Digital Marketing And Strategic Approaches Of Electronic Component Manufacturers In The Era Of Industry 4.0

SATHAPATH KILASO[1], KEATTISAK CHANKAEW[2], KATHALEEYA CHANDA[3]

[1,3] Lecturer in Digital Marketing Program, College of Innovation and Management, Suan Sunandha Rajabhat University, Bangkok, Thailand. E-mail: sathapath.ki@ssru.ac.th[1], kathaleeya.ch@ssru.ac.th[3]

[2] Division of Business Administration, School of Interdisciplinary Studies, Mahidol University Kanchaburi Campus, Thailand. E-mail: keattisak.cha@mahidol.ac.th

ABSTRACT

This research examined the industry 4.0 business environment, management techniques, and service strategies of small and medium-sized electronic component makers. Using a questionnaire, 350 Thai electrical components executives and entrepreneurs provided data. Analyses included frequency, percentage, mean, standard deviation, and factor analysis. The study's majority of respondents were men aged 36–40 with a Bachelor of Business Administration degree. They averaged 11–15 years in the firm. These entrepreneurs distributed electronic components with overseas partners. Their enterprises have 51–100 employees and 6–8 million baht in assets. They exported 1–10% of their goods and imported 1–10% of their raw materials. The firms performed worse than last year. These companies' management strategy factors averaged 4.0. Work satisfaction, economy, quality, command, planning, coordination, just-in-time, and technology were the most important aspects, in order. Control and management were relatively significant. The research found five main components and twenty-five subcomponents of Industry 4.0 management strategies for small and medium-sized electronic component makers. These include organizational quality management, cost-effective planning, coordination, command, and control.

Keywords : Business Management Strategy, Electronics, Industry 4.0, Digital Marketing.

INTRODUCTION

Electronic (Lu & Weng, 2018) component manufacturers are at the forefront of this evolution in the era of Industry 4.0, in which

sophisticated technologies and digital transformation are reshaping industries. As they respond to the requirements of Industry 4.0 (Ammar et al., 2022), manufacturers of electronic components must also navigate the domain of digital marketing in order to effectively reach their target markets and maintain competitiveness in a landscape that is swiftly evolving. Digital marketing has become an integral component of business strategies across all industries, allowing businesses to interact with consumers, increase brand awareness, and generate sales in the digital sphere. As essential suppliers in the technology ecosystem, electronic component manufacturers must leverage digital marketing strategies to position themselves as industry leaders and effectively communicate their value propositions to consumers. The purpose of this study is to investigate the enterprise strategies of electronic component manufacturers in the era of Industry 4.0 (Eksangsri & Jaiwang, 2014), with a particular emphasis on the role of digital marketing. It will explore the challenges and opportunities these manufacturers encounter as they integrate digital marketing into their overall business strategies and respond to the constantly evolving digital landscape. The convergence of Industry 4.0 and digital marketing provides electronic component manufacturers with novel opportunities to leverage digital channels, such as websites, social media platforms, online advertising, and content marketing (Hagen et al., 2022), to reach their target audience, engage with customers, and display their technological innovations. In the era of Industry 4.0 (Tiago & Veríssimo, 2014), manufacturers can enhance their market presence, nurture customer relationships, and promote business growth by adopting these digital marketing strategies. Through an examination of industry trends, case studies, and expert opinions, this research will provide valuable insights into the various digital marketing strategies adopted by manufacturers of electronic components. It will examine the challenges involved in implementing digital marketing strategies, the benefits they offer, and the best practices that can help manufacturers use digital marketing to achieve success in the Industry 4.0 environment.

LITERATURE REVIEW

In the age of Industry 4.0 (Olson et al., 2021), the manufacturing industry is undergoing a profound transformation driven by the convergence of advanced technologies and digitalization. Among the key players in this evolving landscape are electronic component manufacturers, who play a critical role in providing the essential building blocks for modern technology-driven systems. As Industry 4.0 continues to reshape the manufacturing ecosystem, electronic component manufacturers face the challenge of adapting their enterprise strategies to harness the full potential of this transformative

era. One crucial aspect of this adaptation is the effective integration of digital marketing into their overall business strategies (Adeyinka-Ojo et al., 2014).

