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CREATING A SUSTAINABLE DEVELOPMENT PLAN USING BIG DATA IN SUPPLY CHAIN MANAGEMENT PROCESSES FOR THE NEW S-CURVE INDUSTRY IN THE BANGKOK METROPOLIS AND VICINITY AREA

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ABSTRACT

Bangkok and Central Thailand are strategically important locations as they are the country's production, transportation, and communication hubs. This research aims to investigate the creation of a sustainable development plan that utilizes the process of supply chain management based on Big Data for the New S-Curve industry in the Bangkok metropolis, Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Prakan and Samut Sakhon. As part of the quantitative research, a total of 400 samples were collected from industrial enterprises in the New S-Curve group in Bangkok and surrounding areas. The data was analyzed using structural equations. The research results show that the sustainability of the New S-Curve industry in Bangkok and surrounding areas is statistically significant with a predictive power of 93 percent due to the combined influence of big data (TE=0.96) and supply chain management (TE=0.85).

Keywords: supply chain management, big data, new S-curve industries, sustainability

1. INTRODUCTION

The rise of new industries (New S-Curve) is crucial for Thailand's transition to Industry 4.0 (Nuanpradit, 2022). The government has taken steps to encourage investment by designating 10 targeted industry groups (S-Curve) and directing technology agencies to align with this policy. Companies in these industries are encouraged to rapidly adapt their organizational structures and operations (Banmairuroy, Kritjaroen, & Homsombat, 2022) and integrate new technologies to remain competitive in the face of global changes in customer behavior and business operations (Jones & Pimdee, 2017).

The Industry of the Future (New S-Curve), presented by the Ministry of Industry to the Cabinet in 2015, has significant implications and defines industry as the driving force of the future economy (Suphapanworakul, Kaewurai, & Nilsook, 2020). This definition categorizes industry into five existing sectors with expansion potential (First S-curve) and five future industries (New S-curve). The five existing industries with potential are: 1) next-generation automobiles, 2) smart electronics, 3) affluent medical and wellness tourism, 4) agriculture and biotechnology, and 5) food of the future. The five future industries include robotics, aviation and logistics, biofuels and biochemicals, the digital industry and the medical hub (Kumpirarusk & Rohitratana, 2018).

According to a report by Krungsri Research Center, which highlights key industry trends for 2021-2023 in Bangkok and the surrounding areas, Bangkok and the central region have a strategic advantage due to its central location as the nation's manufacturing and transportation hub. The region includes the Bangkok metropolitan area, where most of the highest unit pricing industrial estates in the area. It also includes major industrial provinces such as Samut Prakan, Ayutthaya, Saraburi, Ratchaburi and Samut Sakhon. The central region's industrial districts have focused on sectors such as auto parts, electrical appliances, electronics, and businesses that rely on locally available resources, such as food processing and construction materials. The region is also home to manufacturing facilities for small and medium-sized enterprises (SMEs). The business parks in this region faced challenges during the flood crisis in 2011, resulting in a decline in land sales and rentals, which accounted for only 8.6% and 4.8% of total space for sale and rent in 2012 and 2013, respectively. However, from 2014-2018, the proportion of

space sold and leased increased significantly, indicating the growth potential of the area. Commercial areas in Bangkok and the central region continue to attract investor interest (Krungsri Research, 2021, p.3-4).

In order to promote the competitive advantage of the industry of the future, the New S-Curve, the problem of the lack of big data systems in the process of supply chain management has not been adequately addressed or effectively solved (Addo-Tenkorang & Helo, 2016). Supply chain management includes main activities and supporting activities in operations, such as increasing sales, reducing production costs, minimizing waste, improving production and service efficiency, and reducing transportation costs, among others. These goals can be achieved by implementing new work processes and robust databases to achieve tangible development results (Copacino, 2019). Industries within the New S-Curve group need to utilize big data-driven supply chain management systems to operate sustainably. Such systems can increase production potential, improve understanding of customer needs based on past experiences, mitigate investment risks, support decision-making processes and potentially lead to the creation of new business models. Implementing efficient supply chain management processes will add significant value to the New S-Curve industry (Jain et al., 2019).

