Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

DIGITAL TRANSFORMATION INDUSTRY 4.0 AND OPERATIONAL EXCELLENCE ON SMALL AND MEDIUM ENTERPRISES (SMES) IN MALAYSIA

Mohd Hafeez Al-Amin Abdul Wahab[1*]
Abdul Aziz Yaacob[2]
Che Mohd Syaharuddin Che Cob[3]
Siti Nur Zahirah Omar[4]
Muhammad Yushafiq Yusri[5]

[1]Faculty of Business and Management, Universiti Teknologi MARA Cawangan Kelantan, Kampus Machang, Malaysia, (Email: mohdhafeez@uitm.edu.my)
[2]Faculty of Entrepreneurship and Business, Universiti Malaysia Kelantan, City Campus, Kelantan, Malaysia, (Email: aziz.y@umk.edu.my)
[3]Faculty of Business and Management, Universiti Teknologi MARA Cawangan Kelantan, Kampus Machang, Malaysia, (Email: syaha793@uitm.edu.my)
[4]Faculty of Business and Management, Universiti Teknologi MARA Cawangan Kelantan, Kampus Machang, Malaysia, (Email: sitinurzahirah@uitm.edu.my)
[5]DRED Services, 121 Lorong Taman Sabariah Jalan Pengkalan Chepa, 15400 Kota Bharu, Kelantan, Malaysia (Email: Muhammadyushafiqy@gmail.com)

Article history
Received date : 2-3-2024
Revised date : 3-3-2024
Accepted date : 7-4-2024
Published date : 30-4-2024

To cite this document:
Abdul Wahab, M. H. A., Yaacob, A. A., Che Cob, C. M. S., Omar, S. N. Z., & Yusri, M. Y. (2024). Digital transformation industry 4.0 and operational excellence on Small And Medium Enterprises (SMES) in Malaysia. *International Journal of Accounting, Finance and Business (IJAFB)*, 9 (54), 53 - 62.

Abstract: *Despite small and medium enterprises (SMEs) manufacturing sectors is the largest contributor to the total exports and the second largest contributor to the gross domestic product (GDP) in Malaysia, SMEs are affected by the challenges from the business environment which influence their performance. The purpose of this study was to discusses the relationship between digital transformation industry 4.0 (I4.0) and operational excellence on SMEs manufacturing sectors in Malaysia. The present study is a literature review on the effect of digital transformation industry 4.0 (I4.0) on operational excellence in SMEs manufacturing sectors in Malaysia. This study attempts to help SMEs manufacturing sectors in Malaysia to adopt digital transformation industry 4.0 (I4.0) to remain significantly achieve sustainable operations for operational excellence in the business environment. The practical application of digital transformation industry 4.0 (I4.0) will help SMEs to attain an operational excellence with greater efficiency and productivity in their overall business performance.*

Keywords: *Digital transformation, Industry 4.0, Operational Excellence, Operational Management, Small and Medium Enterprises (SMEs),*

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

Introduction

Business environment is increasingly challenging day by day due to differences in customer needs, demographic changes, technological advancements, and the increasingly noticeable effects of globalization. These changes and challenges have forced most organizations to continuously enhance their capabilities to respond and adapt to changes caused by uncertain environmental conditions. This also impacts organizations in finding the best ways to handle new and diverse demands, such as changes in customer preferences and their need for cheaper, faster, and higher quality products and services (Saeed, Tasmin, Mehmood, & Hafeez, 2020). Additionally, the COVID-19 pandemic has disrupted economies and continues to affect organizations and businesses worldwide. COVID-19 is a tragedy that has struck human civilization and has serious implications for the global economy. The increase in COVID-19 cases has led to international, national, regional, and urban border closures, disrupting business activities overall (Ozili, 2021).