Industry 4.0: To set the context for this research, it is essential to provide a comprehensive overview of Industry 4.0 and its impact on the manufacturing industry. Industry 4.0 is characterized by the integration of advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), big data analytics, cloud computing, and cyber-physical systems. These technologies enable enhanced connectivity, automation, and intelligent decision-making across the manufacturing value chain. As a result, traditional manufacturing processes are being revolutionized, leading to increased efficiency, productivity, and flexibility. The advent of Industry 4.0 presents both opportunities and challenges for electronic component manufacturers as they navigate the digital landscape (Kim, 2021).

Importance of Digital Marketing in the Age of Industry 4.0: In this section, we will explore the growing importance of digital marketing for electronic component manufacturers in the age of Industry 4.0. Digital marketing (Killian & McManus, 2015) has become an integral part of business strategies across industries, enabling companies to connect with their customers, build brand awareness, and drive sales in the digital realm. Electronic component manufacturers, being essential suppliers in the technology ecosystem, must leverage digital marketing strategies to position themselves as leaders in the industry and effectively communicate their value propositions to customers. We will discuss the shift in consumer behavior towards digital channels and the increasing reliance on online research and purchasing decisions, emphasizing the need for manufacturers to adapt to this digital landscape to remain competitive (Dwivedi et al., 2021).Enterprise Strategies of Electronic Component Manufacturers: This section will delve into the enterprise strategies employed by electronic component manufacturers in the age of Industry 4.0. We will examine how these manufacturers adapt their business models, operational processes, and supply chain management to align with the principles of Industry 4.0. This includes the integration of advanced technologies such as automation, robotics, and predictive maintenance into their manufacturing processes to enhance productivity and agility. Furthermore, we will analyze the strategic partnerships and collaborations formed by electronic component manufacturers to foster innovation and stay ahead of the competition. We will highlight the need for a holistic approach that combines technological advancements with effective digital marketing strategies (Stephen, 2016).

Digital Marketing Strategies: Building upon the enterprise strategies, this section will focus on the specific digital marketing strategies

employed by electronic component manufacturers. We will explore various aspects of digital marketing, including online presence and branding, content marketing, search engine optimization (SEO), social media marketing, online advertising, customer relationship management (CRM), and e-commerce. We will examine how electronic component manufacturers leverage these strategies to effectively communicate their value propositions, engage with their target audience, and generate leads. Moreover, we will discuss the challenges faced in implementing these strategies and provide best practices and recommendations to optimize digital marketing efforts (Nafees et al., 2021).

Case Studies and Insights: To provide practical insights and real-world examples, this section will feature case studies of electronic component manufacturers that have successfully implemented digital marketing strategies in the age of Industry 4.0. We will examine their approaches, challenges faced, and outcomes achieved. Additionally, we will include expert insights from industry leaders, digital marketing professionals, and researchers to provide a comprehensive understanding of the landscape and offer valuable recommendations for electronic component manufacturers (Ma, 2023).

RESEARCH METHODOLOGY

This study focused on entrepreneurs and business leaders in the electronic components manufacturing industry located in both Bangkok and other provinces. The sample group comprised 336 entrepreneurs and company executives involved in electronic component manufacturing in the Bangkok area and surrounding regions. The researcher selected a sample size of 350 individuals using a non-probability sampling method based on referrals.

To assess the importance of small and medium-sized business management strategies of electronic component manufacturers in the Industry 4.0 era, a Likert scale was employed. The ranking criteria were as follows:

A mean score of 1.00-1.49 indicated the lowest level of importance.

A mean score of 1.50-2.49 denoted a relatively lower level of importance.

A mean score of 2.50-3.49 indicated a medium level of importance.

A mean score of 3.50-4.49 represented a high level of importance.

A mean score of 4.50-5.00 signified the utmost level of importance.

By utilizing this ranking system, the study aimed to assess and classify the significance of various management strategies employed by small and medium-sized electronic component manufacturers in the Industry 4.0 era.

