The Influence of Technology Adoption and Employee Productivity on the Operating Efficiency of BYD in Thailand

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ABSTRACT

With rapid advancements in technology, organizations are increasingly integrating digital tools to enhance operational performance. However, the effectiveness of these technological implementations largely depends on employee adaptation and utilization. This research aimed to provide insights into how technology adoption and employee productivity influence the overall operational efficiency, highlighting the need for a balanced approach that integrates technological innovations with strategic human resource management. The objectives of the study were:1) To explore the current state of BYD in Thailand; 2) To examine the impact of technology adoption on the operating efficiency of BYD in Thailand; 3) To examine the impact of employee productivity on the operating efficiency of BYD in Thailand.

A quantitative research method was adopted, utilizing a survey with both demographic questions and Likert scale items to capture the relationships among key variables. A total of 260 questionnaires were collected to ensure statistical reliability. The results: 1) Technology adoption influences of the operating efficiency of BYD in Thailand. 2) Employee's productivity influences of the operating efficiency of BYD in Thailand. The results suggest that while technology adoption contributes to

improved operational performance, its effectiveness depends on employee engagement and adaptation. The interplay between technology adoption and employee productivity directly influences the operating efficiency of BYD in Thailand. While technology enhances operational capabilities, its effectiveness is largely contingent on how well employees adapt and utilize these advancements. Recommendation:1) Enhancing technology integration for greater efficiency; 2) Optimizing employee productivity through workforce development; 3) Strengthening organizational strategies for long-term efficiency gains. By integrating these recommendations, BYD can enhance its competitive advantage, improve productivity, and sustain long-term growth in the global automotive market.

Keywords: technology adoption, employee productivity, operating efficiency

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WANG CHAO

DECLARATION

I, WANG CHAO, hereby declare that this Independent Study entitled “The Influence of Technology Adoption and Employees Productivity on the Operating Efficiency of BYD in Thailand” is an original work and has never been submitted to any academic institution for a degree.

(WANG CHAO)

June 17, 2025

CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 INTRODUCTION

1.1 Background of the Study

Work efficiency, as a key indicator of employee productivity, not only reflects individual labor outcomes but also represents the overall operational effectiveness of a company. In recent years, technology adoption has been regarded as a crucial factor in improving employee productivity and work efficiency (Beaman et al., 2021). Particularly in high-tech enterprises, the effective utilization of technological tools can optimize workflows, enhance the speed of information processing, and thereby boost employees' work efficiency. BYD's production base in Thailand is no exception (Diloktiansak et al., 2024; Janjamraj et al., 2025). While introducing advanced technology, achieving a balance between technology adoption and employee work efficiency has become an urgent issue that requires attention (Chinda, 2024).

With the continuous advancement of globalization, multinational corporations have been expanding their presence worldwide. The automotive industry is undergoing a significant transformation worldwide, with a growing emphasis on electric vehicles (EVs) and advanced technologies. As a result, tax reduction policies may no longer be sufficient to support Thailand's automotive industrial development (Savaget et al., 2019). Instead, it is crucial to focus on innovation and technology to adapt to this changing landscape (Ehsan & Ali, 2019). To maintain its competitive edge in the automotive industry, the Thai government needs to reconsider its investment and industry development policies in light of this transition (Basit et al., 2018). The investment and development of Chinese enterprises in Southeast Asia have become particularly prominent. Thailand, as one of the economic hubs of Southeast Asia, has attracted a large amount of Chinese investment (Cooper & Davis, 2017). The Thai government has also become interested in promoting EV usage and building the EV manufacturing industry in Thailand. In 2015, the government created the national EV roadmap and set a target to create 1.2 million EVs by 2036 (Wang et al., 2021). Hence, the Thailand Board of Investment has provided various incentives (such as tax breaks of up to eight years and zero import duty for EV-related machines) to attract foreign direct investment in the EV industry (Auerbach & Green, 2024; Kuo et al., 2022; Kohpaiboon, 2024). Many automotive companies (e.g., BMW, Mercedes Benz, BYD, FOMM, MG, Nissan, Toyota, Honda) have applied for licenses to obtain investment benefits from the Board of Investments. Regarding the EV charging infrastructure, the

Ministry of Energy and the Electric Vehicle Association of Thailand (EVAT) started a pilot project to install charging stations and provided funding to subsidize the investment in 150 charging outlets for both public organizations and private sectors. Since 2015, the number of charging stations in Thailand has gradually increased to 583 in June, 2020 (Thananusak et al., 2020). According to the Thailand Board of Investment (BOI), China has become the largest source of foreign investment in Thailand, with well-known Chinese companies such as Huawei, ZTE, Great Wall Motors, and BYD establishing branches or production bases in the country. This not only promotes Thailand's economic development but also brings new opportunities and challenges to the local labor market.

BYD, as a key representative of China's automotive industry, has rapidly expanded its business in Thailand. In 2015, BYD officially established a production base in Thailand, becoming an important participant in the local automotive sector (Berkowsky et al., 2017; Jafari & Tehran, 2017). The company's operations in Thailand primarily focus on the production and sales of new energy vehicles (NEVs), including electric buses, electric cars, and related component manufacturing. BYD's investment in Thailand has not only driven the transformation of the local automotive industry but also contributed positively to Thailand's green energy development. BYD's production base in Thailand integrates advanced manufacturing technologies and equipment, ensuring efficient production while emphasizing employee skill training and technological applications. The company aims to enhance productivity through continuous technological upgrades (Azizi et al., 2021). As an innovative enterprise, BYD continuously promotes technological innovation at its Thailand production base. It has introduced cutting-edge technologies such as automated production equipment, data analytics systems, the Internet of Things (IoT), and intelligent robotics to improve production efficiency, reduce human errors, and lower production costs. Additionally, BYD utilizes digital technology for resource management and workflow optimization to enhance overall productivity.

However, technology adoption is not an instantaneous process. Employees' acceptance of and adaptability to new technologies directly impact the effectiveness of technological applications (Fu et al., 2018; Ipsen et al., 2021). BYD's technological adoption in Thailand depends not only on the equipment and technology itself but also on employees' understanding and application capabilities (Ali & Anwar, 2021). Therefore, implementing effective training and support measures to enhance employee productivity through technology adoption has become a critical challenge for BYD.

Furthermore, BYD has meticulously designed its production environment in Thailand to create an efficient and intelligent production system. To improve employee productivity, the company invests in modern production equipment and emphasizes skill enhancement (Wang et al., 2021). Through regular technical training and

workflow optimization, BYD ensures that employees can fully utilize new technologies, thereby improving individual and team productivity. Employee productivity plays a crucial role in BYD's production environment. The introduction of new technologies significantly affects work efficiency and quality (Intarakumnerd, 2021). How to enhance employees' technological adaptability and empower them through technology to improve productivity are key challenges that BYD faces in Thailand. Whether employee productivity can effectively enhance work efficiency will be a decisive factor in determining the company's success in a highly competitive market.

It can be said that BYD's production base holds significant advantages in technology adoption, particularly in the application of innovative technologies in the electric vehicle sector, such as automated production lines and intelligent manufacturing systems (Haddadian et al., 2015). These advancements not only improve production efficiency but also enhance product quality. Since the establishment of its production base in Thailand, BYD has not only contributed to local employment but also introduced advanced technologies and management models (Hung & Ramsden, 2021). However, in the operations of multinational enterprises, effectively improving employee work efficiency amid continuous technological advancements has become a focal point for many business managers and researchers. Additionally, the impact of BYD's technology adoption in Thailand on employee productivity and work efficiency has not yet been fully explored through empirical research.

1.2 Questions of the Study

Research on technology adoption and employee work efficiency has yielded significant findings. Studies on technology adoption primarily focus on how the introduction of new technologies enhances organizational operational efficiency (Chinda, 2024; Lim et al., 2021; Diloktiansak et al., 2024; Janjamraj et al., 2025; Schröder, 2024). In manufacturing enterprises, technology adoption is regarded as a key factor in promoting work efficiency and improving productivity. Relevant studies indicate that technology adoption directly influences employee work efficiency by improving workflow, enhancing information processing capabilities, and reducing human errors (Lai, 2017). Based on this situation, the research questions of this study are as follows:

What is the current state of technology adoption at BYD in Thailand?

What is the impact of technology adoption on the operating efficiency of BYD in Thailand?

What is the impact of employee productivity on the operating efficiency of BYD in Thailand?

1.3 Objectives of the Study

This study aims to explore the relationship between technology adoption and employee productivity and further analyze its impact on employee operating efficiency of BYD's international automotive enterprise in Thailand.