The COVID-19 pandemic has also caused instability in industries and businesses, resulting in shortages of raw materials, manufacturing resources, and labor availability. To remain competitive in business in this situation, industries and businesses need to assess and restructure their business practices and supply chain practices through the implementation of smart and sustainable manufacturing systems (Yeganeh, 2021). Furthermore, industries and businesses need to adopt emerging Industry 4.0 (I4.0) technologies and maintain sustainability in business practices, especially for small and medium-sized enterprises (SMEs). I4.0 also provides a safer and healthier work environment for workers compared to traditional manufacturing systems. The cyber-physical systems in I4.0 can also help meet customer demands in a short period (Karuppiah, Sankaranarayanan, D'Adamo, & Ali, 2023).

The Small and Medium Enterprises (SMEs) sector has been identified as the backbone of the overall industrial economy worldwide. SMEs are also major contributors to Gross Domestic Product (GDP) in developing countries around the world. In Malaysia, the SMEs sector is a major contributor to the Malaysian economy and has helped generate approximately 37.4% of GDP and 66% of employment in Malaysia. SMEs in Malaysia encompass various industries including services, manufacturing, construction, agriculture, and mining and quarrying (Malaysia Business Registration Statistics, 2022). The manufacturing sector is a key sector for Malaysia's economic growth and the largest contributor to overall exports and the second-largest contributor to Malaysia's GDP. However, the manufacturing sector now faces competitive challenges due to lower costs compared to competitors and the rapid technological development. This competition has driven the manufacturing sector in Malaysia to make changes in the value chain towards higher manufacturing bases by shifting from labour-intensive sectors to technology-intensive sectors (Wahab, Ibrahim, Yaacob, & Omar, 2023).

Therefore, the SME sector needs to compete with the global industry by adapting emerging Industry 4.0 (I4.0) technologies and maintaining competitiveness in business competition. Due to the critical need for technological competitiveness, the Malaysian government has recognized the importance of I4.0 alongside global digital transformation. The government has launched the National Policy for Industry 4.0 (Industry4WRD) to assist SMEs in digitalization. It demonstrates that inclusive SME involvement is a step towards improving the performance of the manufacturing sector in Malaysia.

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

Literature Review

SMEs in Malaysia

SMEs have been identified as drivers of the economy and catalysts for job creation and economic development. In Malaysia, 97.3% of all businesses registered in 2010 were small and medium-sized enterprises (SMEs). In 2021, SMEs contributed 37.4% to the GDP with an added value of RM518.1 billion. Furthermore, the GDP of SMEs increased to RM572.6 billion in nominal terms in 2021 compared to RM547.3 billion reported in 2020 (Harian Metro, 2022).
In terms of SME types, there are three different types of SMEs in Malaysia, namely micro, small, and medium-sized enterprises. Two criteria are used to determine the different SME categories, namely annual sales turnover and the number of full-time employees. The current definition includes manufacturing, primary agriculture, and services with a minimum annual sales requirement of RM300,000 or less than five full-time employees. Meanwhile, the redefinition of SMEs in Malaysia was approved by the National SME Development Council (NSDC), chaired by the former Prime Minister, YAB Dato' Sri Mohd Najib Tun Haji Abdul Razak, and composed of representatives from key ministries and agencies, and became official in January 2014.

It cannot be denied that SMEs in Malaysia have made significant contributions to the country's economic growth, and the function of SMEs is crucial in transforming Malaysia's economic landscape to achieve high-income status by 2020. For example, SME GDP growth grew at a moderate rate of 5.8% in 2019 compared to 6.2% in the previous year, in line with Malaysia's economic slowdown in 2019 due to challenging global economic conditions and domestic supply disruptions. However, SME growth performance remained higher than the overall GDP and non-SME GDP, recording growth rates of 4.3% and 3.4%, respectively. The comparison of SME and non-SME GDP growth shows that SMEs are more flexible and responsive to change due to their small firm size, private ownership, and relatively simpler corporate structure, all of which are advantageous when facing crises (SME Corp, 2022).