RESEARCH TOOLS

The researcher has employed a questionnaire as the primary instrument for data collection in this study. The questionnaire is divided into four sections, each serving a specific purpose and utilizing different question types.

Section 1: General Information about Respondents:This section functions as a checklist and collects general information about the respondents. It includes questions related to their demographic details, such as age, gender, educational background, and job position. The purpose of this section is to gather basic information to ensure the diversity and representativeness of the sample.

Section 2: Information on the Organization's Overall Nature:

This section is also designed as a checklist. It aims to gather information about the nature of the organizations in which the respondents are employed. The questions cover aspects such as the size of the organization, its industry sector, years of operation, and geographical location. This section helps provide contextual information about the organizations participating in the study.

Section 3: Details on Enterprise Management Strategic Factors 4.0: In this section, the questionnaire utilizes an estimated scale variety of questions. It focuses on exploring the specific enterprise management strategic factors related to Industry 4.0. The questions are designed using a Likert scale with five tiers, allowing respondents to rate their agreement or disagreement with statements regarding technology adoption, resource optimization, quality improvement, completion time, job satisfaction, planning, organization management, commanding, coordination, and control. This section aims to assess the level of implementation and effectiveness of these strategic factors in electronic component manufacturers' small- and medium-sized firms.

Section 4: Open-End Questions:The final section of the questionnaire includes open-end questions that provide respondents with an opportunity to provide additional comments, insights, or suggestions regarding the enterprise management strategies in the era of Industry 4.0. These open-end questions allow for qualitative data collection, enabling respondents to elaborate on their experiences, challenges, or success stories related to the topic.

The independent variable in this study is the technology of saving resources (capital and labor), quality improvement, completion time, job satisfaction, planning, organization management, commanding, coordination, and control. These variables are used to measure the level of adoption and effectiveness of management strategies in small- and medium-sized electronic component manufacturing firms in the era of Industry 4.0.

The dependent variable is the management strategies employed by electronic component manufacturers in the era of Industry 4.0. The study focuses on a specific group of business owners and executives

involved in the production of electronic components in Bangkok, its surrounding provinces, and certain provinces' industrial estates. The aim is to investigate and analyze the strategies adopted by these manufacturers in response to the challenges and opportunities presented by Industry 4.0.

RESULT

The study examined the management practices of small and medium-sized manufacturers of electronic components in the context of Industry 4.0. The summary highlights significant research findings: The majority of respondents were engaged in the prostitution industry, were between the ages of 36 and 40, and held a bachelor's degree in business administration. They averaged between 11 and 15 years of experience in the company. The enterprises were predominantly engaged in the distribution of electronic components and had foreign associates in joint ventures. Factors Affecting General Organizational Structure: The research investigated a number of factors that influence the general organizational structure during industry transformation. The majority of respondents were employed by businesses with between 6 and 8 million baht in assets. 1 to 10% of production costs were attributable to imports of raw materials, and 1 to 10% of total product sales were exported. The study revealed that the current performance of the companies was substantially inferior to their 5-year average performance. It is essential to note that the summary provided is a condensed version that may not contain all the details and nuances of the original study.

Table 1: Importance of Factors in Organizational Management Strategy 4.0

Factors in corporate management strategy 4.0	$\bar{x}$	**S.D .**
Technology	3.51	.810
Economical (resources capital labor)	3.75	.622
Quality	3.62	.842
Timely completion	3.57	.685
Job satisfaction	3.72	.842
Planning	3.60	.952
Management	3.37	.425
Command	3.62	.851
Coordination	3.59	.364
Control	3.43	.585
Overall	**3.58**	**.582**

The study examined various key factors related to the management strategies of small and medium-sized electronic component

manufacturers in the era of Industry 4.0. These factors were assessed in terms of their importance and relevance. The following factors were identified and ranked based on their significance:

1. Technology: The adoption and integration of advanced technologies, such as automation, artificial intelligence, and digitalization, to enhance production processes and improve overall efficiency.
2. Economical (resources, capital, labor): Efficient utilization of resources, including optimizing the allocation of financial resources, manpower, and materials to minimize costs and maximize productivity.
3. Quality: Ensuring the production of high-quality electronic components that meet industry standards and customer expectations, with a focus on consistency and reliability.
4. Timely completion (time): Meeting project deadlines and ensuring timely delivery of products, which is crucial for customer satisfaction and maintaining a competitive edge in the market.
5. Job satisfaction: Creating a positive work environment that promotes employee satisfaction, motivation, and engagement, leading to increased productivity and performance.
6. Planning: Developing comprehensive and well-structured plans and strategies to guide the organization's operations, resource allocation, and decision-making processes.
7. Organization management: Establishing effective organizational structures, roles, and responsibilities to ensure smooth coordination and communication within the company.
8. Command: Strong leadership and effective managerial oversight to provide clear directions, decision-making authority, and guidance to employees at all levels.
9. Coordination: Facilitating seamless collaboration and coordination among different departments and teams to optimize workflows, reduce redundancies, and enhance overall efficiency.
10. Control: Implementing robust control mechanisms and performance monitoring systems to ensure adherence to established standards, identify areas for improvement, and maintain accountability throughout the organization.

The analysis of the importance of factors in the organizational management strategy 4.0 revealed the following results. Overall, the management strategy factor for the organization 4.0 was found to have a high average level of importance (mean = 3.58) when considering each aspect. The mean scores indicated that job satisfaction was considered the most important aspect (mean = 3.72), followed by economical use of resources (capital and labor) (mean = 3.75), quality (mean = 3.62), commanding (mean = 3.62), planning (mean = 3.60), coordination (mean = 3.59), timely completion (mean = 3.57), technology (mean = 3.51), control (mean = 3.43), and organizational management (mean = 3.37). The importance of each factor in the

organizational management strategy 4.0 can be summarized as follows:

Job Satisfaction: This was extremely important, showing that organizational management approach prioritizes employee satisfaction. 4.0. Economical (Resources, Capital, Labor): The management approach relied on efficient utilization of capital and labor. 4.0. Quality: Organizational management approach prioritized product and service quality. 4.0. Commanding: The management approach stressed organizational leadership and authority. 4.0. Planning: The organizational management approach stressed planning and strategic goal-setting. 4.0. Coordination: Successful management in Industry 4.0 required coordination and cooperation across departments and teams. Timely Completion: The organizational management approach stressed deadlines and on-time project completion. 4.0. Technology: In Industry 4.0, the organization's management approach relied on technology adoption and use. Control: The management model relied on effective controls to monitor and assess organizational performance. 4.0. Management Strategy 4.0 prioritized organizational management, including decision-making, structure, and coordination. The research shows that each aspect in organizational management strategy 4.0 is important.

Corporate management strategy factors 4.0 is easily summarized as follows:

The analysis of organizational management strategy 4.0 revealed a number of elements with a relatively high average level of priority. Notably, significant determinants included job satisfaction, savings (resources, capital, labor), quality, and command. In addition, expeditious planning and coordination, made possible by cutting-edge technologies, played vital roles. Control components and organizational administration had moderate relevance. Results for Each Element of the Organizational Management Strategy: The importance of implementing automation or AI in production was rated as mediocre. The organization emphasized the department-wide implementation of new technology. In addition, a system was in place to assure compliance with safety regulations by apparatus and software. The average level of significance indicated efficient and rapid Wi-Fi accessibility, user-friendly software and hardware development, and a reduction in production time. Savings (Resources, Capital, Labor): The preservation of resources, capital, and labor had a significantly above-average importance. The organization utilized specialized equipment to detect production process waste and had a competent staff. They concentrated on lowering the costs and prices associated with the importation of basic materials. It was evident that machinery, structures, and personnel were utilized efficiently. The average rating