RO1: To explore the current state at BYD in Thailand.

RO2: To examine the impact of technology adoption on the operating efficiency of BYD in Thailand.

RO3: To examine the impact of employee productivity on the operating efficiency of BYD in Thailand.

1.4 Scope of the Study

This study adopted a quantitative research approach and collected data through a questionnaire survey. The survey participants were employees of BYD in Thailand. The data collection and analysis process began with the design of a questionnaire targeting technology adoption, employee productivity, and operating efficiency. The questionnaire was distributed to BYD employees in Thailand using a cluster sampling method, and a total of 260 completed responses were collected to gather direct insights on technology adoption and employee work efficiency.

Data analysis was conducted using SPSS statistical software. Descriptive statistical analysis, correlation analysis, and regression analysis were performed to examine the impact of technology adoption and employee productivity on work efficiency.

1.5 Significance of the Study

Theoretical Significance

This study aims to bridge the gap in existing literature regarding the relationship between technology adoption and employee work efficiency by conducting an in-depth

analysis of the impact of technology adoption on employee productivity and work efficiency. While there is extensive research on technology adoption and employee productivity, most studies focus on specific industries or technological applications. By examining the case of BYD as an international automotive enterprise in Thailand, this study applies Human Capital Theory and Socio-Technical Systems Theory to deepen theoretical understanding of technology adoption and employee productivity across different industries. In particular, the study considers the dynamic relationship between employee productivity and work efficiency within the context of globalization, cross-cultural differences, and technological environments.

Practical Significance

From a practical perspective, this study provides empirical evidence for BYD and other foreign-invested enterprises in Thailand to improve employee work efficiency. While existing studies widely acknowledge the relationship between technology adoption and employee productivity, relatively few have focused on the influence of country- and industry-specific factors. Research on how multinational enterprises adopt technology in different cultural and market environments remains limited. For example, studies on BYD's technology adoption in Thailand are insufficient, with most existing research focusing on the generality of technology adoption and its applications in a globalized context, rather than in-depth analysis of practical operations in specific regions and enterprises. While many studies indicate that technology adoption enhances employee productivity, its specific effects within the automotive industry (particularly in Thailand's manufacturing environment) have not been fully verified. As a result, there is a lack of empirical support for the specific mechanisms and effects of technology adoption in improving BYD employees' productivity. Additionally, the relationship between employee productivity and work efficiency has not been comprehensively explored within BYD's Thai operations. By using a case study approach based on Thailand's market, this research fills gaps in these areas. The findings will help enterprises refine and optimize their technology adoption strategies to enhance employee work efficiency and overall productivity.

1.6 Definition of Key Terms

Technology Adoption

Technology adoption refers to the process by which an enterprise introduces and effectively utilizes new technologies in its operations. This process not only involves the introduction of technology but also includes employee acceptance, utilization, and the integration of technology into existing workflows. Technology adoption is closely related to factors such as technological adaptability, employee training, and system updates. In this study, technology adoption is defined as the process through which BYD implements and integrates advanced manufacturing technologies (such as automation, intelligent production equipment, and digital management systems) at its production base in Thailand.

Employee Productivity

Employee productivity refers to the value created or the amount of work completed by an employee within a given period. It is typically measured by the ratio of work output to input (such as time and labor costs). High productivity means that employees can complete more tasks efficiently within a shorter time frame. In this study, employee productivity is assessed by evaluating work output, production efficiency, and the time required to complete tasks, providing insights into how technology adoption enhances productivity.

Operating Efficiency

Operating efficiency refers to the effectiveness with which employee complete tasks. It's what businesses strive to do: produce a high-quality product at scale with as few resources as possible. In this study, operating efficiency is evaluated based on BYD employees' performance at work, including work speed, task completion quality, and resource consumption.

CHAPTER 2 LITERATURE REVIEW

2.1 Overview of BYD in Thailand

This section provides an overview of BYD's international automotive enterprise in Thailand and its current market position.

BYD (Build Your Dreams) is a leading Chinese manufacturer of new energy vehicles (NEVs) and batteries. Established in 1995, BYD initially specialized in nickel-cadmium and nickel-metal hydride batteries before expanding into lithium battery production. In 2003, BYD acquired Xi'an Qinchuan Automobile and rebranded it as BYD Auto, officially entering the automotive industry. In 2004, BYD showcased its first electric vehicle in China. Over the next two decades, the company consistently innovated in the electric vehicle (EV) sector, with multiple models achieving widespread success in China. By June 2022, BYD's market capitalization reached $129.23 billion, surpassing Volkswagen to become the third-largest international automaker, trailing only Tesla and Toyota (Ma & Ye, 2019). BYD remains the only Chinese automobile company in the global top ten, solidifying its position as an emerging powerhouse in the automotive manufacturing industry.

1. BYD's Business and Products in Thailand

BYD's main business operations in Thailand include the production and sales of electric vehicles, pure electric buses, and related battery products. As a global leader in EV manufacturing, BYD has established an advanced electric vehicle production line in Thailand, covering battery systems, charging stations, and integrated electric bus solutions. With strong support from the Thai government, the demand for electric buses has grown significantly. BYD's electric buses have gained widespread recognition in the Thai market and are already in use in multiple cities (Monjagapate & Smitintu, 2024).

Currently, BYD's right-hand-drive vehicles sold in Thailand are produced at its Changzhou factory in China. On September 8, 2022, BYD signed an agreement with Thailand's WHA Industrial Park, marking the establishment of its first overseas

passenger vehicle factory. The BYD Thailand plant is set to begin operations in mid-2024, producing vehicles for the domestic Thai market while also exporting to ASEAN countries and other regions. This move provides Thai consumers with a broader range of technologically advanced vehicle options.

As a leader in the NEV industry, BYD possesses full industrial chain advantages and core technological expertise, including innovations such as the Blade Battery, e-Platform 3.0, and DM-i Super Hybrid technology (Mahmoudi et al., 2018). BYD is actively conducting test drive events in Thailand, allowing local consumers to experience the appeal of its NEVs firsthand. The company also listens to market feedback to tailor its technology and products to the needs of Thai consumers, ensuring better localization and product adaptation.

2. BYD's Production Facilities and Technology Adoption

BYD's production base in Thailand incorporates advanced intelligent manufacturing facilities and automation technology to enhance product quality and production efficiency. The company has introduced automated production lines and robotic technology, leveraging modern manufacturing techniques to improve speed and precision. Additionally, BYD employs an intelligent manufacturing platform for real-time monitoring and data analysis, optimizing production operations.

In terms of technology adoption, BYD has implemented advanced robotic arms, smart sensors, and artificial intelligence technology in vehicle assembly processes to enhance efficiency and reduce human intervention. These innovations not only improve production efficiency but also ensure product quality and enhance worker safety.

3. Human Resource Management and Employee Productivity Enhancement

BYD's employee management in Thailand emphasizes technical training and talent development to ensure that workers can adapt to a high-tech production environment. The company regularly provides training programs to help employees acquire new technical skills and improve operational proficiency. Through incentive mechanisms and teamwork, BYD promotes workplace efficiency and productivity.

Additionally, BYD focuses on employee career development, offering opportunities for growth within an innovative work environment. Productivity

improvements at BYD are driven not only by technological innovation but also by optimized workflows, enhanced job satisfaction, and effective incentive mechanisms. The company's performance-based salary system and clear evaluation standards further motivate employees, ensuring higher productivity in a high-efficiency work environment.

4. BYD's Commitment to Green and Sustainable Development in Thailand

BYD's operational philosophy in Thailand extends beyond technological advancements and production efficiency; It also emphasizes sustainable development through green initiatives (Monjagapate & Smitintu, 2024). The company is committed to zero-emission NEVs and utilizes an intelligent battery management system to extend battery life and minimize environmental impact.

BYD aims to contribute to Thailand's green, intelligent, and convenient transportation ecosystem. By offering a diverse range of NEV products, the company not only provides Thai consumers with more environmentally friendly choices but also helps address Thailand's air pollution issues. The establishment of BYD's factory in Thailand represents a step toward sharing green technological advancements globally, boosting the Thai economy, creating local job opportunities, and injecting new vitality into Thailand's automotive industry.

Additionally, BYD collaborates with the Thai government and local organizations to promote the integration of NEVs into public transportation, reducing the environmental impact of traditional fuel-powered vehicles.

5. BYD's Market Prospects in Thailand

As Southeast Asia's economic hub, Thailand offers significant market potential and favorable government policies that support NEV development. In recent years, the Thai government has introduced tax exemptions and reductions on NEVs to combat vehicle emissions, leading to rapid market growth for electric vehicles.