To ensure the sustainability of supply chain management in the New S-Curve industry with the help of big data, it is important to consider the need for accurate forecasts or estimates. Logistics processes that span the entire supply chain (Schoenherr & Speier-Pero, 2015) make it necessary for industries in this group to rely on the prediction of production and labor trends through the analysis of big data systems. This can increase efficiency from planning to effective utilization of resources, thus reducing unnecessary costs in the supply chain (Taweethavornsawas et al., 2021). In addition, it facilitates effective risk management in the supply chain by enabling the assessment of the current business environment based on the available data, thus reducing risks by reviewing, analyzing, and evaluating interconnected data. In addition, there is a system for notification of various events for the New S-Curve industry, especially unexpected events (Hofmann, 2017).

The integration of supply chain management processes using big data will lead to sustainable development in the industry and focus on three important elements derived from the concept of corporate sustainability: environmental sustainability, social sustainability, and economic sustainability (Hansmann, Mieg, & Frischknecht, 2012). The Department of Industry Promotion has established policies and strategies that align with the UN agency's mission for the Sustainable Development Goals (SDGs), which serve as the post-2015 development agenda for a 15-year period (roughly 2016-2030). The heads of state and government of 194 member countries of the United Nations, including Thailand, have jointly signed the document "Transforming Our World" and endorsed the commitment contained therein: The 2030 Agenda for Sustainable Development" to set the direction of sustainable development globally for the next 15 years. This commitment reaffirms the shared intention to eradicate poverty in all its dimensions and forms. There are 17 main goals covering the three pillars of sustainable development: Economic, Social and Environmental (Department of Industrial Promotion, 2019), which guide the activities of New S-Curve industries towards sustainable success.

It is evident that studies on sustainable development in the New S-Curve industry have not yet been sufficiently conducted. This could be due to time constraints or difficulties in accessing industry players for research data. The importance of the supply chain management process using Big Data is increasingly recognized as a guideline for promoting sustainability in the future of the New S-Curve industry. The researcher recognizes the importance of creating guidelines for a sustainable development plan based on the supply chain management process using Big Data for the New S-Curve industry in Bangkok and surrounding areas and acknowledges the need for such guidelines. The results of this research process will provide important information for all stakeholders to formulate effective supply chain management guidelines by integrating Big Data. This will enable the New S-Curve industry to effectively manage economic crises that may occur in the future and be better prepared than the planning guidelines for dealing with the Covid-19 outbreak in Thailand in the past. In addition, it will serve as a valuable foundation for future research efforts related to this industry.

RESEARCH OBJECTIVE:

To investigate the impact of supply chain management using big data on sustainability in the New S-Curve industry in Bangkok and its surrounding areas.

2. LITERATURE REVIEW

Supply Chain Management

The management of diverse industry activities has been more complex, aligning with social and economic trends. There is a growing necessity to foster collaboration among numerous raw material suppliers to effectively meet customer demands (Trkman, Budler & Groznik, 2015). This concept aids in cost reduction and enables efficient responsiveness to customer needs. Administrative techniques, operations, and information technology play pivotal roles in crafting a Supply Chain Management Model, which serves as a decision-making tool in operations (Asamoah et al., 2021). Supply chain management entails comprehensive guidelines spanning from upstream to downstream, encompassing environmental, social, and governance aspects. This holistic approach ensures effective linkage of operational processes between organizations and stakeholders within the supply chain network, fostering collaborative efforts towards sustainability throughout the system. Such endeavors yield positive impacts on customers, society, and the environment at large (Suharitdamrong, 2016). Business organizations confront escalating risks, primarily stemming from the increasing number of trading partners within the supply chain. This phenomenon is driven by shared objectives of inventory reduction (Kersten, Hohrath, Boeger, & Singer, 2011, p.1). Successful supply chain management within an organization necessitates the development of a structured supply chain analysis model to cultivate relationships across different dimensions of supply chain management. The outcomes serve as inputs for analyzing the overall efficacy of supply chain management, fostering maximum efficiency within the organization (Gorane & Kant, 2015).

The supply chain management process must also consider the flow of the supply chain starting from raw material/component suppliers, manufacturers, wholesalers/distributors, retailers, to consumers, by applying strategies, methods, practices, or theories to effectively manage from one unit in supply chain activities to another unit (Kamglang, 2017, p.49). Supply chain management creates value for customers by coordinating the activities of all participants. However, most organizations strive to reduce their own inventory. The organization maintains efficiency by employing standard inventory control methods and financial evaluation to assess organizational performance (Shahabuddin, 2010). An essential aspect called the value chain, according to Porter's concept (1985), helps understand the role of each operating unit in aiding business organizations to create value and deliver it to customers. The value a company creates can be measured by the amount consumers are willing to pay for the company's products or services. This concept divides activities within the organization into two main categories: Primary Activities and Support Activities. All types of activities contribute to adding value to the organization's products or services. The five primary activities are related to producing or creating products or services, marketing and transporting goods or services to consumers, which consist of: 1) Inbound Logistics: Activities related to receiving, transporting, storing, and distributing raw materials, and inventory management, 2) Operations: Activities related to changing or transforming raw materials into products through production and packaging steps, 3) Outbound Logistics: Activities related to storing, collecting, and distributing products and services to customers, 4) Marketing and Sales: Activities related to persuading customers to purchase products and services, such as advertising and distribution channels, 5) Services: Activities covering providing services to add value to products, including after-sales service and usage recommendations (Sopadang, Tippayawong & Chaowarut, 2012).