indicated the company's efficiency in utilizing production components. The organization implemented a systematic and dependable inspection system for electronic component quality. They manufactured components that met predetermined requirements and obtained certification from auditing and certification agencies. The production procedures and standards conform to industry standards. As per external quality assurance requirements, the company conducted quality inspections before, during, and after sales. Planning: The organization's ability to plan product output based on capacity and labor endurance was deemed to be of middling importance. They met customer requirements and adhered to delivery schedules. Before and after sales, the company effectively implemented customer management strategies. The methods of production were effective and neither redundant nor time-consuming. Components were finished on schedule. Priorities typically included acquiring inputs in accordance with the production schedule and meeting consumer demands. Job Satisfaction: The most important factor was a willingness to adhere to the system and production process, thereby minimizing waste and ensuring product quality. In addition to learning new skills and methods of work, working proficiently in the manufacturing process, enhancing one's efficacy, and accepting challenges and participation opportunities were also essential. The importance placed on clearly defined objectives, goals, and operational techniques was average. The organization had systems in place for communicating work schedules in advance and provided operational planning with defined rules and guidelines. A well-defined work duration and operational control plan were implemented.Leadership in Organizations: The importance of leadership was rated as average. The organization provided training to improve the skills, knowledge, and job abilities of its employees. There were clearly defined roles and responsibilities, as well as a distinct management or organizational structure. Individuals were assigned tasks based on their aptitude, knowledge, and abilities. Status, duties, and responsibilities were used to segregate work groups, thereby defining employees' employment characteristics. The appropriate application of authority by administrators in allocating tasks and administering positions was deemed crucial. Each department operated under a structure of delegated authority, allowing supervisors to carry out their responsibilities toward subordinates. According to the management structure, command lines were clearly defined, enabling commanders to address emergent concerns.

CONCLUSION

Several main findings emerged from a study of small and medium-sized electronic component manufacturers in the era of Industry 4.0. The majority of business owners in the study employed 51 to 100 people

and had assets worth between 6 and 8 million baht. Exports accounted for between 1 and 10 percent of production costs and total product sales. Intriguingly, the study discovered that the current performance of these companies was lower than their five-year average. This decline can be ascribed to the need for adaptability in regulating an external environment that is constantly changing. To address the challenges presented by Industry 4.0, these businesses' operators must implement effective management strategies. These strategies involve the creation of exhaustive action plans that incorporate a variety of factors, including job titles, responsibilities, workforce allocation, organizational structure, and authority to make decisions. Executives at all levels must possess the analytical skills necessary to make informed decisions, and departmental and individual coordination must be efficient. These strategies seek to maximize the use of resources, such as basic materials, machinery, production processes, and expenditures. The research by Siriwan Sereerat and associates demonstrates the significance of these strategies for effective functioning.In analyzing the constitution of small and medium-sized business management strategies for manufacturers of electronic components in the era of Industry 4.0, the study identified five significant components. The researcher discussed the following findings for each component: This component includes eight subcomponents: job descriptions and responsibilities, organizational structure, work allocation based on position and responsibility, employee placement according to knowledge and competence, employee satisfaction with challenging work, employee preparedness for development, timely implementation of customer management plans, and quality assurance from external standards organizations. Establishing distinct job titles, responsibilities, and an appropriate organizational structure can increase work efficiency and success probability. The research conducted by Chirumalla et al. (2018) on the development of technological universities in the context of Industry 4.0 supports these findings. Budget-Friendly Planning: This component consists of four subcomponents: explicit establishment of work time periods, unambiguous operating rules, development of highly productive software and hardware, and operation planning supervision. It is essential to design comprehensive action plans that encompass all procedures and provide direction for future developments. This planning should be guided by foresight and novel management techniques. In the context of Industry 4.0, Krings et al. (2021) research on human resource competency development for Thailand 4.0 operations emphasizes the significance of demographic characteristics and employee productivity. This component entails incorporating advanced technologies within the organization, such as Internet access using office applications, digital technology integration,

eco-friendly industrial machinery, and robotics. Developing employees who are well-versed in the implementation of sophisticated technologies can have a positive effect on employee performance. This finding is consistent with the research on long-term management planning conducted by Sedalo et al. (2022) In the era of Industry 4.0, the significance of effective management strategies for small and medium-sized manufacturers of electronic components is emphasized. These strategies include organizational quality management, cost-effective planning, and technological integration, among others. Implementing these strategies can increase work efficiency, facilitate adaptation to changing environments, and promote industry success.