Furthermore, based on the latest data from the Malaysia Statistical Business Register (MSBR), the number of SMEs in Malaysia in 2020 was 1,151,339 or 97.2% of the total business establishments. On average, the number of SMEs has increased by 4.9% annually since 2015. The service sector has consistently accounted for more than 80% of all SMEs, contributing 85.5% in 2020 with a total of 984,643 SMEs. The construction sector became the second largest contributor during that year, accounting for 7.4% (85,637). Meanwhile, around 5.1% of SMEs (58,439) were involved in the manufacturing sector, followed by 1.7% (19,130) in the agricultural sector, with the remainder of 0.3% (3,490) in the mining and quarrying sector (SME Corp, 2022).

Operational Excellence

Various definitions of operational excellence can be found in previous studies. Mitchell (2015) refers to operational excellence as a descriptive term that clearly defines feasibility and objectives. Operations refer to activities that involve producing and/or delivering products and achieving temporary missions while excellence signifies objectives that must be met and sustained for continuous success. Treacy and Wiersema (2004) define operational excellence as the discipline of delivering products or services with good quality at the lowest cost. Similarly, Assen (2011) defines operational excellence as a strategy to enhance operational performance by continuously improving production and delivery systems to provide value-added products and services to customers. Furthermore, Dunggan (2011) explains that

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

operational excellence is a term where operations are at the highest performance level and the organization has achieved the highest operational capability possible. Operational excellence closely relates to operational performance aspects such as cost, time, quality, and flexibility, as well as operational methods that support business growth.

Meanwhile, Russell and Koch (2009) state that operational excellence refers to achieving higher operational efficiency by improving business operations faster and cheaper. Traditionally, operational excellence aims to improve business processes, production, and manufacturing to meet customer needs, enhance quality, and increase productivity and efficiency. Today, operational excellence is evolving and is key to improving profitability and gaining competitive advantages. It emphasizes continuous improvement in managing business operations efficiently. Operational excellence is a holistic approach to achieving the best performance in quality, productivity, and service delivery. Systematic operational excellence enables organizations to achieve service excellence, customer orientation, a culture of continuous improvement, and customer satisfaction while also achieving operational efficiency.

Friedli and Werani (2013) explain that operational excellence is balanced management of quality, cost, and time while focusing on customer needs. Operational excellence emphasizes organizational performance and practices in how organizations are managed to achieve superior performance and continuous improvement. It is continuous improvement in all production dimensions and measured by performance efficiency and effectiveness. To achieve operational excellence, top management must play a role in incorporating operational excellence structures and culture into their workforce. Additionally, Miller (2014) states that operational excellence is a continuous effort to achieve better performance and effectiveness in all aspects of the organization. Operational excellence focuses on creating value by integrating employee, customer, and supply chain performance while also focusing on production processes, consistency, and waste reduction to enhance customer value. Operational excellence is not about achieving perfection but about achieving superior performance and profitability using a systematic approach that focuses on people and implementing changes by involving customers, continuous innovation, continuous operational improvement, and moving at optimal speed.

On the other hand, Treacy and Wiersema (2004) state that operational excellence is a systematic approach to production and delivery of products and services. This systematic approach aims to reduce costs and improve processes to provide reliable products or services to customers at competitive prices with minimal delivery difficulties. This can be achieved by reducing production steps and transaction costs and optimizing business processes. Additionally, Ifeanyichukwu (2010) defines operational excellence as the best systematic management system that improves organizational performance through the use of best practices and continuous improvement. It helps organizations improve and maintain business growth by reducing waste, reducing operating costs, improving quality, and customer satisfaction. It is also an approach that helps managers focus on being more competitive and achieving better performance by integrating employees, processes, and equipment.