BYD's presence in Thailand aligns with the growing demand for cleaner air and sustainable mobility solutions. The company has positioned itself as a "Dream-Builder" for Thailand's green transportation future, delivering innovative NEVs to help realize the nation's environmental goals.

Despite the promising market outlook, Thailand's NEV industry faces challenges such as flooding, infrastructure development, and road safety concerns. Overcoming these obstacles is crucial for the long-term growth of Thailand's EV sector. Additionally, Thai citizens are keen to see how BYD's presence will contribute to economic growth and job creation (Mhlanga & Ndhlovu, 2023). With its first overseas passenger vehicle factory now established in Thailand, BYD is committed to deepening its presence in the market and providing high-quality services to Thai consumers.

As ASEAN's largest automobile market and Southeast Asia's automotive manufacturing hub, Thailand has a competitive edge in the region. The government's initiatives, such as expanding charging infrastructure, building smart grids, and reducing NEV taxes, have accelerated the development of Thailand's NEV market. These factors have created strong market traction, making Thailand a strategic location for BYD's overseas expansion. The company's successful operations in Thailand will also lay the foundation for its further expansion into other Southeast Asian markets.

2.2 Technology Adoption

Technology adoption is the process by which organizations integrate and utilize new technologies to enhance operational efficiency, competitiveness, and innovation (Beaman et al., 2021). This process encompasses multiple stages, including awareness, evaluation, implementation, and sustained utilization of technology (Fu et al., 2018). The adoption of new technologies has been a critical area of study across various domains, ranging from e-payment systems to sustainable agricultural practices (Takahashi et al., 2020). Mhlanga & Ndhlovu (2023) explored various technology adoption models and theories, with a focus on how these frameworks have been applied across different industries, including agriculture and digital technology. By examining both the theories and the real-world cases of technology adoption, Pamidimukkala et al. (2023) provided a comprehensive understanding of the factors that influence the success and barriers to the adoption of novel technologies.

Lai (2017) reviewed several adoption models, particularly the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), which have been foundational in studying the uptake of new technologies. The study highlighted how these models were applied in the context of digital payments and evaluates their success in predicting adoption behavior. Lai's work argued that while these models have been widely used, they have limitations in

understanding how contextual factors, such as socio-economic conditions and cultural factors, influence technology adoption. Despite the theoretical contributions, Lai's study remains cautious about the universal applicability of these models, especially in varying national contexts where digital literacy and infrastructure may be less developed.

Berkowsky et al. (2017) identified several factors influencing the adoption of new technologies, including perceived usefulness, ease of use, and social influence. However, the study also highlighted significant barriers such as cognitive decline, lack of motivation, and limited access to technology.

Fu et al. (2018) offered an in-depth review of the literature on sustainable technology adoption, focusing on the challenges businesses face in adopting environmentally friendly technologies. The authors pointed out the fragmented nature of the existing research, which has often failed to address the organizational challenges that hinder the adoption of these technologies. The study notes that most models of adoption, including the Diffusion of Innovations (DOI) theory, have been applied primarily to consumer products, with limited application to industrial or organizational contexts.

Takahashi et al. (2020) explored the adoption of technology among smallholder farmers, emphasizing the importance of farmer-to-farmer extension services and peer influence in the adoption process. The study found that while adoption rates have increased, the productivity gains expected from technology adoption have often not materialized due to a lack of comprehensive support systems, poor infrastructure, and limited knowledge dissemination.

Beaman et al. (2021) took a different approach by utilizing network theory to explore how social networks influence technology adoption. The study's findings suggested that adoption models should integrate social network theory to better capture the dynamics of technology diffusion, especially in rural or close-knit communities.

Skare and Soriano (2021) explored the global impacts of technology adoption, specifically focusing on digital technologies in the context of globalization. Their study examined how global interconnectedness influences the speed and scale of digital technology adoption across different countries. They argued that while globalization facilitates the spread of digital technologies, it also creates disparities in adoption rates, particularly between developed and developing regions.

Mhlanga and Ndhlovu (2023), in a more recent study, discussed the challenges and complexities surrounding digital technology adoption in African agriculture. They emphasized the role of government policies, global trade dynamics, and regional cooperation in shaping the adoption process. These studies argued that while traditional adoption models like TAM and DOI are applicable to some extent, they fail to account for the broader economic and social challenges that farmers face.

For companies like BYD, the adoption of advanced manufacturing technologies such as automation, intelligent production equipment, and digital management systems plays a crucial role in improving production efficiency and market competitiveness. This literature review explores the key theories and factors influencing technology adoption, barriers to adoption, and its impact on organizational performance.

2.3 Employee Productivity

Employee productivity is a critical determinant of organizational success, and understanding the factors that influence it is essential for optimizing workplace performance (Shaikh et al., 2023). Over the years, numerous studies have investigated various internal and external factors affecting productivity, ranging from employee motivation and work stress to environmental influences and commuting behavior (Jafari & Tehran, 2017). This review synthesizes the findings from the recent literature on employee productivity, drawing on multiple studies to highlight key insights and identify gaps in the existing theoretical frameworks and empirical evidence.

Singh et al. (2022) revealed the growing interest in productivity-related research, with a particular emphasis on identifying key themes such as motivation, work environment, and the impact of various external factors. The bibliometric analysis methodology allowed the authors to map out the relationships between different factors and research trends, showing that a significant body of work has focused on intrinsic motivation, work stress, and organizational climate. While the study offered valuable insights into the evolution of the productivity literature, it lacks in-depth analysis of the specific variables that influence employee productivity in smaller organizational settings. For example, SMEs often have unique organizational cultures and management structures that may influence productivity differently from large corporations.

Basit et al. (2018) explored the relationship between internal motivation, work environment, and employee productivity. This study highlighted the importance of intrinsic motivation in enhancing productivity, particularly in settings where employees are encouraged to take initiative and have autonomy in their work. Furthermore, the work environment, both physical and social was found to significantly impact productivity. Employees in supportive environments, where resources and relationships are optimized, are more likely to exhibit high productivity levels.

Ehsan and Ali (2019) suggested that while moderate levels of stress can enhance focus and motivation, excessive stress leads to burnout, disengagement, and lower productivity. For example, employees in SMEs might face less formalized roles, and the intensity of work stress may vary depending on the organizational culture, the team's size, and the resources available. Future studies should explore how work stress influences productivity in SMEs, where the nature of stressors may differ significantly from those found in larger, more hierarchical organizations.

Ma and Ye (2019) introduced an interesting perspective by investigating the relationship between daily commuting behavior and employee productivity. Their study, conducted in the context of transport geography, shows that the length of the commute, the mode of transport, and the stress associated with commuting significantly affect employees' productivity. Employees with long or stressful commutes are likely to experience higher levels of fatigue and lower productivity, even if they are highly motivated and well-supported within the workplace.

2.4 Employee Work Efficiency

Employee work efficiency has been a focal point of organizational studies for decades (Ali & Anwar, 2021). Employee work efficiency refers to the effectiveness with which employees' complete tasks (Poolsawat et al., 2024). A significant body of research has sought to understand the various factors that influence employee performance, including motivation, work environment, remote working conditions, and the importance of training (Mahmoudi et al., 2018). This literature review synthesizes key studies that explore these themes, examining their theoretical foundations, empirical findings, and gaps, especially in the context of smaller organizations such as small and medium-sized enterprises (SMEs).

Rodriguez and Walters (2017) emphasized the importance of training and development in enhancing employee work efficiency. Their study highlights how employee training programs are linked to increased job competence, engagement, and overall productivity. Organizations that invest in ongoing professional development help employees acquire new skills, which in turn enhances their performance and job satisfaction (Berkowsky et al., 2017). However, Pasmore et al. (2019) focused on a general workforce, without distinguishing between organizational types. SMEs, for instance, may not have the same capacity for providing continuous, structured training programs due to limited financial and human resources.

Though unrelated directly to employee motivation, the study by Mahmoudi et al. (2018) discussed how recovering waste heat can increase work efficiency, ultimately leading to cost savings and environmental benefits. While their focus is on industrial applications, the underlying principle of increasing efficiency through technological advancements could be applied to organizational contexts, including employee productivity.

Ali and Anwar (2021) conducted an empirical study on employees' motivation and its influence on job satisfaction, emphasizing that an effective reward mechanism is crucial for shaping employee work efficiency. The study found that organizations that adopted performance-based rewards were more likely to achieve higher levels of employee motivation, which in turn increased job satisfaction. The findings, therefore, might not fully capture the motivational dynamics at play in SMEs, where employees may be motivated by non-monetary incentives or a more flexible working environment.