As for supporting activities, they are activities that aid in supporting the main activities to proceed smoothly. They consist of: 1) Procurement: activities involved in purchasing inputs for use in main activities, 2) Technology Development: activities related to the development of technology aimed at enhancing the value provided to products and services or improving production processes, 3) Human Resource Management: Activities related to managing human resources, including analysis of work, recruitment and selection, evaluation, development, training, salary system, and labor relations, 4) Firm Infrastructure: The foundational structure of an organization,

including the accounting system, financial system, and overall management of the organization (Pal & Altay, 2019).

However, value may have different meanings from different perspectives. For example, from a customer's perspective, value may entail affordability, improved product quality, enhanced service provision, uniqueness, or product integrity. Value is derived from the knowledge, experience, skill, time, and resources that the organization invests in the product or activity. The value chain plays a crucial role in the organization, not only in product production but also in providing enhanced services. By adding value to products or services, organizations can achieve success in their business operations (Fotiadis et al., 2022).

Value chain management comprises two elements that play pivotal roles: Supply Chain Management (SCM) and Customer Relationship Management (CRM). The supply chain assists in decision-making processes such as determining which resources or raw materials should be incorporated into the value chain, the quantity to be imported, how these resources or raw materials will be managed or processed to transform them into products or services aligning with customer needs, and how to distribute products to customers. This includes determining the delivery schedule and implementing monitoring and control measures for product delivery (Mehrmanesh, Parikhi & Fazlollahtabar, 2013).

BIG DATA

Big Data, according to the definition provided by the Office of the Royal Society (2019) as outlined by the Computer and Information Technology Dictionary Committee, refers to the rapidly increasing amount of diverse data. This includes data from sources such as website search indexes, mobile phone communications, social networks, weather forecasts, satellite images, and more (Computer and Information Technology Dictionary Committee, 2019). Big Data is closely related to data analysis, reflecting the growing importance of statistical analysis due to the complexity, and increasing volume of data. This entails the development of principles focusing on probability theory, regression analysis, and design of experiments (Angrist & Pischke, 2010, p.24).

Big data possesses important characteristics as described by Abdullah et al. (2015) as follows: 1) Volume: large volumes of data at the terabyte or petabyte level and above, 2) Velocity: data that changes continuously and rapidly, 3) Variety: diverse types and nature of data, including structured, semi-structured, or unstructured formats such as images, text, and video, 4) Veracity: data quality and reliability, which is crucial because low-quality data lacks credibility when analyzed, and 5) Value: data that holds value and can be utilized or is significant to the business, according to Varian (2014, p.28). Two intriguing issues related to big data are the challenge of storing and managing large volumes of data, and the challenge of analyzing data using statistical methods.

Collecting and analyzing large amounts of big data is not necessarily indicative of the success of a business organization. The primary objective lies in creating tangible business value from the evidence gathered. Empirical evidence demonstrates that businesses leveraging big data for decision-making have clearer work direction, leading to enhanced productivity and profitability (McAfee & Brynjolfsson, 2012). Marketing researchers utilize social media big data to identify various business opportunities globally, maintaining target markets and customer engagement, rather than solely engaging in traditional product sales (Business-to-Customer) (Chen, Chiang, & Storey, 2012; Lusch, Vargo, & Tanniru, 2009, p. 4). It is evident that big data plays a crucial role across various domains in driving business, as highlighted by the World Economic Forum (2011), emphasizing its significance in business operations and the increasing volume facilitated by advancements in information technology channels. This development fosters communication among employees, customers, and business partners, extending from data warehouses and Business Intelligence (BI), which are of keen interest to business organizations due to their potential to boost profits and gain competitive advantage (Şirin & Karacan, 2017). An exemplary case illustrating the competitive advantage garnered through the use and analysis of big data is the department store Walmart, which utilizes big data analysis to enhance supply chain efficiency by refining pricing models (Hartmann et al., 2014).