REFFERECE

Adeyinka-Ojo, S. F., Khoo-Lattimore, C., & Nair, V. (2014). A Framework for Rural Tourism Destination Management and Marketing Organisations. Procedia - Social and Behavioral Sciences, 144, 151-163. https://doi.org/10.1016/j.sbspro.2014.07.284

Ammar, M., Haleem, A., Javaid, M., Bahl, S., & Verma, A. S. (2022). Implementing Industry 4.0 technologies in self-healing materials and digitally managing the quality of manufacturing. Materials Today: Proceedings, 52, 2285-2294. https://doi.org/10.1016/j.matpr.2021.09.248

Dwivedi, Y. K., Ismagilova, E., Hughes, D. L., Carlson, J., Filieri, R., Jacobson, J., Jain, V., Karjaluoto, H., Kefi, H., Krishen, A. S., Kumar, V., Rahman, M. M., Raman, R., Rauschnabel, P. A., Rowley, J., Salo, J., Tran, G. A., & Wang, Y. (2021). Setting the future of digital and social media marketing research: Perspectives and research propositions. International Journal of Information Management, 59. https://doi.org/10.1016/j.ijinfomgt.2020.102168

Eksangsri, T., & Jaiwang, T. (2014). Feasibility Study on Reuse of Washed Water in Electronic Industry: Case Study for Flexible Printed Circuit Board Manufacturing in Thailand. Procedia Environmental Sciences, 20, 206-214. https://doi.org/10.1016/j.proenv.2014.03.027

Hagen, D., Risselada, A., Spierings, B., Weltevreden, J. W. J., & Atzema, O. (2022). Digital marketing activities by Dutch place management partnerships: A resource-based view. Cities, 123. https://doi.org/10.1016/j.cities.2021.103548

Killian, G., & McManus, K. (2015). A marketing communications approach for the digital era: Managerial guidelines for social media integration. Business Horizons, 58(5), 539-549. https://doi.org/10.1016/j.bushor.2015.05.006

Kim, K. H. (2021). Digital and social media marketing in global business environment. Journal of Business Research, 131, 627-629. https://doi.org/10.1016/j.jbusres.2021.02.052

Krings, W., Palmer, R., & Inversini, A. (2021). Industrial marketing management digital media optimization for B2B marketing. Industrial Marketing Management, 93, 174-186. https://doi.org/10.1016/j.indmarman.2021.01.002

Lu, H.-P., & Weng, C.-I. (2018). Smart manufacturing technology, market maturity analysis and technology roadmap in the computer and electronic product manufacturing industry. Technological Forecasting and Social Change, 133, 85-94. https://doi.org/10.1016/j.techfore.2018.03.005

Ma, K. (2023). Digital inclusive finance and corporate green technology innovation. Finance Research Letters. https://doi.org/10.1016/j.frl.2023.104015

Nafees, L., Cook, C. M., Nikolov, A. N., & Stoddard, J. E. (2021). Can social media influencer (SMI) power influence consumer brand attitudes? The mediating role of perceived SMI credibility. Digital Business, 1(2). https://doi.org/10.1016/j.digbus.2021.100008

Olson, E. M., Olson, K. M., Czaplewski, A. J., & Key, T. M. (2021). Business strategy and the management of digital marketing. Business Horizons, 64(2), 285-293. https://doi.org/10.1016/j.bushor.2020.12.004

Sedalo, G., Boateng, H., & Kosiba, J. P. (2022). Exploring social media affordance in relationship marketing practices in SMEs. Digital Business, 2(1). https://doi.org/10.1016/j.digbus.2021.100017

Stephen, A. T. (2016). The role of digital and social media marketing in consumer behavior. Current Opinion in Psychology, 10, 17-21. https://doi.org/10.1016/j.copsyc.2015.10.016

Tiago, M. T. P. M. B., & Veríssimo, J. M. C. (2014). Digital marketing and social media: Why bother? Business Horizons, 57(6), 703-708. https://doi.org/10.1016/j.bushor.2014.07.002