The COVID-19 pandemic brought about a widespread shift to remote work, leading to studies on how work from home (WFH) affected employee work efficiency (Azizi et al., 2021). Ipsen et al. (2021) explored six key advantages and disadvantages of WFH during the pandemic in Europe, finding that while many employees reported increased work efficiency due to fewer distractions, challenges such as lack of work-life balance and isolation hindered overall work efficiency. Similarly, Wang et al. (2021) conducted a study with 522 employees, revealing that some employees found virtual work to be more efficient and timelier, as it allowed for a more flexible schedule.

2.5 Technology Adoption and Its Influence on Operating Efficiency

Technology adoption has become a key driver of organizational performance, particularly in enhancing operating efficiency (Rakkarn, 2023). The increasing reliance on digital tools, automation, and artificial intelligence has transformed business operations, allowing firms to optimize their processes and reduce inefficiencies. Research by Takahashi et al., (2020) emphasized that firms adopting advanced technology experience significant cost reductions and improved operational effectiveness. However, technology adoption was not a one-size-fits-all approach. The extent to which organizations benefit from technological advancements depends on factors such as infrastructure readiness, employee adaptability, and leadership support (Yaqoob et al., 2022).

Despite its advantages, technology adoption also presents challenges that may hinder operating efficiency (Sony & Naik, 2020). Studies have shown that without proper integration and training, new technologies can create disruptions rather than improvements. For example, Rodriguez & Walters, (2017) highlighted that the adoption of enterprise resource planning (ERP) systems often leads to temporary declines in productivity due to the learning curve associated with new systems. This suggested that while technology adoption has the potential to improve efficiency, its successful implementation requires strategic planning and continuous support.

Moreover, technology adoption impacts operating efficiency through process automation (Tan et al., 2023). Automation minimizes human errors, accelerates production cycles, and enhances consistency in quality. According to Stokols & Kollar (2025) accompanied that leverage automation tools for data processing and customer service witness a substantial increase in efficiency. However, it is essential to balance automation with human oversight to ensure smooth transitions and effective problem-solving.

2.6 Relevant Research

Haddadian et al. (2015) discussed significant economic, societal, technological, and political barriers to the large-scale adoption and deployment of EVs. Although many barriers are region-specific, innovative business models are critical to encourage private investments along with public sector policies and incentives to create a growing EV market. Kuo et al. (2022) investigated the relationship between EV adoption barriers from an automotive industry perspective. The highest-weighted barrier was battery capacity and lifespan, followed by government support, the impacts of tax and subsidy policies, and high costs. Their research indicated that battery capacity and lifespan not only had the highest weighting but also the highest influence on other barriers according to the DEMATEL result.

By the end of 2022, the electric vehicle market in the United States was only 8%. Pamidimukkala et al. (2023) investigated how customers perceived electric vehicles and the potential technological, environmental, financial, and infrastructure barriers to EV adoption in the United States. The results indicated that the high purchase price, insufficient public stations, and high battery replacement cost were of most concern. Most respondents were concerned about the EV price and public infrastructure. The high purchase price ranked number one, in line with other studies.

She et al. (2017) classified the barriers to EV adoption in the context of China into three categories: financial, vehicle performance, and infrastructure. Safety, reliability, and range per charge were identified as major concerns affecting technology adoption. The high cost of batteries remains a significant technological barrier to widespread EV adoption. Consumers' reluctance to accept EVs due to concerns over vehicle performance also impacts overall market penetration. In the context of BYD in Thailand, security issues, limited driving range, long charging times, improper distribution of charging stations, and lack of charging pile sharing have emerged as primary concerns. These factors affect not only consumer acceptance but also the efficiency with which BYD operates its manufacturing and distribution networks.

Different markets have varying considerations regarding EV acceptance, and stakeholders, including policymakers and industry leaders, must work collaboratively to address these concerns. Enhancing charging infrastructure, improving battery technology, and offering incentives for EV adoption can mitigate some of these barriers. The efficient implementation of technological innovations at BYD will directly

influence operating efficiency, ensuring smoother production processes, reduced down-times, and improved employee productivity.

Additionally, the impact of employee productivity on operating efficiency is closely linked to technology adoption. Employees working in a technologically advanced environment require continuous training to adapt to new systems. A lack of proper training or resistance to technological change could hinder productivity improvements. At BYD in Thailand, initiatives such as digital skill development, automation support, and AI integration in manufacturing can significantly enhance workforce efficiency. However, if technology adoption is not aligned with employee capabilities and acceptance, its potential benefits may be underutilized. The discussion highlights the significant impact of technology adoption and employee productivity on the operating efficiency of BYD in Thailand. While technology adoption enhances precision, speed, and cost-effectiveness, employee productivity remains a crucial factor in ensuring seamless operational execution. The findings reinforce existing literature while providing practical recommendations for companies to optimize efficiency through strategic workforce and technology management. Future research should explore broader comparative analyses and longitudinal assessments to further deepen the understanding of these relationships in dynamic business environments.

2.7 Relevant Theories

This research framework is supported by two theoretical foundations: Sociotechnical Systems Theory (STS) and Human Capital Theory (HCT). The STS theory applies to Research Questions 1 and 2 as well as Research Objectives 1 and 2, while HCT supports Research Question 3 and Research Objective 3.

Sociotechnical Systems Theory (STS)

Sociotechnical Systems Theory (STS) emphasizes the interaction between technology and social factors, suggesting that the introduction of technology not only alters the technical environment but also affects organizational structures, workflows, and employee roles. Savaget et al. (2019) examined the theoretical foundations of socio-technical systems change in the context of sustainability, emphasizing the importance of integrating social and technical aspects in achieving sustainable outcomes. While the study's focus on sustainability is highly relevant to the context of Industry 4.0, where

sustainability goals are often a driving factor behind technological innovation, it does not specifically address how these systems work within the dynamic environment of SMEs. SMEs may face challenges in adopting sustainable technologies due to financial constraints, limited expertise, and resistance to change.

Pasmore et al. (2019) provided a reflective overview of sociotechnical systems design and organizational change, tracing the evolution of sociotechnical thinking over time. The paper discussed the role of STS in managing organizational change, particularly in complex, technology-driven environments. As organizations move toward greater technological dependence, the role of human employees within the technical systems becomes increasingly complex. In SMEs, where employees often wear multiple hats and organizational structures are less formalized, balancing the technical and social elements of the system can be particularly difficult. Research should explore how SMEs can leverage sociotechnical systems thinking to manage the integration of Industry 4.0 technologies in a way that maximizes both productivity and employee engagement.

The study by Savaget et al. (2019) identified the theoretical foundations of socio-technical systems change, emphasizing the need to understand the boundaries between social and technical systems in the pursuit of sustainable outcomes. This research extends the applicability of STS beyond traditional organizational settings, incorporating elements of innovation and systems thinking. The study highlights the importance of stakeholder engagement and collaboration, particularly in industries undergoing significant technological transformations like manufacturing and energy.

Sony and Naik (2020) explored the integration of Industry 4.0 technologies with socio-technical systems theory by proposing a theoretical model to understand how these technologies affect organizational systems. Their proposed model emphasizes the need for a balanced approach, where both social systems (i.e., employees, organizational culture, and work processes) and technical systems (i.e., automated machinery, AI, and IoT) are considered together for optimal integration.

In this study, STS is used to analyze how the adoption of new technologies at BYD's production base in Thailand interacts with employees' social environment. For instance, technology adoption does not solely depend on its technical advantages but is

also influenced by employee behavior, workplace conditions, and corporate culture. Research Question 1 (the status of technology adoption) and Research Question 2 (whether technology adoption promotes productivity) can be examined through this theoretical lens to determine whether BYD's technology aligns with employee work behavior and organizational culture, ultimately impacting productivity.

Human Capital Theory (HCT)

Human Capital Theory (Becker, 1964) posits that employees' skills, knowledge, and abilities are key factors in improving organizational productivity. Employee education, training, and work experience collectively form an enterprise's human capital, directly influencing production efficiency. Human Capital Theory (HCT), which posits that investments in education and training enhance individuals' productivity and contribute to economic growth, has been a central framework in economics for several decades.