According to Ojha (2015), operational excellence focuses on providing customers with quality services and products delivered with minimal problems and minimal difficulty. Operational excellence can be achieved through innovation and technology development in product development and distribution. Furthermore, operational excellence involves activities such as cost reduction, quality improvement, and resource management. Operational excellence will affect productivity improvement, quality improvement, delivery improvement, flexibility

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

improvement, cost reduction, and waste reduction. Garvare and Isaksson (2001) define operational excellence as effective and efficient process management to maximize shareholder value in the long term while maintaining a balance of interests of all stakeholders. Operational excellence will affect overall organizational performance through improved operational performance to be more effective and cost reduction through alignment removal.

In summary, operational excellence can be defined as a holistic approach to achieving superior performance and continuous improvement in all dimensions of internal organizational processes and providing the best delivery satisfaction of products and services to customers through excellent management practices and continuous improvement activities. The objective of operational excellence is to provide competitive advantages and improve business performance through continuous improvement in all dimensions of the organization to achieve superior outcomes. Operational excellence emphasizes operational performance and sustainable organizational performance. In operational performance, operational excellence emphasizes quality improvement, delivery improvement, cost improvement, and flexibility improvement. Furthermore, operational excellence also considers sustainable organizational performance that emphasizes effectiveness in managing people and resources such as waste reduction, energy, time, and employee, customer, community, and supply chain interaction performance. By achieving operational excellence, it will lead the organization towards superior performance and provide competitive advantages in the market competition.

Industry 4.0 (I4.0)

Industry 4.0 (I4.0), also known as the Fourth Industrial Revolution (4IR), refers to a disruptive transformation in industries through the use of technology. I4.0 is characterized by new technologies that integrate the physical, digital, and biological realms, impacting all fields, industries, and economies. For example, bio-printing uses digital files (digital) to print objects such as organs (physical) using cells and biomaterials (biological) (Economic Planning Unit, 2021). According to the Ministry of International Trade and Industry (2018), the term I4.0 essentially originated from the German government's initiative to transform their manufacturing sector towards cyber-physical-based advanced production.

According to Schwab (2016), I4.0 emphasizes the use of supercomputers, smart robots, driverless vehicles, genetic modifications, and neurotechnology development to optimize human-machine functions further. I4.0 technologies integrate physical, digital, and biological aspects of human life necessary to equip future generations to address issues in the digital world. I4.0 represents a new approach to using innovative digital technology to transform production and processing of products. I4.0 combines and connects digital and physical technologies, such as artificial intelligence (AI), the Internet of Things (IoT), robotics, and cloud computing, to drive businesses to be more flexible, responsive, and connected, capable of making efficient and effective decisions (Cotteleer & Sniderman, 2017).

Aligned with I4.0, the manufacturing sector faces pressure to transition from a labor-dependent landscape to automation and digital landscapes. To realize the concept of I4.0, all efforts need to be made, including providing connectivity, communication, network entities, real-time data, and extensive information across the global value chain to achieve full automation, digitization, and smart manufacturing environments. Therefore, the manufacturing sector needs to build a network framework that encompasses three key features: vertical integration (integration within organizational systems), horizontal integration (integration between different organizational

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

systems), and digital engineering integration from early to final stages (Ling Hamid & Te Chuan, 2020).
Vertical integration in the manufacturing context refers to data from smart sensor devices from physical production floors being sent to network systems and physical processes monitored and controlled through the network (Hofmann & Rüsch, 2017). According to Oesterreich and Teuteberg (2016), smart system integration at various hierarchical levels such as between human-machine interfaces, actuators, sensors, and different production object control, production management, manufacturing and execution levels, and corporate planning levels are considered vertical integration. Vertical integration enables integration within organizations through both manufacturing and IT systems, processes, and data flow throughout the entire company from start to end of the manufacturing process.