Utilizing big data to analyze products and services in business can be approached in three ways (Gantz & Reinsel, 2012, p.9): 1) analyzing business situation data, 2) analyzing data and presenting results of products and services, and 3) analyzing the overall composition of big data. Therefore, analyzing the problems and challenges in the methodological areas for big data analysis and design is essential. Many well-known businesses have developed the ability to analyze big data. However, the use of big data is not limited to the most successful businesses. It is also utilized by businesses aiming to improve existing operations or create new ventures (Kaisler, Armor, Espinosa, & Money, 2013, p.1). To successfully apply big data, it is crucial to set goals and develop the necessary strategies to achieve them. Utilizing modern technology or equipment alone is not sufficient. It is important to identify personnel, from executives to operators, who can effectively apply big data within the organization. Using big data involves more than just determining the desired report format or visual representation. It entails finding answers from data, highlighting that it is not solely a technological endeavor but also requires strategic planning (Niu et al., 2021).

Current Situation of the New S-Curve Industry in Thailand

The industry of the future (New S-Curve) in Thailand, particularly in Bangkok and its surrounding areas, is recognized as a significant hub for Thai product manufacturing with considerable potential for global market expansion. Despite experiencing some slowdowns during the epidemic crisis, the industry remains dynamic, especially in the four key product categories discussed below. These products have shown resilience amidst the COVID-19 outbreak, positioning them as emerging stars ready to penetrate the modern global economic market. These categories include medicines and biological medicines, medical equipment, alternative food, and herbs. Thai products in these sectors are deemed noteworthy and align with government policies aimed at promoting new target industries (New S-Curve). Such policies encompass aspirations of establishing Thailand as a comprehensive medical center (Medical Hub), a hub for high-quality agricultural products and food worldwide, and embracing concepts such as the bio-circular-green economy (BCG), which enhance product value and bolster the country's competitiveness. Furthermore, these initiatives contribute to strengthening Thailand's local economy by accelerating the establishment of production standards, promoting the upgrading of Thai products, and capitalizing on emerging opportunities. The Office of Trade Policy and Strategy (O.T.C.) has compiled a study report titled "Guidelines for enhancing the potential of products in the pharmaceutical and biological medicine, medical equipment, alternative foods, and herbs group," along with policy recommendations aimed at integrating the commercial industry into the modern trade economy context, generating income, and driving the nation's GDP (Katchwattana, 2021). Thailand is well-prepared to address the COVID-19 outbreak and has set ambitious goals to establish itself as a medical and export center (Medical Hub) for the complete medical industry, as well as agriculture and biotechnology. This exemplifies a crucial target industry (New S-Curve) that the government is committed to supporting through investments, particularly in Bangkok and its surrounding areas. Efforts are directed towards enhancing competitiveness through technology adoption and innovation to create added value for products and services, along with leveraging big data to bolster the country's competitive ability.

Government Measures to Stimulate Investment in the New S-Curve Group

The government has recognized the importance of investing in the New S-Curve Group and has been planning operations for a long time. As evidenced by events from 2015 show, the government has adopted the Ministry of Industry's proposal titled "10 Targeted Industries: Engines of the Economy for the Future" as a long-term measure to restructure the country's production structure in the agriculture, industry, and services sectors. The aim is to improve efficiency, competitiveness, and the creation of quality work and to support the regional economy systematically, continuously, and sustainably. This is based on three central assumptions:

(1) The weakness of the economy is attributed to minimal investment. Therefore, the identification of a target industry is crucial. Statistical data shows that competition in Asia has intensified significantly over the last decade, but Thailand has been slow to adapt, leading to an economic recession.

(2) This recession is primarily since Thailand has not made serious and sustained efforts to accelerate investment. As a result, production efficiency and competitiveness have become the biggest challenges for Thailand's

economic structure. Historical data shows that investment in Thailand has only increased by 2 percent per year over the past decade, while the Thai private sector has reduced its investment from 14 percent to 3 percent per year, while the growth rate has been 9-10 percent per year.

(3) Thai investment has different characteristics recently; it is widely dispersed and not unified. Therefore, Thailand must strive to increase investment by 10 percent per year as in the past. This will be enough to realize its full potential and compete with other countries again (Saengsuphan, 2015).