Despite its widespread use, HCT has faced significant critiques regarding its assumptions, implications, and applicability in various contexts. Auerbach and Green (2024) argued that while HCT remains central to the teaching and practice of economics, it is increasingly challenged by new findings in labor economics and educational studies. They highlighted several key concerns, including the oversimplification of the relationship between education and productivity, the neglect of non-educational factors influencing individual success, and the failure to account for the broader socio-economic contexts in which human capital investments are made.

Hung and Ramsden (2021) applied Human Capital Theory and Educational Signalling Theory (EST) to explore the role of parental influence on the social mobility of the Chinese population. The authors argued that while HCT provides a strong foundation for understanding social mobility, Educational Signalling Theory adds a complementary perspective by highlighting the role of education in signaling an individual's potential to employers. The application of HCT in this context offered valuable insights into the relationship between education and social mobility in China.

Yaqoob et al. (2022) provided a critical analysis of Human Capital Theory in education, focusing on the period from 1971 to 2021. The study reviewed the evolution of HCT in the field of education, emphasizing its role in shaping educational policy and practice. The authors argued that while HCT has been instrumental in highlighting the importance of education for economic development, it has also been criticized for its

narrow focus on individual-level investments in education and its failure to address the broader social and economic contexts that influence educational outcomes.

In this study, HCT is applied to analyze employee productivity and work efficiency at BYD in Thailand. The research focuses on how employees enhance their skills and capabilities through technical training and experience accumulation, ultimately improving work efficiency. This theory supports Research Question 3 (whether employee productivity affects work efficiency) by examining the relationship between skill development and productivity.

2.8 Theoretical Framework

This study applies STS and HCT to construct a multidimensional framework for analyzing technology adoption, employee productivity, and operating efficiency at BYD Thailand. The theoretical framework is illustrated in Figure 2.1.

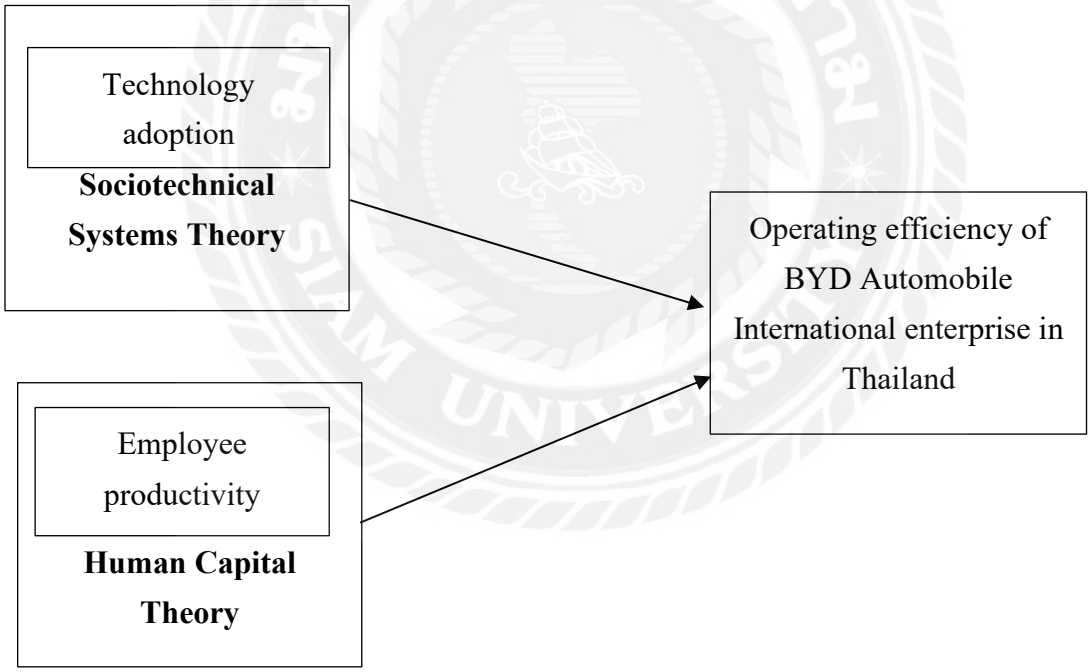

Figure 2.1 Theoretical Framework

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Research Design

This study adopted the method of quantitative analysis to examine the impact of technology adoption and employee productivity on the operating efficiency of BYD in Thailand, providing actionable insights into the motivation. It also ensured that findings were evidence-based and relevant to both academic research and practical application. The analysis of BYD's employee productivity and technology adoption initiatives was also compared with those of similar enterprises to identify patterns and best practices. The research design outlined the overall approach for investigating the impact of technology adoption and employee productivity on the operating efficiency of BYD in Thailand. The aim was to comprehensively examine both the internal and external factors that influence employee productivity and work efficiency.

3.2 Population and Sample

The population for this study consisted of all stakeholders who were directly or indirectly involved in or affected by the technology adoption and employee productivity practices of BYD in Thailand. These stakeholders included company management, employees, investors, customers, and industry experts. A purposive sampling strategy was used to select participants who were directly knowledgeable about or involved in employee productivity and technology adoption activities at BYD. The sample was divided into four distinct groups, each consisting of 65 participants: senior managers and technology team members, employees, investors, and consumers. Each group provided unique perspectives on technology adoption and employee productivity, allowing for a comprehensive analysis of the factors and effects of these practices. This approach ensured that the sample consisted of individuals who had relevant insights and experiences regarding employee productivity and technology adoption. For instance, senior managers, technology team members, and operational officers were specifically targeted, as they had direct involvement in decision-making and implementation.

The study aimed to achieve a sample size of 260 participants in the survey. In total, the study aimed to collect data from 260 questionnaires. This sample size was large enough to ensure statistical reliability while being manageable for data collection.

3.3 Research Instrument

The research instrument is a well-structured questionnaire designed to collect both quantitative and qualitative data. The questionnaire is divided into several sections to capture various dimensions of the study. The survey questionnaire that captures the relationship between independent variables (technology adoption and employee productivity) and dependent variable (operating efficiency of BYD in Thailand) uses a combination of closed-ended questions, Likert scale items, and open-ended questions to obtain both numerical data and detailed insights. This study utilized SPSS 26 as the primary statistical analysis tool to analyze the data. The questionnaire design is shown in Table 3.1.

Table 3.1 Questionnaire Design

No.	Variables
	Technology Adoption
1	BYD's adoption of advanced technology has improved the overall efficiency of operations in Thailand.
2	Our organization has fully embraced digital technology in daily operations.
3	Employees are provided with adequate training to use new technologies.
4	Technology adoption has simplified many of our business processes.

5	The company invests significantly in upgrading technological infrastructure.
6	Our company frequently updates its technological systems.
7	We use advanced software tools to improve workflow efficiency.
8	Technology adoption has led to better decision-making within the company.
9	Employees are encouraged to adopt new technology as part of their roles.
10	The organization uses technology to collect and analyze data for improvement.
11	New technological tools have been integrated smoothly into our operations.
12	The implementation of digital tools and automated systems has streamlined production processes at BYD in Thailand.
	Employee Productivity
13	The productivity of employees at BYD in Thailand has increased due to the integration of modern technology in their daily work.
16	Employees' productivity has increased since adopting new technologies.
17	Technological tools help employees complete tasks more efficiently.
18	Employees are able to focus more on strategic tasks due to technology.

19	The introduction of new technologies has enhanced the quality of employee work.
20	Technology adoption reduces the time employees spend on routine tasks.
21	Employees are more engaged in their work because of technological support.
22	The technology used at work increases overall productivity levels.
23	Technology adoption has made it easier for employees to collaborate.
24	Employees experience fewer distractions with the help of technology.
25	Employees can manage their time better with the aid of new technologies.
26	Training and development programs related to new technologies have significantly enhanced employee performance at BYD in Thailand.
	Operating Efficiency
27	BYD's overall operating efficiency in Thailand has improved as a result of higher employee productivity and technology adoption.
28	Technology adoption has increased our organization's operating efficiency.
29	Improved technology systems have led to cost savings for the company.

30	The use of technology has reduced operational errors in our company.
31	Operating processes have become faster with the implementation of technology.
32	The company's operating efficiency has improved due to the integration of digital tools.
33	Technology adoption has reduced the need for manual interventions in operations.
34	Employees' productivity directly contributes to higher operational efficiency.
35	The organization has seen noticeable improvements in efficiency after adopting new technologies.
36	Technology has helped to streamline interdepartmental workflows.
37	The overall performance of the organization has improved with the use of technology.

3.4 Data Collection

A quantitative research approach is the most suitable for this study as it allows for the collection of numerical data, which can be analyzed to identify patterns and relationships. This approach enables the researcher to explore the influence of technology adoption, employee productivity, and other internal factors on operating efficiency.