Furthermore, horizontal integration refers to the entire value network integrating multiple companies (from suppliers to end customers) involved in the value chain to enhance collaboration between organizations (Leyh, Sch, Bley & Forstenh, 2017). This network is optimized in real-time to be smart and digital. The need to integrate networks horizontally involves the completeness of networks, infrastructure, and technology involved in IoT among value chain partners (Mikawa, 2015). IoT is a smart network that integrates equipment and information tracking systems, and various types of access networks and the internet. In the context of I4.0, IoT is used to make manufacturing processes virtual and drive autonomy in production processes. Information, financial, and material flows in this network can be optimized in real-time (Soldatos, Gusmeroli, Maló & Orio, 2016).

Additionally, the combination of vertical integration and integration allows integration from early to final stages throughout the entire value chain. It involves cross-linking and smart digitization throughout all phases of the product lifecycle (Yang, Huang & Hang, 2018). Digital integration from early to final stages is essential to facilitate product analysis and, consequently, can reduce operating costs (Oesterreich & Teuteberg, 2016). Digital integration from early to final stages describes integration across engineering processes to ensure the digital world is connected with the real world throughout the company's supply chain and different business partners, including customer demand (Liao et al., 2017). Using sophisticated communication and virtualization methods, significant optimization potential can be achieved by integrating engineering throughout the value chain (Keller et al., 2014).

SMEs Manufacturing Sectors and I4.0 in Malaysia

The manufacturing sector plays a crucial role in Malaysia's economy through its contributions to GDP, foreign trade, and job creation. The manufacturing sector is a key driver of Malaysia's economic growth, the largest contributor to total exports, and the second-largest contributor to Malaysia's GDP. According to the Economic Census 2016, there were 49,101 manufacturing companies established in Malaysia, with the SME sector representing 47,698 or 97.14% of the total number of companies. The contribution of SMEs to Malaysia's economy is undeniable; it significantly contributes to Malaysia's economic development and plays a vital role in shaping Malaysia's economic landscape towards achieving high-income status by 2020 (Mahmud and Hilmi, 2014). As reported by the SME Annual Report 2017/2018, Malaysian SMEs contributed more than one-third of Malaysia's economy in 2017, contributing to higher GDP growth by 37.1%, 66% of employment, and 17.3% of total exports.

Although the contribution of SMEs to the Malaysian economy is significant, SMEs now face issues and challenges in expanding and sustaining businesses due to intense competition on

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

production costs from lower cost developing countries and rapid technological changes. This competition has had a negative impact on SME performance in facing an increasingly challenging business environment. To address competition in this challenging environment, SMEs in Malaysia need to improve and enhance performance in manufacturing processes by transitioning from labor-based manufacturing processes to technology-based manufacturing processes (Khin & Hung, 2022).

Recognizing the need and critical development of technological competition, the Malaysian government has paid attention to I4.0 in line with global and regional trend changes. This is done by raising awareness and encouraging the manufacturing sector to transition to the fourth industrial revolution (IR4.0). The transition and change of the manufacturing sector to IR4.0 will undoubtedly pose challenges to the manufacturing sector. Therefore, the Malaysian government allocated funds through the National Budget in 2019 to assist the manufacturing sector, especially SMEs, in adapting to Industry 4.0 technology and transitioning from traditional operational and business processes to digital-based processes and models. Specifically, in the National Budget for 2019, the Malaysian government allocated RM210 million for the Readiness Assessment Program and RM3 billion for the Industrial Digital Transformation Fund to accelerate the adoption of Industry 4.0-related technology by the manufacturing sector in Malaysia (New Straits Times, 2019).

Furthermore, through the National Budget 2020, the Malaysian government allocated funds to support the use of Industry 4.0 technology through the construction of the 5G Ecosystem, implementation of the Fiberization and National Connection Plan, and providing various investment incentives to help local companies adopt Industry 4.0 (Bank Negara Malaysia, 2020). The government has also launched several initiatives, including the Digital Transformation Drive Program by the Malaysia Digital Economy Corporation, the Industry Digitalization Transformation Fund by the Malaysia Development Bank, the Strategic Investment Fund, and the Automation Capital Allowance by the Malaysia Investment Development Authority. Additionally, the Soft Loan Scheme for Automation and Modernization by the Malaysia Industrial Development Corporation serves as a gateway to Industry 4.0 for the manufacturing sector, especially SMEs in Malaysia (MITI, 2019).