To incentivize the development of the New S-Curve group, the government, through Limpichamnong (2023), Director of the National Science and Technology Development Agency (NSTDA), has proposed measures to reduce resource consumption and environmental pollution through the introduction of technologies. The government has recognized that the transition from current industries to new industries requires the integration of technologies and is therefore offering tax exemptions and incentives:

- New entrepreneurs venturing into the new S-curve with advanced technology will be exempted from corporate income tax for 5 years,
- Joint ventures that invest in advanced technology businesses within the New S-Curve sector will be exempt from tax on investment income for 10 years, and
- Investors who invest their income in technology businesses can benefit from tax deductions of up to 100,000 baht.

Based on the literature review, the following conceptual framework can be presented as follows:

Conceptual Framework

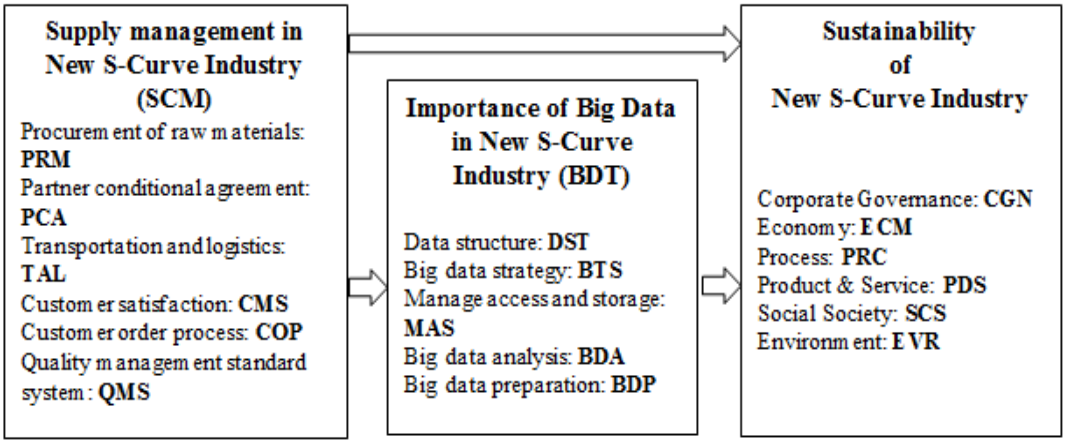

Figure 1 Conceptual Framework

3. RESEARCH METHODOLOGY

1. **Population and Sample Group**: The population utilized for conducting the research comprises 295,260 industrial entrepreneurs belonging to the New S-Curve group, with business establishments located in Bangkok and its surrounding areas (National Statistical Office, 2020). This population is segmented into five industrial groups: robotics industry, aviation and logistics industry, biofuels and biochemicals industry, digital industry, and integrated medical industry. The sample size was determined using Yamane's formula (1970), with a confidence level of 95 percent and an error level of 5 percent (Wanichbancha, 2017). The study employed a sample size of 400 individuals. Random sampling was conducted utilizing the quota sampling method, segregating industrial operators based on their respective provinces as follows:

Table 1: Proportion of the sample

Province	Number of entrepreneurs (persons)	Number of sample data collected
Bangkok	135,648	184
Nakhon Pathom	19,181	26
Nonthaburi	29,943	41
Pathum Thani	48,927	66
Samut Prakan	39,992	53
Samut Sakhon	21,569	29
Total	**295,260**	**400**

2. **Research Tools**: A questionnaire was employed as the primary tool for data collection. The creation and development of the research tools involved studying concepts, theories, documents, and relevant research findings, which were utilized to formulate the questionnaire. The process entailed defining the concept and scope of the content and drafting a questionnaire to address the research scope comprehensively. Subsequently, the completed questionnaire underwent content validity testing by experts to ascertain the confidence value.

3. **Data Analysis**: The statistical methods employed to analyze the data encompassed frequency, percentage, mean, standard deviation, skewness, kurtosis, and structural equation analysis, facilitating path analysis.

4. RESEARCH RESULTS

The analysis of basic information regarding the current state of industries within the New S-Curve group and the characteristics of respondents revealed several key findings. It was observed that the development trajectory of businesses towards becoming part of the New S-Curve industry primarily emphasizes the establishment of alliances or business partnerships, constituting 40.75% of respondents. Furthermore, a significant proportion of industrial operations operate as limited partnerships, accounting for 39.50% of respondents. Among the industries poised for development within the New S-Curve sector, aviation and logistics emerge as the most prominent, with 28.75% indicating readiness for advancement. Regarding the duration of industry operation, the majority falls within the range of 16 to 30 years, encompassing 26.25% of respondents. Additionally, the predominant location of industrial operations is concentrated in Bangkok, representing 46.00%of respondents.

