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Digital leadership of entrepreneurs and productivity in the health and beauty supplement manufacturing industry

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ABSTRACT
This study aims to (1) examine the digital leadership of entrepreneurs in the health supplement, wellness, and beauty manufacturing industry; (2) analyze the productivity of these businesses; and (3) investigate the relationship between digital leadership and productivity. A mixed-methods approach integrating both quantitative and qualitative methodologies was employed. The research instruments included structured questionnaires and interviews. The quantitative sample consisted of 400 business owners, determined using Taro Yamane's formula with a 0.05 margin of error, and selected through accidental sampling. Descriptive statistics such as percentages, means, and standard deviations were used to analyze the quantitative data, along with inferential statistical techniques, including correlation analysis. The qualitative data collected from interviews were analyzed using content analysis. The findings revealed that digital leadership was rated at a high level, with digital vision scoring the highest, followed by innovation creation, technology utilization, and change management. Productivity was also rated at a high level, with resource utilization and product quality receiving the highest scores, followed by operational efficiency and product output. A statistically significant positive correlation was found between digital leadership and productivity ($p < 0.01$). Among digital leadership dimensions, change management exhibited the strongest correlation with productivity, followed by technology utilization and digital vision. Additionally, the study highlights the effectiveness of the research instruments, ensuring validity and reliability. The findings offer helpful advice for entrepreneurs in the OEM health and beauty sector, emphasizing the critical role of change management and technology adoption in enhancing productivity.

Origin and significance of the issue

The Original Equipment Manufacturer (OEM) sector, particularly in the production of dietary supplements, health, and beauty products, faces significant challenges in adopting digital transformation while simultaneously maintaining operational efficiency and complying with stringent regulatory standards (Dongjie, Z., Wongkumchai, T., & Worapongpat, N., 2024). The adoption of digital technologies in manufacturing is no longer merely an option but a crucial necessity, as it directly influences business

sustainability, cost efficiency, and innovation capacity (Liu, H., Niyomsilp, E., & Worapongpat, N., 2020; Wei, Y., Worapongpat, N., & Prompanyo, M., 2020).

Recent studies indicate that digital leadership is a key enabler of organizational agility and productivity; however, its impact on OEM businesses specializing in health and beauty supplements remains underexplored. Malik et al. (2025). According to a report from Thailand's Office of Industrial Economics, the nutraceuticals and beauty supplement industry has experienced rapid growth, with an annual increase of 12-15%, driven by shifting consumer preferences toward personalized health and wellness products. Worapongpat, N. (2023a). However, despite this expansion, many OEM businesses struggle with digital adoption, leading to inefficiencies in production processes and supply chain management. Jianyu, Z., Wongkumchai, T., & Worapongpat, N. (2024a). This highlights a critical research gap regarding how entrepreneurs' digital leadership strategies influence the productivity of OEM firms in this sector. Tao, Q., Wongkumchai, T., & Worapongpat, N. (2024b).

Given the increasing demands for digital integration in business operations, this study examines the role of digital leadership in OEM businesses specializing in health and beauty supplements. Yicheng, W., Worapongpat, N., & Wongkumchai, T. (2024). The research focuses on entrepreneurs' leadership styles, digital competencies, and strategic decision-making in driving digital transformation. Gongjing, Worapongpat.N, Wongkumchai.T. (2024). This is particularly relevant to the Thai OEM industry, where small and medium-sized enterprises (SMEs) account for over 80% of supplement manufacturers Previous research on digital leadership has largely centered on large corporations and multinational enterprises Worapongpat. N, Phakamach. P. (2024). leaving a knowledge gap in understanding how SME entrepreneurs leverage digital strategies to enhance productivity and innovation. (Park et al., 2023).

Furthermore, this research aims to identify specific challenges faced by OEM manufacturers, including barriers to digital adoption, resource constraints, and workforce adaptation to digital technologies. The researcher's extensive experience collaborating with OEM manufacturers in Thailand provides valuable industry-specific insights into the digital transformation challenges unique to this sector.