Moreover, the government continues to commit to realizing the digital revolution by launching the National Policy on Industry 4.0 (Industry4WRD), aimed at transforming the manufacturing sector, especially SMEs, into a smart, systematic, and resilient sector by leveraging Industry 4.0 technology. Through the Industry4WRD initiative, the government predicts a 30% increase in production productivity per worker, an increase in the manufacturing sector's contribution to the country's economy from RM254 billion to RM392 billion. Industry4WRD also aims to enhance innovation capacity and capabilities, and subsequently shape more highly skilled workers in the manufacturing industry from 18% to 35% (New Straits Times, 2019).

Discussion and Conclusion

The purpose of this study was to discusses the relationship between digital transformation industry 4.0 (I4.0) and operational excellence on SMEs manufacturing sectors in Malaysia. Specifically, it aims to explores the effect of digital transformation industry 4.0 (I4.0) on operational excellence on SMEs manufacturing sectors in Malaysia and provide insights to SMEs owners and managers on how digital transformation industry 4.0 (I4.0) will help SMEs to attain an operational excellence with greater efficiency and productivity in their overall business performance.

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

Moreover, the business environment today is increasingly challenging due to various customer needs, demographic changes, technological advancements, the effects of globalization, and the impact of the COVID-19 pandemic. Organizations must enhance their capabilities to respond and adapt to uncertain environmental changes, including improving organizational operations management to remain competitive in business. Operational excellence is a critical component of business excellence, and both internal and external factors of an organization influence the success towards achieving operational excellence. Therefore, organizations need to reinvent themselves and create new strategies and ideas to achieve business excellence and sustain competitiveness.

Additionally, operational excellence in business is a primary requirement for organizations to survive and succeed in the competitive global market, especially in the SME manufacturing sector. In line with global trend changes, SMEs need to adapt Industry 4.0 technology to remain competitive and sustain business sustainability. Previous studies have found that the implementation of Industry 4.0 in manufacturing processes and procedures such as artificial intelligence (AI), the Internet of Things (IoT), robotic systems, big data analytics, and cloud computing can enhance business operations performance. According to Agostini and Nosella (2019), Industry 4.0 may not significantly impact basic manufacturing level management, but it can organize, manage, and enhance company operations performance. The integration between operational processes and Industry 4.0 will affect the business performance of companies, such as reducing operating costs, reducing manufacturing cycle times, increasing inventory turnover, and reducing production material costs.

In conclusion, SMEs have been identified as the main driver of national economic growth. Currently, digital innovation is an essential tool in life and work as it is closely related to improving business performance and market dynamics. Considering the rapid development of digitalization worldwide, SMEs in Malaysia need to adapt Industry 4.0 technology to drive the country's economic growth. Therefore, SMEs need to adapt technological innovations of Industry 4.0 in enhancing their performance towards achieving operational excellence in line with changes in the global technological revolution.

References

Agostini, L., & Nosella, A. (2019). The adoption of Industry 4.0 technologies in SMEs: results of an international study. Management Decision, 58(4), 625–643. https://doi.org/10.1108/MD-09-2018-0973

Bank Negara Malaysia (2019). 2020 budget speech Available at: http://www.bnm.gov.my/documents/budget/bs2020.pdf

Barney, J. B. (1991). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99–120. https://doi.org/10.1177/014920639101700108

Buer, S. V., Strandhagen, J. O., & Chan, F. T. S. (2018). The link between industry 4.0 and lean manufacturing: Mapping current research and establishing a research agenda. International Journal of Production Research, 56(8), 2924–2940. https://doi.org/10.1080/00207543.2018.1442945

Cotteleer, M., & Sniderman, B. (2017). Forces of change: Industry 4.0. Deloitte Insights, 18(1), 1-16.