Table 2: Supply Chain Management Processes in the New S-Curve Industry

	Mean	SD	Skewness	Kurtosis
Procurement of raw materials: PRM	4.30	0.57	-0.81	-
Partner conditional agreement: PCA	4.25	0.55	-0.54	-
Transportation and logistics: TAL	4.21	0.59	-0.60	0.12
Customer satisfaction: CMS	4.24	0.57	-0.72	0.12
Customer order process: COP	4.19	0.54	-0.61	0.18
Quality management standard system:	4.29	0.52	-0.69	0.30
TOTAL	**4.25**	**0.56**	**-0.66**	**0.08**

The overall supply chain management process in the New S-Curve industry has been rated at the highest level (Mean = 4.25). The top three components receiving the highest evaluations were procurement of materials (Mean = 4.30), quality management standards system (Mean = 4.29), and conditional agreement (Mean = 4.25), respectively.

Table 3: Importance of Big Data in the New S-Curve Industry

	Mean	SD	Skewness	Kurtosis
Data structure: DST	4.15	0.65	-0.58	-0.50
Big data strategy: BTS	4.22	0.58	-0.58	-0.18
Manage access and storage: MAS	3.82	0.55	-0.03	-0.10
Big data analysis: BDA	3.68	0.68	-0.15	0.76
Big data preparation: BDP	3.64	0.68	-0.07	0.31
TOTAL	**3.90**	**0.63**	**-0.28**	**0.06**

The overall importance of big data in the New S-Curve industry is at a high level (Mean = 3.90). The top three factors that received the highest evaluations were strategies regarding big data (Mean = 4.22), data structure (Mean = 4.15), and data access, management, and storage (Mean = 3.82), respectively, as assessed through survey responses.

Table 4: Sustainability Assessment for the New S-Curve Industries in Bangkok and Surrounding Areas

	Mean	**SD**	**Skewness**	**Kurtosis**
Corporate Governance: CGN	3.71	0.63	0.01	-0.05
Economy: ECM	3.72	0.69	-0.17	-0.33
Process: PRC	3.72	0.70	0.12	-0.35
Product & Service: PDS	3.74	0.74	-0.02	-0.16
Social Society: SCS	3.77	0.69	-0.11	-0.46
Environment: EVR	3.71	0.69	-0.23	0.71
TOTAL	**3.73**	**0.69**	**-0.07**	**-0.11**

Sustainability for the New S-Curve industry in Bangkok and the surrounding area is rated at a high level (Mean = 3.73). The top three factors receiving the highest evaluations were: sustainability of social structure (Mean = 3.77), sustainability of products and services (Mean = 3.74), and economic sustainability (Mean = 3.72), respectively.

The results of the supply chain management analysis, relying on big data, affect sustainability in the New S-Curve industry.