Objectives

1.To assess the level of digital leadership among entrepreneurs and its impact on the productivity of comprehensive OEM businesses in the dietary supplement, health, and beauty product industry.

2.To evaluate the level of productivity in comprehensive OEM businesses within the dietary supplement, health, and beauty product industry.

3.To analyze the relationship between digital leadership among entrepreneurs and the productivity of comprehensive OEM businesses in the dietary supplement, health, and beauty product industry.

Literature review

Digital leadership and productivity in OEM businesses

1. Digital Leadership: Concepts and Theoretical Frameworks Digital leadership is not just about the implementation of technology; it encompasses creating a culture that fosters adaptability, continuous learning, and effective collaboration. Digital leadership involves guiding organizations through the digital transformation process, ensuring that employees possess the necessary digital skills, and fostering an environment that supports innovation. Worapongpat, N., Purisuttamo, P., Phrakhruudombodhivides (Narong Uttamavangso Sendaranath), Arunyakanon, P., & Dookarn, S. (2024).

Sophon, T., & Worapongpat, N. (2025). Several theoretical frameworks support the study of digital leadership, including:Transformational Leadership Theory: Emphasizes the role of leaders in inspiring and motivating employees to exceed expectations and embrace change. Worapongpat, N., Chaiwiwat, U., Thavisin, N.., & Sun, Q. (2025). Strategic Leadership Theory: Focuses on how leaders align digital strategies with organizational goals to enhance long-term sustainability. Yasuttamathada , N., &

Worapongpat, N. (2025). Distributed Leadership Theory: Suggests that leadership is not confined to individuals at the top but is shared across multiple levels of an organization. Worapongpat, N., Thavisin, N., & Viphoouparakhot, B. (2024).

Measuring digital leadership effectiveness can be done using tools such as self-assessment, subordinate assessment, and peer evaluations, which help identify the leadership style and its influence on the organization's digital transformation efforts. Worapongpat, N. (2023b).

2. Productivity in Original Equipment Manufacturer (OEM) Businesses In the context of OEM businesses, productivity is a multidimensional concept that goes beyond just the quantity of production. Chen, Y., Worapongpat, N., & Wongkumchai, T. (2024c). It includes product quality, speed of production, and flexibility in meeting consumer demand. Key productivity indicators for OEM businesses may include: Machine Utilization Rate: Measures the efficiency of machinery in the production process. Defect Rate: Indicates the quality of products produced. Lead Time: Reflects the speed at which products are manufactured and delivered. Jinlei.W, Worapongpat, N, Wongkumchai.T. (2024). Productivity enhancement in OEM businesses can be achieved through several techniques, including:Lean Management: Focuses on minimizing waste and improving operational efficiency. Automation: Implements automated systems to streamline production processes. Data Analytics: Utilizes data-driven insights to optimize operations and make informed decisions. Wang, J., Worapongpat, N., & Wongkumchai, T. (2024).

3. The Relationship Between Digital Leadership and Productivity Digital leadership can directly and indirectly influence productivity by encouraging technology adoption, developing employee capabilities, and fostering a culture that promotes efficient work practices. Worapongpat, N. (2024c) Leaders who adopt digital strategies help to streamline processes, improve decision-making, and create an environment where innovation thrives. Worapongpat, N., & Khamcharoen, N. (2024).

Although empirical research exploring the relationship between digital leadership and productivity in OEM businesses is still limited, the potential impact is substantial. Worapongpat, N., Yotkham, E., Limlertrit, T., & Srichan, P. (2024). Future research could explore how digital leadership strategies affect various aspects of productivity, including operational efficiency and employee engagement. Several factors may influence this relationship, such as: Organizational Size: Larger organizations may have more resources to invest in digital leadership. Product Type: Different product lines may require different levels of technological integration. Market Characteristics: The external environment, such as customer expectations and competition, may also shape the effectiveness of digital leadership in enhancing productivity.

