CB-SEM Model, *Economies* 2018, 6, 9. https://doi:10.3390/economies6010009
Nichols, A.L. (2016). What do people desire in their leaders? The effect of leadership experience on desire leadership traits, *Leadership & Organization Development Journal* 37 (5).
Oktariyani, O., & Hasanah, A. (2019). The Effect of Free Cash Flow, Liquidity and Foreign Ownership on Debt Policy in Companies Listed on the Indonesia Stock Exchange, *Journal of Applied Managerial Accounting* 3 (1), 20-35.
Oono, Taiichi (2005). Toyota Production System, Diamond, Inc., Japan. 2005.
Pandya, A., Ismoyowati, D. and Suharno. (2020). Developing Coffeeshop Improvement Strategy by Considering Voice of Customer, *Agroindustrial Journal* Vol. 7 Issue 2 (2020) 475-483
Prusa, R. and Jursová, S. (2019). The analysis of selected relationships between human resource management style and the effectiveness of knowledge management, *System safety: Human-technical facility-environment, CzOTO* vol. 1, Iss.1, 2019. doi: 10.2478/czoto-2019-0110
Rad,M.H., Mojtahedi and Ostwald, M. J. (2021). The Integration of Lean and Resilience Paradigms: A Systematic Review Identifying Current and Future Research Directions, *Sustainability* 2021, 13, 8893. https://doi.org/10.3390/su13168893
Ribalko O.M., Varlamova I.S., Yevtushenko R.M. (2021). Eatures Of Improvement Of Cost Accounting Methods And Product Accounting Calculation, *Bulletin of Zaporizhzhia National University. Economic sciences* № 1 (49), 2021, DOI https://doi.org/10.26661/2414-0287-2021-1-49-12
Robbins, S.P. (1994).*Management;* McGraw: New York, USA, 1994.
Roy, M.D., and Sana, S.S. (2021). Inter-dependent lead-time and ordering cost reduction strategy: a supply chain model with quality control lead-time dependent backorder and price-sensitive stochastic demand, *OPSEARCH* (2021) 58:690–710

https://doi.org/10.1007/s12597-020-00499-w
Saaty, T. L. (1980). *The Analytic Hierarchy Process;* McGraw: New York, USA, 1980.

Sadorsky, P. (2021). A Random Forests Approach to Predicting Clean Energy Stock Prices, *Journal of Risk and Financial Management* 14: 48.2021. https://doi.org/ 10.3390/jrfm14020048

Sarkar,B., Sarkar,M., Baishakhi Ganguly,B. and Cárdenas-Barrón, L. E. (2021). Combined effects of carbon emission and production quality improvement for fixed lifetime products in a sustainable supply chain management, *International Journal of Production Economics.* 231 (2021) 107867. https://doi.org/10.1016/j.ijpe.2020.107867

Sasmita Mohanty, S. and Pradhan, B. (2020). Dynamic teamwork within a lean organization, *Palarch's Journal of Archaeology Of Egypt/Egyptology* 17(6). ISSN 1567-214x

Saumyaranjan Sahoo. (2020). Lean manufacturing practices and performance: the role of social and technical factors, *International Journal of Quality & Reliability Management.* Vol. 37 No. 5, 2020, pp. 732-754. DOI 10.1108/IJQRM-03-2019-0099

Schulman, S. (2017). *Develop and deliver: Making the case for social R&D infrastructure*, Vancouver, BC: In with Forward.

Shook, J. (2008). *Managing to Learn: Using the A3 Management Process to Solve Problems, Gain Agreement, Mentor, and Lead,* Lean Enterprise Institute, Inc., 2008.

Tortorella, G., Cauchick-Miguel, P.A. and Gaiardelli, P. (2019). Hoshin Kanri and A3: a proposal for integrating variability into the policy deployment process, *The TQM Journal* Vol. 31 No. 2, 2019. pp. 118-135. https://DOI 10.1108/TQM-06-2018-0076

Tscheikner-Gratl, F., Egger, P., Rauch, W. and Kleidorfer, M. (2017). Comparison of Multi-Criteria Decision Support Methods for Integrated Rehabilitation Prioritization, *MDIP Journal* Water 2017, 9, 68; doi:10.3390/w9020068

Velte, P. (2021). Meta-analyses on Corporate Social Responsibility (CSR): a literature review, *Management Review Quarterly* 18 March 2021. https://doi.org/10.1007/s11301-021-00211-2

Womack, J., & Jones, D. (2003). *Lean thinking (1st ed., p. 400)*. London: Free Press.

Wu, F. (2019). Sectoral contributions to systemic risk in the Chinese stock market, *Finance Research Letters* 31 (2019) 386–390. https://doi.org/10.1016/j.frl.2018.12.009

Zhao, B. and Tu, C. (2021). Research and Development of Inventory Management and Human Resource Management in ERP, *Hindawi* Volume 2021, Article ID 3132062, 12 pages https://doi.org/10.1155/2021/3132062

Zhao, Y. (2021).Succession and Innovation Input in Family Firm. *Sun Yat-Sen Management Review* 2021-29(1), 151-178. DOI：10.6160/SYSMR.202103_29(1).0005