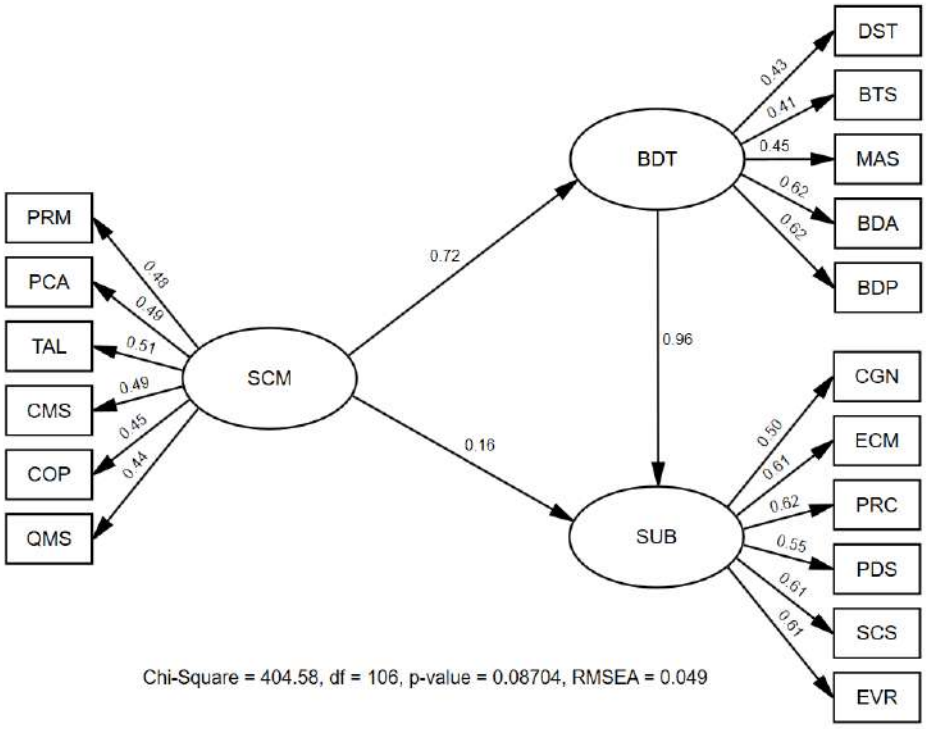

Figure 2: Supply Chain Management Impacted by Big Data for Industrial Sustainability in the New S-Curve Group, Bangkok, and Surrounding Areas (Adjusted Model)

Table 5: Results of Path Analysis

	Big Data (BDT) R^2=0.57			**Sustainability (SUB) R^2=0.93**		
	DE	**IE**	**TE**	**DE**	**IE**	**TE**
Supply chain management (SCM)	0.72** (0.06) 11.52	- - -	0.72** (0.06) 11.52	0.16* (0.04) 3.40	0.69** (0.06) 11.71	0.85** (0.05) 14.36
Big Data (BDT)				0.96** (0.08) 11.75	- - -	0.96** (0.08) 11.75

χ^2 = 404.58, df = 106, χ^2/df = 3.81, RMSEA = 0.049, NFI = 0.950, CFI = 0.950, GFI =0.930,

AGFI =0.950, SRMR = 0.049

Presented values: EP = Estimation Parameter, SE = Standard Error, t-value

DE=Direct Effect / IE = Indirect Effect/ TE = Total Effect

The research results indicate that the sustainability of the New S-Curve industries in Bangkok and surrounding areas is influenced by the combined effects of big data (TE = 0.96) and supply chain management (TE = 0.85), both of which are statistically significant and collectively contribute to a predictive power of 93 percent. Furthermore, the impact of supply chain management on the New S-Curve industry through big data (TE = 0.72) is also significant, with a predictive power of 57 percent.

In addition, the results indicate that supply chain management has a direct impact on the sustainability of the New S-Curve industry in Bangkok and surrounding areas (DE = 0.16). This impact is less than the indirect effect of

supply chain management through big data, which has an impact on the sustainability of the New S-Curve industries in Bangkok and surrounding areas (IE = 0.69), approximately 4.31 times greater.

In practice, it is essential that New S-Curve businesses rely on big data as a core element. The results of the study suggest that the sole use of a supply chain management system has less positive impact on business sustainability than the use of big data for decision making, including the inclusion of supply chain management systems that rely on big data for decision making. This is mainly because investments in New S-Curve ventures are expensive and high risk. Should a company make a wrong decision, relying on the right big data can mitigate this risk factor and support sustainable business operations.

Examples of the significant benefits of big data in supply chain management include helping to analyze data to accurately predict customer demand, facilitating the development of a just-in-time (JIT) production system, thereby improving the efficiency of inventory management, and enabling real-time tracking of inventory and material flow. In addition, big data helps to predict demand for electronic components, enabling adaptation to technological changes, among other benefits.

5. DISCUSSION

The sustainability of the New S-Curve industries in Bangkok and surrounding areas is influenced by the combined effects of big data and supply chain management, which are statistically significant. This finding is in line with the research findings of Poompurk and Chienwattanasook (2022) who investigated the integration of Big Data in the process of supply chain management to promote sustainability in the MICE industry. Their study demonstrates the sorting and filtering of big data, which enables the development of architectures to extract information from large amounts of disparate data through complex processing, ultimately saving time and costs. Furthermore, it supports the findings of Mollenkopf, Frankel & Russo (2011), who suggest that supply chain management involves integrating information sharing, risk sharing, collaboration, and a focus on serving the customer, leading to process integration and partnership to build long-term relationships. Similarly, Chienwattanasook and Jermsittiparsert (2018) found that supply chain integration and risk management practices positively influence supply chain performance. In addition, Waller & Fawcett (2013) suggested that the use of big data in supply chain management, particularly in predictive analytics to forecast the Discount Payback Period (DPB), enables organizations to respond to changes and fluctuations in uncertain business environments. Gaining useful information within the supply chain promotes the sustainable growth of companies.