4. Digital Transformation in the Food Supplement, Health, and Beauty Industries In the food supplement, health, and beauty sectors, digital transformation is facilitated by advanced technologies such as biotechnology, information technology, and advanced manufacturing technologies. These technologies are vital for improving product development, enhancing operational efficiency, and offering personalized customer experiences. Personalized Production: Tailoring products to individual consumer needs using data and innovative manufacturing techniques Data-Driven Decision Making: Utilizing big data to guide production, marketing, and customer service strategies. Customer Experience: Creating seamless and engaging experiences for customers through digital platforms and online services.

OEM businesses in this sector face several challenges in digital transformation, such as:Data Security: Ensuring the protection of sensitive customer and operational data. Worapongpat, N., & Bhasabutr, P. (2024). Regulatory Compliance: Adhering to industry standards and government regulations related to manufacturing and product safety. Skills Development: Equipping employees with the necessary digital skills to leverage new technologies. Worapongpat, N., & Somchob, P. (2024).

Additional Suggestions, to provide a more comprehensive literature review, it is recommended to include both domestic and international research to gain a well-rounded perspective on the topic. A systematic and logical analysis of the literature is essential to ensure the reliability and relevance of the findings. Furthermore, the presentation of the literature should be clear and concise, ensuring that readers

can easily understand the key issues surrounding digital leadership and productivity in the OEM sector.

Conceptual framework

This research framework integrates the key concepts of digital leadership and productivity, exploring the relationship between the two within the context of OEM businesses, particularly in the dietary supplements, health, and beauty products sector. The framework is structured around the independent variable (entrepreneur's digital leadership) and the dependent variable (productivity), which includes output, resource utilization, efficiency, and quality of output.

1. Related Variables

1.1 Digital Leadership

Digital leadership refers to the ability of entrepreneurs to strategically lead organizations through digital transformation by leveraging technology to enhance operational performance and innovation. It consists of several sub-variables: Digital Vision: The entrepreneur’s ability to foresee and plan the long-term integration of digital technologies in the organization.

Innovation: The capacity of the entrepreneur to foster creative thinking and innovation through the adoption and application of digital technologies.

Technology Integration: The ability to embed digital technologies into the organization's work processes to improve efficiency, collaboration, and overall performance.

Change Management: The entrepreneur’s competency in managing and driving digital transformation within the organization, promoting adaptability among employees, and ensuring smooth transitions to new technologies.

1.2 Productivity

Productivity in OEM businesses is defined not only by the quantity of output but also by the efficient use of resources and the ability to meet quality standards. Productivity indicators include:

Output: The results derived from the production processes, such as the number of units or services produced. Resource Utilization: How effectively the organization utilizes its resources (e.g., labor, machinery, materials) to achieve maximum output.

Efficiency: The ability to maximize output with minimal input, ensuring time and resources are utilized optimally.

Quality of Output: The degree to which the produced goods or services meet predefined quality standards, ensuring customer satisfaction and compliance with industry regulations.