EFQM. (2022). Retrieved from https://efqm.org/

Farah, A. (2018). 2019 Budget a testament to gov't ambition in accelerating Industry 4.0 adoption. New Straits Times. Available at: https://www.nst.com.my/business/2018/11/427724/2019-budget-testament-govt-ambition

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

accelerating-industry-40-adoption

Friedli, T., & Werani, J. (2013). Leadership Principles & Operational Excellence. 347–353. https://doi.org/10.1007/978-3-642-35161-7

Garvare, R., & Isaksson, R. (2001). Sustainable development: extending the scope of business excellence models. Measuring Business Excellence, 5(3), 11–15. https://doi.org/10.1108/13683040110403899

Harian Metro. (2022). KDNK PKS perlahan berbanding KDNK Malaysia. Harian Metro. Retrieved from https://www.hmetro.com.my/bisnes/2022/07/865595/kdnk-pks-perlahan-berbanding-kdnk-malaysia

Ifeanyichukwu, O. C. (2010). Organizational performance improvement in an oil producing facility in Nigeria through operational excellence. North-West University.

Kamble, S., Gunasekaran, A., & Dhone, N. C. (2019). Industry 4.0 and lean manufacturing practices for sustainable organisational performance in Indian manufacturing companies. International Journal of Production Research, 0(0), 1–19. https://doi.org/10.1080/00207543.2019.1630772

Kementerian Perdagangan Antarabangsa dan Industri Malaysia (MITI) (2018). National Industry 4.0 Policy Framework.

Koe, W., & Abdul Majid, I. (2013). Sustainable Entrepreneurship among Small and Medium Enterprises (SMEs) in Malaysia. International Journal of Economics, Finance and Management, 2(4), 286–290.

Hofmann, E., and Rüsch, M. (2017). Industry 4.0 and the current status as well as future prospects on logistics. Comput. Ind

Husaini; Pirzada, K. and Saiful, (2020). Risk Management, Sustainable Governance Impact on Corporate Performance. Journal of Security and Sustainability Issues, 9(3), 993-1004.

Keller, M., Rosenberg, M., Brettel, M., and Friederichsen, N. (2014). How Virtualization, Decentrazliation and Network Building Change the Manufacturing Landscape: An Industry 4.0 Perspective. Int. J. Mech. Aerospace, Ind. Mechatron. Manuf. Eng. 8, 37–44.

Karuppiah, K., Sankaranarayanan, B., D'Adamo, I., & Ali, S. M. (2023). Evaluation of key factors for industry 4.0 technologies adoption in small and medium enterprises (SMEs): an emerging economy context. Journal of Asia Business Studies, 17(2), 347-370.

Lee, A. J. L., Lim, R. Y. G., Ma, B., & Xu, L. X. X. (2013). Improving productivity of the SMEs in Singapore - Case studies. 2013 IEEE International Conference on Industrial Engineering and Engineering Management, 73–77. https://doi.org/10.1109/IEEM.2013.6962377

Leyh, C., Sch, T., Bley, K., and Forstenh, S. (2017). Information Technology for Management: New Ideas and Real Solutions. 277, 103–119. Available at: http://link.springer.com/10.1007/978-3-319-53076-5.

Liao, Y., Deschamps, F., Loures, E. de F. R., & Ramos, L. F. P. (2017). Past, present and future of Industry 4.0 - a systematic literature review and research agenda proposal. International Journal of Production Research, 55(12), 3609–3629. https://doi.org/10.1080/00207543.2017.1308576

Ling, Y. M., Hamid, N. A. A., & Te Chuan, L. (2020). Is Malaysia ready for Industry 4.0? Issues and challenges in manufacturing industry. International Journal of Integrated Engineering, 12(7), 134-150.

Mikawa, S. (2015). Industrie 4.0 and the latest trends in Monozukuri innovation in the auto industry. NEC Tech. J. 10, 28–32.