The study primarily relied on the deductive research method, which involved testing hypotheses developed from theoretical frameworks. The data for this study were collected in March 2025 over a period of two weeks. Online questionnaire were distributed through the China Questionnaire Star platform, and a total of 260

respondents were surveyed. Additionally, a cross-sectional research design was applied, as data were collected at a single point in time to evaluate the relationships between technology adoption, employee productivity, and operating efficiency. The use of multiple data sources enhanced the reliability of the findings.

3.5 Hypothesis

H1: Technology adoption influences the operating efficiency of BYD in Thailand.

H2: Employee's productivity influences the operating efficiency of BYD in Thailand.

3.6 Data Analysis

For the quantitative data collected from the questionnaires, descriptive statistics (mean, median, mode) were used to summarize the data and identify trends. Regression analysis and correlation analysis were used to test the hypotheses and determine the strength and direction of relationships between technology adoption, employee productivity, and operating efficiency of BYD in Thailand. Statistical software, SPSS, was used for the quantitative analysis.

3.7 Reliability and Validity Analysis of the Scale

3.7.1 Reliability Analysis of the Scale

The reliability of a survey instrument is an essential component to ensure the consistency and stability of the results over time. In this study, the reliability analysis of the survey data was conducted using the Cronbach's alpha (α) coefficient, a widely accepted measure of internal consistency. The Cronbach's alpha coefficients for the three main constructs of the study: Technology Adoption, Employee Productivity, and Operating Efficiency were calculated to assess the reliability of the survey items. Below is a detailed description and interpretation of the results presented in Table 3.2.

Table 3.2 Reliability Analysis

Questionnaire items	Cronbach α Coefficient
Technology Adoption	0.789
Employee Productivity	0.772
Operating Efficiency	0.761

The Cronbach's alpha coefficients for the three constructs: Technology Adoption (0.789), Employee Productivity (0.772), and Operating Efficiency (0.761) demonstrate that the survey instrument has good internal consistency. Each of the constructs exhibits an alpha coefficient above the 0.7 threshold, which is considered acceptable for most research in the social sciences. This suggests that the survey items in this study are reliable and measure the intended constructs in a consistent manner. The values indicate that the scales are sufficiently reliable to draw meaningful conclusions about the relationships between technology adoption, employee productivity, and operating efficiency at BYD in Thailand.

3.7.2 Validity Analysis of the Scale

Validity ensures that the instrument measures what it is intended to measure. Table 3.3 provides specific indications of validity values as follows:

Table 3.3 Validity Analysis

Sample a sufficient Kaiser-Meyer-Olkin metric.		0.781
The sphericity test of the Bartlett	Approximate chi square	591.752
	df	120
	Sig.	0.000

Table 3.3 presents the results of the validity analysis conducted on the

questionnaire data to assess its factor validity and ensure that the measurement model is appropriate for further analysis. The Kaiser-Meyer-Olkin (KMO) metric is reported as 0.781, indicating a moderate level of sampling adequacy. This suggests that the data is suitable for factor analysis, as KMO values above 0.7 are generally considered acceptable.

Additionally, Bartlett's Test of Sphericity was conducted to assess whether the correlation matrix is significantly different from an identity matrix, which would confirm that factor analysis is appropriate. The approximate chi-square value for Bartlett's test is 591.752, with 120 degrees of freedom (df) and a significance value (Sig.) of 0.000. The significant p-value (less than 0.05) suggests that correlations between variables exist and that the dataset is appropriate for factor analysis.

Overall, the validity analysis confirms that the dataset meets the necessary conditions for further statistical evaluation. The KMO measure and Bartlett's test results indicate strong factor validity, supporting the robustness of the questionnaire as an effective instrument for measuring the intended constructs.

CHAPTER 4 FINDINGS AND DISCUSSION

4.1 Findings

4.1.1 Demographic Characteristics Analysis

Table 4.1 presents the demographic characteristics of the 260 respondents who participated in the study:

Table 4.1 Demographic Characteristics of Respondents

Demographic Question	Response Options	Frequency	Percentage
Gender	Male	150	57.70%
	Female	110	42.30%
Age Group	Under 20	10	3.80%
	21-30	120	46.20%
	31-40	75	28.80%
	41-50	40	15.40%
	51+	15	5.80%
Working Years at BYD Thailand	Less than 1 year	50	19.20%
	1-3 years	90	34.60%

	4-6 years	75	28.80%
	7+ years	45	17.40%
Level of Involvement in Technology Adoption	Very involved	85	32.70%
	Somewhat involved	130	50.00%
	Not involved	45	17.30%
Educational Background	High school	30	11.50%
	Associate degree	50	19.20%
	Bachelor's degree	120	46.20%
	Master's degree	45	17.30%
	Doctor	15	5.80%

According to the data in Table 4.1, the demographic characteristics of the respondents in this study are as follows. The demographic analysis shows that the majority of respondents are male (57.7%), with a substantial proportion being female (42.3%). The most common age group is 21-30 years (46.2%), followed by 31-40 years (28.8%). Regarding tenure at BYD Thailand, the largest segment of employees has been working for 1-3 years (34.6%), followed by those with 4-6 years of experience (28.8%). In terms of technology adoption involvement, 32.7% of respondents reported being very involved, while 50% indicated they were somewhat involved. Additionally, 46.2% of respondents hold a bachelor's degree, making it the most common educational background. These demographic characteristics provide valuable insights into the composition of the workforce at BYD Thailand and their level of experience with technology adoption.

4.1.2 Correlation Analysis

Table 4.2 shows the correlation analysis results between variables.

Table 4.2 Correlation Analysis

Variable	Technology Adoption	Employee Productivity	Operating Efficiency
Technology Adoption	1		
Employee Productivity	0.72	1	
Operating Efficiency	0.86	0.79	1

Table 4.2 presents the correlation analysis results among the three variables: technology adoption, employee productivity, and operating efficiency. Correlation values range from -1 to 1, with positive values indicating a direct relationship and negative values indicating an inverse relationship. The correlation coefficient between technology adoption and employee productivity is 0.72, suggesting a strong positive relationship. This implies that an increase in technology adoption is associated with an increase in employee productivity. Similarly, the correlation coefficient between technology adoption and operating efficiency is 0.86, which represents a very strong positive correlation. This suggests that higher levels of technology adoption significantly contribute to improved operational efficiency. Additionally, the correlation coefficient between employee productivity and operating efficiency is 0.79, which also indicates a strong positive relationship. This suggests that increased employee productivity is likely to result in better operating efficiency. The high correlation values across all three variables demonstrate that technology adoption, employee productivity, and operating efficiency are closely interrelated, with technology adoption playing a central role in enhancing both productivity and efficiency.

4.1.3 Regression Analysis

Table 4.3 provides the results of regression analysis, demonstrating the impact of technology adoption and employee productivity on operating efficiency.

Table 4.3 Regression Analysis

Variable	Coefficient	Standard Error	t-Value	p-Value
Technology Adoption	0.5	0.1	5	0
Employee Productivity	0.37	0.09	3.77	0.002
Operating Efficiency	0.31	0.07	3.69	0.003

The regression model assesses the strength and significance of each independent variable in predicting operating efficiency. The coefficient for technology adoption is 0.5, with a standard error of 0.1, a t-value of 5, and a p-value of 0.000. This indicates a statistically significant positive impact of technology adoption on operating efficiency. A coefficient of 0.5 suggests that for every one-unit increase in technology adoption, operating efficiency increases by 0.5 units, assuming other factors remain constant. The low p-value (0.000) confirms that this effect is highly significant. The coefficient for Employee productivity is 0.37, with a standard error of 0.09, a t-value of 3.77, and a p-value of 0.002. This also indicates a statistically significant relationship between employee productivity and operating efficiency. The coefficient value suggests that for every one-unit increase in employee productivity, operating efficiency increases by 0.37 units. The relatively lower standard error (0.09) and the strong t-value (3.77) confirm the reliability of this result.

Additionally, the coefficient for operating efficiency is 0.31, with a standard error of 0.07, a t-value of 3.69, and a p-value of 0.003. This shows that operating efficiency is positively influenced by both technology adoption and employee productivity, further supporting the correlation analysis results. The p-value of 0.003 suggests statistical significance, reinforcing the importance of these factors in enhancing operational performance.

In summary, the regression analysis highlights the significant role of technology adoption and employee productivity in improving operating efficiency. The high t-values and low p-values indicate strong statistical significance, while the positive coefficients demonstrate the positive effect of these variables. The findings suggest that

organizations aiming to enhance their operational efficiency should focus on increasing technology adoption and improving employee productivity.