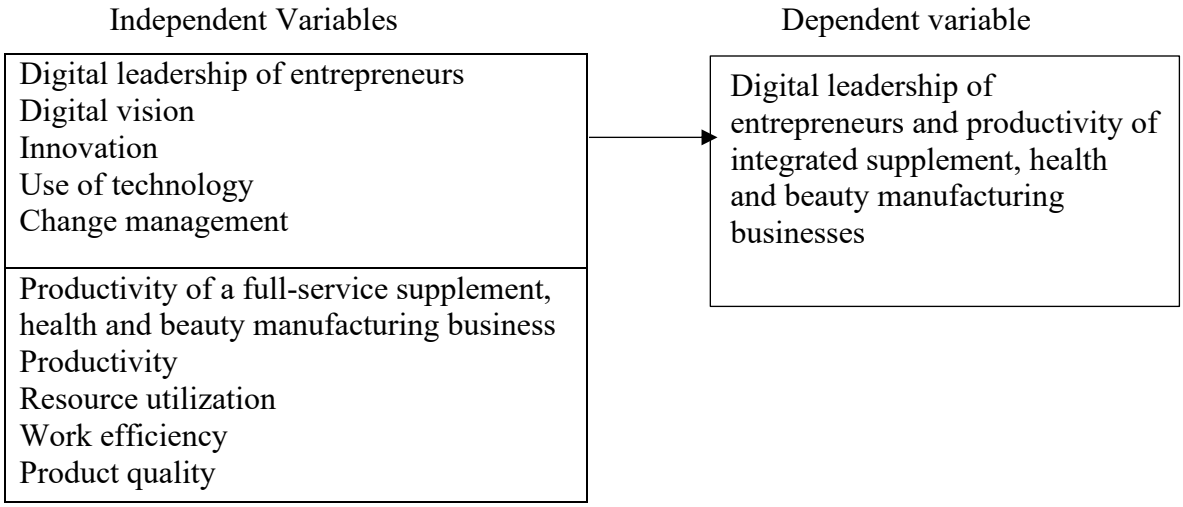

Figure 1. Conceptual framework

Methods

1. Population and sample group

1.1 Population and sample group for quantitative data

The target population for this research consists of employees working in the comprehensive manufacturing businesses of dietary supplements and cosmetics in the Samut Sakhon local administrative area, Samut Sakhon Province. Since the population size cannot be determined, the sample size was calculated using Cochran's (1977) formula for cases with an unknown population size. The calculation was based on the following parameters: Confidence level: 95%

Margin of error: 5% Proportion of the characteristic of interest in the population: 0.5 The required sample size, based on the calculation, is 385. To account for potential errors in questionnaire collection, the researcher decided to increase the sample size to 400. A purposive sampling technique was employed, and data collection was conducted over a 5-month period, from January 1, 2024, to May 30, 2024.

1.2 Target Group for Qualitative Data Experts (Connoisseurship): 3 experts specializing in digital leadership and productivity in the manufacturing sector. Entrepreneurs: 30 members of the Samut Sakhon Entrepreneurs Association, particularly the board members operating in the food industry (as reported in the 2023 labor situation report of Samut Sakhon Province and the Samut Sakhon local administrative area).

2. Research Instruments

The research will utilize the following tools for data collection:

2.1 Interviews

In-depth interviews with experts and key industry players will gather qualitative insights into digital leadership and productivity in the manufacturing sector. These interviews will be semi-structured, allowing flexibility for participants to express their perspectives.

2.2 Questionnaires

The main quantitative data collection tool will be a questionnaire, divided into the following parts:

Part 1: Basic Information

This section collects demographic details about respondents (executives, employees, or other stakeholders), such as gender, age, Highest level of education, Business size Work experience

The data will be collected using checklists and fill-in-the-blank fields.

Part 2: Digital Leadership and Productivity Assessment

This section uses a 5-point Likert scale to assess the level of digital leadership among business

operators and the productivity of manufacturing businesses in the dietary supplement, health, and cosmetics industries. It includes questions about digital vision, innovation, technology integration, change management, and how these factors influence Output Resource Utilization Efficiency Quality of Output

Part 3: Comments and Additional Suggestions

This section allows respondents to provide open-ended feedback, offering qualitative insights into challenges, opportunities, and suggestions for improvement.

3. Quality of Research Instruments

3.1 Improvement of the Questionnaire

The questionnaire was presented to the research advisor for initial feedback. Based on the feedback, the questionnaire was revised for accuracy and comprehensiveness.

3.2 Content Validation

The revised questionnaire was evaluated for content validity by 3 experts using the Index of Item-Objective Congruence (IOC) method. The IOC value ranged from 0.80 to 1.00, indicating a high level of content validity.

3.3 Pilot Testing

The questionnaire was pilot-tested with 30 non-sample respondents. The results showed that the discriminative power of the questionnaire items ranged from 0.25 to 0.75. The reliability coefficient, assessed using Cronbach's alpha, was found to be 0.95, indicating excellent internal consistency.