2. Sustainability of the New S-Curve industry in Bangkok and surrounding areas: It was found that the main impact came from big data rather than supply chain management. These research findings are consistent with those of Singh and El-Kassar (2019), who suggest that the use of big data helps companies achieve their goals by making better decisions and improving organizational efficiency. However, the importance of big data lies not only in the vast amount of data stored, but also in its ability to be analyzed to gain insights that add value to the business (Duan & Xiong, 2015). This finding is in line with the research of Chienwattanasook and Jermsittiparsert (2018), who found a significant correlation between organizational sustainability and supply chain efficiency. Furthermore, Chienwattanasook et al. (2022) emphasized the importance of investing in and leveraging information management systems and technology in Industry 4.0 to improve the efficiency in order management processes and ensure supply chain sustainability.

In conclusion, Big Data-driven Supply Chain Management systems offer numerous benefits for industries in the New S-Curve group:

(1) Increasing operational efficiency: These systems aid in analyzing data to identify weaknesses and opportunities for enhancing inventory management efficiency. They also help in reducing operating costs and optimizing transportation and logistics,

(2) Forecasting: By tracking inventory and material flow in real-time, these systems enable accurate prediction of customer needs and swift responses to market changes,

(3) Enhancing decision-making efficiency: Big Data insights empower entrepreneurs to make informed decisions, thus reducing risks in decision-making and increasing profit opportunities,

(4) Enabling flexible management: These systems facilitate quick adaptation to market changes and better coping with unexpected events, and

(5) Improving customer service: By directly responding to customer needs, these systems enhance the customer experience.

6. POLICY RECOMMENDATIONS

1. The sustainability of the New S-Curve industry in Bangkok and surrounding areas requires supply chain management utilizing Big Data, especially focusing on the completeness of data to facilitate decision making and respond quickly and accurately to dynamic changes to create a competitive advantage. Therefore, all stakeholders must work together to create a comprehensive database. This includes the development of data structures, a big data strategy, access to data, its management and storage, and the systematic preparation of big data. Although the Digital Government Development Office was established as a public organization to develop Thailand's big data system as an open data repository from which businesses can download data for use, access to important information that affects the country's competitiveness can still be limited in today's global business environment. Therefore, the government needs to take concrete measures to ensure access to vital information for New S-Curve Group companies. This remains a challenge to the ability of the government sector to build a robust data network that can be effectively utilized and ensure accuracy and stability in information sharing between entrepreneurs and between the government sector and entrepreneurs.

2. This study has found that the sustainability of the New S-Curve industry is both directly and indirectly influenced by supply chain management. Although the direct influence of supply chain management factors is less than the indirect influence of big data, it is considered very important and indispensable as a supporting factor for the sustainability of the New S-Curve industry in Bangkok and surrounding areas. Entrepreneurs need to be aware of effective supply chain management practices ranging from material sourcing and entering into conditional agreements to transportation and logistics, creating customer satisfaction, operational cost management, and implementing a system of quality management standards. These practices help to reduce the business risks associated with the supply chain and strengthen its role as a key tool for creating competitive advantage. For example, the complexity of individual activities in the supply chain is reduced in order to increase operational flexibility and avoid risks by planning with foresight and flexibility depending on the situation. In addition, the use of big data must be systematically integrated with linked data so that big data management technology becomes the key player.

3. Big data-driven supply chain management in the New S-Curve offers the industry many advantages. However, there are still some limitations, such as the need for investment in technology, the demand for specialized skills and data security issues. Therefore, the various industries in the New S-Curve group should prepare for the introduction of this system.

7. SUGGESTIONS FOR FUTURE RESEARCH

Future research should consider extending the study to the New S-Curve industries in the wider region. This extension will provide a clearer understanding of the use of Big Data, considering the different levels of readiness and differences in basic utilities across territories. Comparative studies between regions could be conducted to improve the clarity and comprehensiveness of the research findings.

To gain deeper insights at the policy level, future research could use qualitative methods, such as conducting in-depth interviews with key stakeholders who influence policy decisions about big data systems. These could include senior officials from ministries, representatives from organizations such as the Thai Chamber of Commerce and the Confederation of Thai Industry, and the presidents of relevant associations. Such research efforts would provide valuable insights that could inform future policy development in this area.

In this study, the quota sampling method was used to proportionally distribute the representatives from each province. However, the sample was still accessed using a method that is not based on the principle of probability, which leads to limitations in the methods of data collection. Therefore, the researcher suggests using a stratified random sample at the next opportunity to continue the work and gain more effective access to the sample. Alternatively, they can extend the survey of New S-Curve entrepreneurs to the whole of Thailand by using a multistage sample.

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