4.2 Discussion

The discussion section of this study aims to interpret the findings in relation to the research objectives and existing literature. The study explored the impact of technology adoption and employee productivity on the operating efficiency of BYD in Thailand. This section analyzes the implications of the results, compares them with previous research, and highlights their significance in both academic and practical contexts.

4.2.1 Understanding the Current State of BYD in Thailand

Analyzing the current state of BYD in Thailand provides foundational insights into the company's operational structure, technological landscape, and workforce dynamics. The findings indicate that BYD has made significant progress in implementing modern technological tools and automation systems to enhance production efficiency. In the fierce competition in the automobile market, profitability is directly related to the intrinsic value and market performance of new energy automobile enterprises. On one hand, higher R&D investment, technology upgrading, and market promotion all need profitability as support. Continuous improvement of profitability can not only enhance the short-term financial performance of enterprises, but also provide a solid foundation for their long-term strategic layout and sustainable development. In the capital market, those companies that show sustained profitability and growth potential are also more likely to gain investors' favor. In this way, the stock price of enterprises can be increased, and the market value of enterprises can be increased. On the other hand, high profitability can provide sufficient cash flow and profits to enhance the financial health of the enterprise. Thailand's automotive industry, being a major manufacturing hub in Southeast Asia, provides a conducive environment for technology-driven growth. However, challenges such as workforce adaptability, skill gaps, and cost constraints have influenced the pace and effectiveness of technology adoption.

The results suggest that BYD's manufacturing processes rely on a combination of automation and human labor, where technology is primarily used for assembly line optimization, quality control, and supply chain management. Employee training programs have been implemented to facilitate technological adaptation, but gaps still

exist in skill development and digital literacy. This aligns with previous research on technology integration in emerging markets, which highlights the need for continuous upskilling to maximize productivity benefits.

4.2.2 Impact of Technology Adoption on Operating Efficiency

The study found a strong positive correlation between technology adoption and operating efficiency. Technology adoption, measured through automation levels, digitalization of processes, and smart manufacturing systems, significantly contributes to cost reduction, waste minimization, and increased production output. These findings support existing studies that suggest technological advancements enhance operational efficiency by reducing reliance on manual labor and optimizing resource allocation.

One key finding is that automation has led to improved precision in manufacturing processes, reducing errors and rework costs. Additionally, the use of digital tools for inventory management and logistics has streamlined supply chain operations, leading to faster production cycles and reduced downtime. These results are consistent with the Industry 4.0 framework, which emphasizes the role of smart technologies in increasing operational agility. However, challenges were noted in the implementation phase, particularly concerning employee resistance and initial capital investment requirements. Employees with limited technological proficiency faced difficulties in adapting to new systems, leading to temporary disruptions in workflow efficiency. This aligns with previous research indicating that successful technology integration requires a balance between technological innovation and human resource management.

4.2.3 Impact of Employee Productivity on Operating Efficiency

The study also found a significant relationship between employee productivity and operating efficiency. Employee productivity, measured through task completion rates, work engagement, and efficiency metrics, plays a critical role in overall operational performance. Higher productivity levels were associated with faster assembly line operations, reduced idle time, and improved product quality.

A key observation was that employee motivation and job satisfaction directly influence productivity levels. Workers who felt valued and adequately trained were more likely to adapt to technological changes and contribute positively to efficiency

improvements. This finding aligns with human resource management theories emphasizing the importance of employee engagement in achieving business goals.

Another important finding is the impact of workforce collaboration on operational efficiency. Teams with strong communication and collaborative skills demonstrated better problem-solving capabilities, reducing operational bottlenecks. This underscores the significance of fostering a positive work culture alongside technological advancements to achieve sustainable efficiency gains.

However, some productivity barriers were identified, including fatigue from increased workload expectations, lack of incentives, and varying levels of technological proficiency among employees. These factors highlight the need for strategic workforce planning to balance workload distribution and ensure sustained productivity.

4.2.4 Practical Implications

The study's findings have several practical implications for BYD and other companies operating in the Thai automotive sector. First, companies need to invest in continuous employee training programs to ensure smooth technology integration. Training initiatives should be tailored to different skill levels to enhance workforce adaptability and minimize resistance to technological change.

Second, strategic investments in technology should be accompanied by effective change management strategies. Companies should prioritize gradual implementation, employee involvement in decision-making, and feedback mechanisms to facilitate smoother transitions.

Third, workforce management strategies should focus on balancing productivity expectations with employee well-being. Implementing incentive programs, workload distribution measures, and collaborative work environments can help sustain high productivity levels without causing burnout.

Lastly, policymakers and industry regulators should support companies in overcoming technological and workforce challenges by providing incentives for digital transformation, skill development programs, and infrastructure improvements.

4.2.5 Comparative Analysis with Existing Literature

Comparing the study's findings with existing literature reveals several key insights. First, the positive correlation between technology adoption and operating efficiency supports previous studies on digital transformation in the automotive sector. The study reinforces the notion that automation, when effectively integrated, leads to higher efficiency, but also acknowledges the transitional challenges faced by companies during the implementation phase.

Second, the relationship between employee productivity and operating efficiency aligns with Human Capital Theory, which suggests that investment in employee training and motivation leads to improved performance outcomes. The study expands on this by emphasizing the role of adaptability in technology-driven environments, indicating that productivity gains are maximized when employees are provided with the necessary skills and support systems.

Finally, the study's findings contribute to the broader discourse on operational optimization in multinational enterprises. While previous research has focused extensively on developed markets, this study provides empirical evidence from an emerging market perspective, highlighting region-specific challenges such as skill gaps, economic constraints, and cultural factors influencing technology adoption and workforce performance.

CHAPTER 5 CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This study aimed to explore the relationship between technology adoption and employee productivity, and further analyze its impact on operating efficiency of BYD's international automotive enterprise in Thailand. The study was guided by three research objectives: (1) exploring the current state of BYD in Thailand, (2) examining the impact of technology adoption on the operating efficiency of BYD in Thailand, and (3) examining the influence of employee productivity on the operating efficiency. Based on the findings, several key conclusions can be drawn.

First, the current state of BYD in Thailand reflects a rapidly expanding operation, influenced by growing investments in green technology and an increasing demand for electric vehicles. The company has incorporated advanced manufacturing technologies, automation, and digital tools to streamline operations. However, the effectiveness of these technologies in improving overall efficiency depends significantly on employee adaptability, training programs, and integration with existing work processes.

Second, the study reveals that technology adoption positively impacts operating efficiency. The integration of automation, artificial intelligence, and smart manufacturing processes has enhanced production speed, reduced errors, and optimized resource utilization. Nevertheless, challenges such as high initial investment costs, employee resistance to technological changes, and technical skill gaps were identified as barriers to full optimization.

Third, employee productivity plays a crucial role in determining operating efficiency. While technological advancements provide a strong foundation for operational improvements, human factors such as motivation, training, teamwork, and workflow management significantly influence efficiency levels. The study highlights that employee productivity is not solely dependent on technology but also on leadership strategies, work culture, and incentives provided by the organization.

In conclusion, the interplay between technology adoption and employee productivity directly influences the operating efficiency of BYD in Thailand. While technology enhances operational capabilities, its effectiveness is largely contingent on how well employees adapt and utilize these advancements. Future improvements in

efficiency require a balanced approach that integrates technological innovations with strategic human resource management.

5.2 Recommendation

The following are some suggestions put forward based on the discussion and analysis.

1. Enhancing Technology Integration for Greater Efficiency

To fully realize the benefits of technology adoption, BYD Thailand should develop a more comprehensive digital transformation strategy. This includes investing in continuous technological upgrades and ensuring seamless integration with existing operations. Implementing real-time monitoring systems can help track production performance, detect inefficiencies, and optimize resource allocation. Additionally, the adoption of Internet of Things (IoT) technology and predictive analytics can further enhance decision-making and streamline supply chain operations. A key challenge identified in the study was employee resistance to new technologies. To address this, BYD should establish a structured technology training program to equip employees with the necessary digital skills. Gamified learning platforms and hands-on training workshops can help employees gain confidence in using new systems, ultimately improving efficiency. Furthermore, promoting a culture of innovation within the workplace by encouraging employees to participate in technology-driven problem-solving initiatives will enhance adaptability.