3.4 Additional Suggestions and Refinements

An open-ended question format was included to capture problems, obstacles, and additional suggestions. This process followed four key stages: Reviewing relevant documents and research to inform the development of the questionnaire.

Defining variables and creating questionnaire items, followed by presenting a draft to the project advisor for refinement.

Presenting the revised questionnaire to 3 experts for content validity evaluation. The IOC values for this stage ranged from 0.67 to 1.00.

Revising the questionnaire based on expert feedback, followed by final approval and pilot testing. The final reliability coefficient was 0.98.

4. Data Analysis

Data analysis will be conducted using SPSS (Statistical Package for the Social Sciences) software. The following methods will be employed:

4.1 Descriptive Statistics

For Part 1 (demographic data), descriptive statistics such as percentages, frequency distribution, means, and standard deviations will be used to summarize the data. These will be presented in tabular form.

4.2 Digital Leadership and Productivity Analysis

For Parts 2 and 3 (digital leadership and productivity levels), the mean scores and standard deviations will be calculated for each aspect and item, with a 5-level interpretation scale to assess the level of digital leadership and productivity.

4.3 Hypothesis Testing

To test the hypothesis about the impact of digital leadership on productivity, the researcher will perform

Pearson's Product-Moment Correlation Coefficient to examine the strength and direction of the relationship between the variables.

Multiple Regression Analysis (Enter Method) to explore how digital leadership factors (e.g., innovation, technology integration) predict productivity outcomes (e.g., output, efficiency).

5. Statistical Methods Used in Data Analysis

Quality Check for Tools: The Index of Item-Objective Congruence (IOC) and Cronbach's Alpha will be used to ensure the reliability and validity of the research instruments.

Descriptive Data Analysis: Frequency distribution, percentages, means, and standard deviations will be employed to summarize and describe the demographic data and the levels of digital leadership and productivity.

Hypothesis Testing: Pearson's Product-Moment Correlation Coefficient and Multiple Regression Analysis (Enter Method) will be used to test the research hypotheses and analyze the impact of digital leadership on productivity.

Results

1. Level of situational leadership of entrepreneurs from the perspective of employees. This section presents the findings from the survey on the level of situational leadership as perceived by employees in the comprehensive health, beauty, and supplement manufacturing business.

Table 1: Number and percentage of general information of respondents

Variable	Number (persons)	Percentage (%)
1) Gender		
(1) Male	108	27.00
(2) Female	292	73.00
Total	400	100.00
2) Education Level		
(1) Bachelor's Degree	251	62.75
(2) Higher than Bachelor's Degree	149	37.25
Total	400	100.00
3) Work Experience		
(1) Less than 5 years	104	26.00
(2) 5-10 years	125	31.25
(3) More than 10 years	171	42.75
Total	400	100.00
4) OEM Business Size		
(1) Small	58	14.50
(2) Medium	154	38.50
(3) Large	60	15.00
(4) Extra Large	128	32.00
Total	400	100.00

Interpretation of Results from Table 1 Gender: The majority of respondents were female (73.00%), with male respondents making up 27.00% of the sample. Education Level: A significant portion of employees (62.75%) held a bachelor's degree, while 37.25% had higher educational qualifications, reflecting a highly educated workforce. Work Experience: Employees with more than 10 years of work experience represented the largest group (42.75%), suggesting a strong presence of experienced employees in the industry. The next largest group was those with 5-10 years of experience (31.25%), and 26.00% of employees had less than 5 years of experience. OEM Business Size: The most prominent category in terms

of business size was medium-sized businesses (38.50%), followed by extra-large businesses (32.00%). Smaller businesses were less common, with 15.00% working in large businesses and 14.50% in small businesses.

This general demographic data reveals the composition of the respondents and sets the stage for further analysis of the leadership styles and their relationship to business productivity. The distribution across business sizes and work experience levels will be particularly useful in examining the variances in leadership perspectives.