Miller, A. (2014). Redefining Operational Excellence: New Strategies for Maximizing Performance and Profits Across the Organization. The Journal of Applied Management and Entrepreneurship, 19(4).

Volume: 9 Issues: 54 Special Issue [March, 2024] pp. 53 - 62
International Journal of Accounting, Finance and Business (IJAFB)
eISSN: 0128-1844
Journal website: www.ijafb.com
DOI: 10.55573/IJAFB.095406

Mitchell, J. S. (2015). Operational Excellence: Journey to Creating Sustainable Value. Wiley.

Njaramba, E. A. N., & Ngugi, J. K. (2014). Influence of Internal Controls on Growth of Small and Medium Enterprises in the Errand Services Businesses in Nairobi County. International Journal of Current Business and Social Sciences, 1(1), 30–47.

Oesterreich, T.D., and Teuteberg, F. (2016). Understanding the implications of digitisation and automation in the context of Industry 4.0: A triangulation approach and elements of a research agenda for the construction industry. Comput. Ind.

Ozili, P. K. (2021). Covid-19 pandemic and economic crisis: The Nigerian experience and structural causes. Journal of Economic and Administrative Sciences, 37(4), 401-418.

Russell, R. H., & Koch, J. I. (2009). Operational Excellence: The New Lever for Profitability and Competitive Advantage. Palladium Group, 1–24.

Sabai Khin & Daisy Kee Mui Hung (2022): Identifying the driving and moderating factors of Malaysian SMEs' readiness for Industry 4.0, International Journal of Computer Integrated Manufacturing, DOI: 10.1080/0951192X.2022.2025619

Schwab, K., 2016, The Fourth Industrial Revolution, World Economic Forum, Geneva.

SME Corp. (2022). SME Corp. Retrieved from https://smecorp.gov.my/index.php/my/profil-sme

SME Corp. Malaysia (2022). Laporan Tinjauan PKS 2019/20. https://www.smeinfo.com.my/laporan-tinjauan-pks-2019-20-keluaran-baharu/#

Soldatos, J.K., Gusmeroli, S., Maló, P., and Orio, G. Di (2016). Internet of things application in future manufacturing

Treacy, M., & Wiersema, F. (2004). Discipline of market leaders. 1–33. https://doi.org/10.1080/08843758808910038

Unit Perancang Ekonomi, J. P. M. (2021). Dasar Revolusi Perindustrian Keempat (4IR) Negara. Unit Perancang Ekonomi, Jabatan Perdana Menteri, Julai.

Van Assen, M. F. (2011). Operational Excellence for Services. Center of Operational Excellence,"[Online].[Retrieved February 29, 2012]. Available at: http://www. vanassen. info/wpcontent/uploads/Position-paper-Operational-Excellence-for-Services. pdf.

Wahab, M. H. A. A. A., Ibrahim, N., Yaacob, A. A., Cob, C. M. S. C., & Omar, S. N. Z (2023). The Relationship Between Soft and Hard Factors on Operational Excellence in Small and Medium Enterprises (SMEs). International Journal of Accounting, Finance and Business (IJAFB), 8(47), 21-29.

Wernerfelt, B. (1984). A Resource based view of the firm. Strategic Management Journal, 5(2), 171–180. https://doi.org/10.1002/smj.4250050207

Yang, J., Huang, G., and Hang, Q. (2018). Advances in production management systems. Smart manufacturing for Industry 4.0 (Springer International Publishing) Available at: http://link.springer.com/10.1007/978-3-319-99707-0.

Yeganeh, H. (2021). Emerging social and business trends associated with the Covid-19 pandemic. Critical perspectives on international business, 17(2), 188-209.

Zarina, Z. (2018). Malaysia's 13 strategies to transform manufacturing & services sector. New Straits Times. Available at: https://www.nst.com.my/business/2018/10/426984/malaysias-13-strategies-transform manufacturing-services-sector.