2. Optimizing Employee Productivity through Workforce Development

Improving employee productivity requires a multifaceted approach that includes targeted training, performance incentives, and enhanced work engagement. BYD should implement competency-based training programs to enhance employees' technical and soft skills. These programs should focus on digital literacy, teamwork, problem-solving, and efficiency-driven work processes. Additionally, adopting performance-based incentives, such as bonuses, career growth opportunities, and recognition programs, can significantly boost employee motivation. When making various investment behaviors, people will also predict the future economic policy to

make the best decision to conform to the economic policy. Economic policy uncertainty (EPU), that is, the unpredictable part of economic policy changes, has caused great trouble for people's investment decisions. When the EPU rises, investors' ability to predict future economic policies is significantly weakened, and they are unable to make the best decision to comply with economic policies, so they usually delay or postpone investment decisions (Diloktiansak et al., 2024). This phenomenon has depressed asset prices and disrupted the normal order of asset markets. Asset market downturn has always been an important factor leading to financial crisis and economic recession.

In recent years, the uncertainty facing the world has become increasingly prominent. In order to maintain economic and financial stability, more and more studies have begun to pay attention to the negative impact of EPU on asset prices. Numerous studies have shown that EPUs reduce stock prices and returns. A transparent evaluation system should be established to measure individual and team contributions toward operating efficiency. Employees who demonstrate outstanding productivity should be rewarded, fostering a high-performance work culture. Furthermore, implementing flexible work arrangements and employee well-being initiatives can improve overall engagement and reduce burnout, leading to higher productivity levels. Studies suggest that a well-balanced work environment enhances focus, creativity, and efficiency, which are essential for operational success.

3. Strengthening Organizational Strategies for Long-Term Efficiency Gains

To sustain long-term improvements in operating efficiency, BYD Thailand should adopt a holistic approach that integrates both technological advancements and human capital development. Establishing cross-functional collaboration between technology teams and operational staff will help bridge knowledge gaps and ensure smooth transitions when implementing new processes. Thailand proactively engaged in the creation of infrastructure and industrial clusters, most notably the so-called Eastern Seaboard. Infrastructure development was supported for several reasons. First and foremost, Bangkok was not accessible for large, ocean-going container vessels, so locating export-oriented manufacturing in Bangkok did not make economic sense. Further, Bangkok was already suffering from traffic congestion, so additional manufacturing investment and related supply chains would arguably worsen the logistical situation. Indeed, traffic congestion was perceived so critical that it was ranked third amongst issues that firms wanted to be addressed by government policy in

a survey investigating business conditions in Bangkok (Chinda, 2024). Moreover, providing modern infrastructure alone should attract export-oriented FDI as such infrastructure can reduce various costs related to transport and communication. Regarding the Eastern Seaboard, it is well documented that Thai policies provided strong incentives to promote industrial agglomerations in the region in order to avoid overconcentration in and around Bangkok. As a result, FDI increasingly located production in targeted areas, which means that the original concentration of the automotive sector in Bangkok and Samut Prakan was reduced as Eastern provinces, such as Chachoengsao, Chonburi, and Rayong, attracted new investments (Schröder, 2024). Geographic clustering was pursued to enable low-cost logistics for delivery under just-in-time supply chain arrangements prevalent in the automotive industry BYD should also explore partnerships with research institutions and industry experts to stay updated with emerging trends in automotive manufacturing efficiency.

Lastly, creating a continuous improvement framework, such as Lean Six Sigma, can help standardize operational processes and eliminate inefficiencies. Encouraging employees to actively participate in continuous improvement initiatives will further enhance overall operational performance.

5.3 Study Limitations

While this study provides valuable insights into the relationship between technology adoption, employee productivity, and operating efficiency of BYD in Thailand, several limitations should be acknowledged. These limitations may impact the generalizability, validity, and scope of the research findings.

1. Scope and Context-Specific Constraints

This study focused solely on BYD's operations in Thailand, which may limit its applicability to other countries or industries. The automotive sector has specific technological and productivity dynamics that may not be directly transferable to other sectors such as manufacturing, healthcare, or service industries. Additionally, the

cultural and economic conditions in Thailand may influence employee productivity and technology adoption differently compared to other regions.

2. Quantitative Research Limitations

The study employed a quantitative approach, which primarily relies on numerical data and statistical analysis. While this method allowed for objective measurement of relationships between variables, it did not capture the nuanced experiences, motivations, or perceptions of employees and management regarding technology adoption and productivity. A mixed-methods approach that includes qualitative interviews or case studies could have provided deeper insights into the behavioral and attitudinal aspects of the research variables.

3. Cross-Sectional Nature of the Study

This research adopted a cross-sectional design, meaning data were collected at a single point in time. Consequently, the study did not account for potential changes in technology adoption practices or productivity levels over time. A longitudinal study, which tracks changes and developments over an extended period, would offer a more comprehensive understanding of how technological advancements and workplace dynamics evolve.

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APPENDIX

Questionnaire

Dear,

Thank you for participating in this survey. Your opinion is very important to us. All answers will be strictly confidential and used only for research purposes.

Part 1: Demographic Information (Personal Information Questions)

Demographic Question	Response Options
1. What is your gender?	Male / Female / Other
2. What is your age group?	Under 20 / 21-30 / 31-40 / 41-50 / 51+
3. What is your current position at BYD Thailand?	(Open-ended)
4. How long have you been working at BYD Thailand?	Less than 1 year / 1-3 years / 4-6 years / 7+ years
5. What is your level of involvement in technology adoption at BYD Thailand?	Very involved / Somewhat involved / Not involved

6. What is your educational background?	High school / Associate degree / Bachelor's degree / Master's degree / Doctorate

Part 2: Likert Scale Questions (Technology Adoption, Employee Productivity, and Operating Efficiency)

Variable	Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Technology Adoption	BYD' s adoption of advanced technology has improved the overall efficiency of operations in Thailand.	1	2	3	4	5
	Our organization has fully embraced digital technology in daily operations.	1	2	3	4	5
	Employees are provided with adequate training to use new technologies.	1	2	3	4	5
	Technology adoption has simplified many of our business processes.	1	2	3	4	5
	The company invests significantly in upgrading technological infrastructure.	1	2	3	4	5
	Our company frequently updates its technological systems.	1	2	3	4	5
	We use advanced software tools to improve workflow efficiency.	1	2	3	4	5
	Technology adoption has led to better decision-making within the company.	1	2	3	4	5
	Employees are encouraged to adopt new technology as part of their roles.	1	2	3	4	5

	The organization uses technology to collect and analyze data for improvement.	1	2	3	4	5
	New technological tools have been integrated smoothly into our operations.	1	2	3	4	5
	The implementation of digital tools and automated systems has streamlined production processes at BYD in Thailand.	1	2	3	4	5
Employee Productivity	The productivity of employees at BYD in Thailand has increased due to the integration of modern technology in their daily work.	1	2	3	4	5
	Employees' productivity has increased since adopting new technologies.	1	2	3	4	5
	Technological tools help employees complete tasks more efficiently.	1	2	3	4	5
	Employees are able to focus more on strategic tasks due to technology.	1	2	3	4	5
	The introduction of new technologies has enhanced the quality of employee work.	1	2	3	4	5
	Technology adoption reduces the time employees spend on routine tasks.	1	2	3	4	5
	Employees are more engaged in their work because of technological support.	1	2	3	4	5
	The technology used at work increases overall productivity levels.	1	2	3	4	5

	Technology adoption has made it easier for employees to collaborate.	1	2	3	4	5
	Employees experience fewer distractions with the help of technology.	1	2	3	4	5
	Employees can manage their time better with the aid of new technologies.	1	2	3	4	5
	Training and development programs related to new technologies have significantly enhanced employee performance at BYD in Thailand.	1	2	3	4	5
Operating Efficiency	BYD's overall operating efficiency in Thailand has improved as a result of higher employee productivity and technology adoption.	1	2	3	4	5
	Technology adoption has increased our organization's operating efficiency.	1	2	3	4	5
	Improved technology systems have led to cost savings for the company.	1	2	3	4	5
	The use of technology has reduced operational errors in our company.	1	2	3	4	5
	Operating processes have become faster with the implementation of technology.	1	2	3	4	5
	The company's operating efficiency has improved due to the integration of digital tools.	1	2	3	4	5
	Technology adoption has reduced the need for manual interventions in operations.	1	2	3	4	5

	Employees' productivity directly contributes to higher operational efficiency.	1	2	3	4	5
	The organization has seen noticeable improvements in efficiency after adopting new technologies.	1	2	3	4	5
	Technology has helped to streamline interdepartmental workflows.	1	2	3	4	5
	The overall performance of the organization has improved with the use of technology.	1	2	3	4	5

Thanks!