Section 2: Digital Leadership of Entrepreneurs in the Supplement, Health, and Beauty Product Manufacturing Business. The results indicate that the overall digital leadership of entrepreneurs in the supplement, health, and beauty manufacturing business is rated highly across all categories, with the "Digital Vision" receiving the highest score. The following table summarizes the analysis of digital leadership across various subcategories.

Table 2 Analysis of the Digital Leadership of Entrepreneurs in the Supplement, Health, and Beauty Product Manufacturing Business by Overall Category and Subcategory

Item	Mean	S.D.	Interpretation	Rank
Digital Vision	4.19	0.51	High	1
Innovation Creation	4.17	0.54	High	2
Technology Utilization	4.09	0.57	High	3
Change Management	4.06	0.58	High	4
Overall	4.00	0.50	High	-

Interpretation of Results: Digital Vision (Rank 1): The highest-rated aspect of digital leadership was "Digital Vision," with a mean score of 4.19, indicating a strong focus on aligning business strategies with digital innovations and future trends. Innovation Creation (Rank 2): The second highest score was for "Innovation Creation" (4.17), which emphasizes the entrepreneurial ability to foster and implement new ideas and solutions, further enhancing the business's competitive advantage. Technology Utilization (Rank 3): Technology Utilization scored 4.09, highlighting a solid emphasis on leveraging technology to improve operational efficiency, product development, and customer experience. Change Management (Rank 4): While still rated highly (4.06), "Change Management" was ranked slightly lower. This result suggests that while the entrepreneurs are skilled at adapting to digital shifts, there may be opportunities to improve further in managing the organizational and cultural changes that accompany digital transformations. Overall Digital Leadership: The overall score of 4.00 reflects a high level of digital leadership across the board, signaling that the business operators are effectively integrating digital strategies to enhance business operations.

Table 3: Analysis of the Efficiency of the Business by Overall Category and Subcategory

Item	Mean ($\bar{x}$)	SD	Interpretation	Rank
Output	4.00	0.58	High	1
Resource utilization	4.09	0.60	High	2
Work efficiency	4.07	0.65	High	3
Product quality	4.09	0.70	High	4
Overall	4.00	0.00	High	-

The following table presents the analysis of the efficiency of the business across various categories. The results indicate that the efficiency of the supplement, health, and beauty product manufacturing

company is highly rated across all categories. Interpretation of Results: Output (Rank 1): "Output" received the highest score (4.00), indicating that the business's ability to produce goods efficiently is highly regarded. This result suggests the company has well-established processes to maintain a steady and high output rate. Resource Utilization (Rank 2): With a score of 4.09, "Resource Utilization" emphasizes how well the business uses its available resources, such as raw materials, labor, and capital. The high score suggests that the business operates efficiently and effectively maximizes its available resources. Work Efficiency (Rank 3): "Work Efficiency" scored 4.07, reflecting how effectively employees carry out their tasks. This high rating indicates that work processes are streamlined and employees are well-managed to ensure high productivity levels. Product Quality (Rank 4): "Product Quality" scored 4.09, emphasizing the importance of maintaining high standards in the products offered. High-quality products are crucial for customer satisfaction and brand loyalty. Overall Efficiency: The overall score of 4.00 shows that the efficiency of the business, including output, resource utilization, work efficiency, and product quality, is rated highly across all categories.

Table 4: Analysis of the correlation coefficients between digital leadership and productivity in the supplement, health, and beauty product manufacturing business

Digital Leadership of Entrepreneurs	Output	Resource Utilization	Work Efficiency	Product Quality	Ytot
Digital Vision	0.712**	0.652**	0.793**	0.899**	0.719**
Innovation Creation	0.706**	0.642**	0.788**	0.871**	0.711**
Technology Utilization	0.816**	0.710**	0.834**	0.913**	0.748**
Change Management	0.918**	0.697**	0.819**	0.892**	0.706**

Note: Significant at the 0.01 level

This table shows the correlation between different aspects of digital leadership (digital vision, innovation creation, technology utilization, and change management) and various measures of productivity, including output, resource utilization, work efficiency, and product quality. The results are statistically significant at the 0.01 level.

Table 5 Summary of Xtot values

Digital leadership	Xtot
Digital vision	0.764
Innovation creation	0.752
Technology utilization	0.818
Change management	0.832

Summary and Interpretation of Results: Strong Positive Correlations: The results show a statistically significant positive correlation between all aspects of digital leadership (digital vision, innovation creation, technology utilization, and change management) and productivity measures in the supplement, health, and beauty product manufacturing business. This means that improvements in digital leadership are linked to improvements in business productivity. Change Management and Productivity: The highest correlation is observed between change management and all measures of productivity, indicating that effective leadership in managing change is crucial for improving various productivity factors such as output, resource utilization, work efficiency, and product quality. Technology Utilization and Innovation: Technology

utilization and innovation creation also have strong positive correlations with productivity, emphasizing the role of technological integration and innovation in driving business efficiency. Digital Vision: Digital Vision, while still strongly correlated, shows slightly lower correlations compared to Change Management and Technology Utilization. However, it remains essential as it helps set the direction for digital transformation and innovation within the business.

Results from Research Objective 1: The Relationship Between Digital Vision and Productivity The analysis of the relationship between Digital Vision and productivity revealed a strong correlation (Xtot = 0.764). This finding suggests that a clear digital vision significantly influences productivity in the health supplement, wellness, and beauty manufacturing sectors. A well-articulated digital vision provides businesses with a clear direction and a roadmap for adopting effective digital strategies, which in turn enhances work efficiency and resource utilization. This result may be attributed to the fact that organizations with a defined digital vision are better positioned to anticipate market trends, allocate resources effectively, and align their operational goals with digital transformation objectives. Previous research on digital leadership (Worapongpat, N., 2021) confirms this. A strong digital vision helps drive long-term strategic alignment, which is essential for maintaining competitive advantage in fast-evolving industries.

The results from the second research objective, which focused on the role of Innovation Creation in enhancing productivity, are presented below. The second objective examined the role of innovation creation in boosting productivity, with an Xtot value of 0.752. This value highlights the importance of continuous innovation in maintaining high levels of productivity. Innovation creation facilitates the development of new products, processes, and business models, which is critical for staying competitive in the rapidly evolving health and beauty manufacturing market. This result may be explained by the fact that businesses that prioritize innovation are more likely to optimize their processes, enhance product quality, and improve efficiency. Worapongpat, N. & Rungnapa, A. (2023) emphasize that innovation drives organizational growth and operational excellence, particularly in industries where differentiation and product development are key success factors. Worapongpat, N. (2023), & Bhasabutr, P. (2024).

Results from Research Objective 3: The Impact of Technology Use on Productivity The analysis of technology use (Xtot = 0.818) showed the strongest correlation with productivity, underscoring the central role technology plays in enhancing operational performance. Companies that effectively integrate technologies such as automation, data analytics, and artificial intelligence into their operations tend to exhibit higher levels of efficiency, better resource management, and superior product quality. This is especially relevant in health supplement, wellness, and beauty manufacturing, where technological advancements are critical for maintaining a competitive edge. The high Xtot value may reflect the growing reliance on digital tools to streamline operations and improve product outcomes. As noted by Worapongpat, N., & Aekaraj, N. (2024). The adoption of digital technologies allows businesses to utilize data for better decision-making and quicker production cycles, as supported by documents from Worapongpat, N., and Narong Uttamavangso/Sendaranath, P. (2024).

Results from Research Objective 4: The Influence of Change Management on Productivity The findings from the analysis of change management (Xtot = 0.832) revealed the highest correlation with productivity, indicating that effective change management practices are vital for fostering productivity in the health and beauty manufacturing industry. Companies that excel in managing change-whether through the integration of new technologies or handling shifts in organizational culture-are better equipped to maintain operational efficiency and adapt to market demands. This result may be attributed to the fact that businesses with strong change management frameworks can execute transitions more smoothly, minimizing disruption and ensuring continuous improvement. Yong Ming. C, Worapongpat, N, and Wongkumchai.T. (2024). The framework on change management points out that there is clear leadership in guiding organizations through transformative processes, which ultimately results in higher productivity.

Body of knowledge

The study has provided several key insights on digital leadership and its impact on productivity in the health supplement, wellness, and beauty manufacturing business, which contribute to the existing body of knowledge. These insights can be visually summarized in a diagram (Figure 2), which illustrates the impact of digital leadership on various productivity indicators in the manufacturing industry.

From the analysis, the following critical aspects emerge:

Enhanced Efficiency: The adoption of digital leadership strategies directly influences operational efficiency. Businesses that embrace digital leadership are able to streamline their processes, optimize resource utilization, and eliminate inefficiencies. By adopting digital tools and systems, companies can reduce time and costs associated with manual processes, leading to higher productivity and profitability.

Innovation and Competitiveness: Digital leadership is a key driver of innovation, enabling businesses to stay competitive in a rapidly evolving market. By fostering a culture of innovation, businesses can develop new products, improve production processes, and respond to market changes more effectively. Innovation allows organizations to meet consumer demands and expectations more quickly, ensuring they remain relevant in the marketplace.

Quality of Output: One of the most important outcomes of adopting digital leadership principles, particularly through the use of advanced technologies, is the enhancement of product quality. By integrating digital solutions like automation, data analytics, and quality control systems, businesses can ensure consistent and high-quality products. Such quality not only improves customer satisfaction but also builds brand reputation and loyalty.

Effective Change Management: The successful management of digital transformation and technological integration is essential for minimizing resistance to change within an organization. Digital leadership helps guide businesses through transitions, ensuring smooth adoption of new technologies and business practices. Strong change management practices reduce disruptions and improve organizational outcomes, enhancing both employee morale and overall productivity.

Diagram Summary: The diagram in Figure 2 visually represents the key relationships between digital leadership and productivity, emphasizing the holistic nature of leadership in the digital age. The adoption of digital technologies, innovation practices, and effective change management leads to.

Suggestions

1. Suggestions for applying research results

Digital Leadership Training: Prioritize comprehensive programs to equip leaders with skills for digital transformation, innovation, and agility, enabling informed decisions for operational efficiency.

Embed Continuous Innovation: Foster a culture of ongoing innovation by adopting new technologies, refining processes, and establishing R&D teams focused on AI, machine learning, and automation for sustained productivity.

Strategic Technology Leverage: Adopt and optimize ERP, cloud computing, and data analytics to streamline processes (supply chain, production, CRM), reduce costs, and improve market responsiveness for enhanced efficiency.

Strong Change Management Culture: Develop a culture that embraces change through clear communication, employee engagement, and support during technology integration to ensure successful adoption and minimize disruption.

Data-Driven Decision Making: Promote the use of data analytics from customer feedback, sales, and operations to optimize resources, improve quality, and enhance agility in meeting market needs.

Enhance Customer Experience via Technology: Apply digital leadership to personalize marketing, optimize e-commerce, and integrate customer service automation (e.g., AI chatbots) to improve satisfaction and service efficiency.

Strategic Technology Partnerships: Collaborate with tech providers for access to advanced tools and

expertise, accelerating digital strategy implementation and staying ahead of industry trends.

2. Suggestions for future research implementation

Continuous monitoring of emerging technologies: Establish systems to track and evaluate the potential impact of new technologies (e.g., Web3, metaverse, advanced robotics) for future innovation.
Develop a Digitally Skilled Workforce: Invest in training programs to enhance the digital competencies of all employees, fostering adaptability and effective contribution to digital initiatives.
Explore Data Monetization and New Digital Business Models: Investigate opportunities to leverage accumulated data for new revenue streams and innovative service offerings, adhering to privacy regulations.
Strengthen Cybersecurity and Data Privacy: Prioritize investments in advanced security and robust data protection policies to safeguard data, build trust, and ensure regulatory compliance.

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