ORGANIZATION MANAGEMENT GUIDELINES IN THE CHEMICAL INDUSTRY TO DEAL WITH A CHANGING ENVIRONMENT IN THE DIGITAL ECONOMY

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ABSTRACT

Aim: *This research was to study the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy.*

Methodology: *This was inductive research with mixed-methodology techniques including qualitative research through in-depth interviews and quantitative research by collecting the data of 500 questionnaires distributed to business executives of the chemical industry divided into Small and Medium Enterprises (SMEs) and large enterprises and analyzing the data using the Structural Equation Model (SEM). Finally, SEM was fit in accordance with empirical data.*

Finding: *The results reveal that: 1) The organization management guidelines in the chemical industry to deal with a changing environment in the digital economy consist of four factors i.e. Leading Change, Innovation and Technology, Marketing and Risk Control. The analysis of the importance level shows a high importance level overall and for each factor, 2) The development of SEM shows that the model fits with the empirical data at the 0.102 Chi-Square Probability level, Relative Chi-Square at 1.106, Goodness of Fit Index at 0.953 and Root Mean Squared Error of Approximation at 0.015, 3) The hypothesis results show the following influencing factors: Leading Change has direct influence on Risk Control at the statistically significant level of 0.001, Innovation and Technology at the statistically significant level of 0.001, and Marketing at the statistically significant level of 0.05. Risk Control has direct influence on Marketing at the statistically significant level of 0.001 and Marketing has direct influence on Innovation and Technology at the statistically significant level of 0.001.*

Conclusion: *This research found that the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy are a successful strategy to adapt to volatile external factors, rapid change, uncertain change in technology, changes in consumer behavior and the need for increased long-term sustainable competitiveness. The evaluation of SEM in organization management in the chemical industry to deal with a changing environment in the digital economy showed the empirical data fit the passing criteria of the SEM model. It was found that Chi-Square Probability Level equaled 0.102, Relative Chi-Square was 1.106, Goodness of Fit Index was 0.953 and Root Mean Squared Error of Approximation was 0.015.*

INTRODUCTION & LITERATURE REVIEW

Nowadays, businesses have to be agile and adapt to a rapidly changing world. In the petrochemical industry, the procurement of raw materials is critically important and has a direct impact on the operating conditions and profitability of manufacturing processes due to the fluctuation of raw material prices (Hong et al., 2018). Governments around the world are becoming increasingly aware of plastic pollution and are introducing bans and reducing single-use plastic waste (United Nations Environment Programme (UNEP), 2018). Consumers' concern for environmental issues is global. Changing peoples' lifestyles to be more environmentally responsible is being promoted through widespread campaigns. The business sector promotes greener lifestyles and encourages less reliance on plastic bags (Suki, 2013). Consumer behavior around the world is changing, with social and environmental concerns such as biodegradable packaging. Consumers in developed countries have continued to increase the demand for organic foods. Consumers demand food be safe from chemical and pesticide residues (Export-Import Bank of Thailand, 2014).
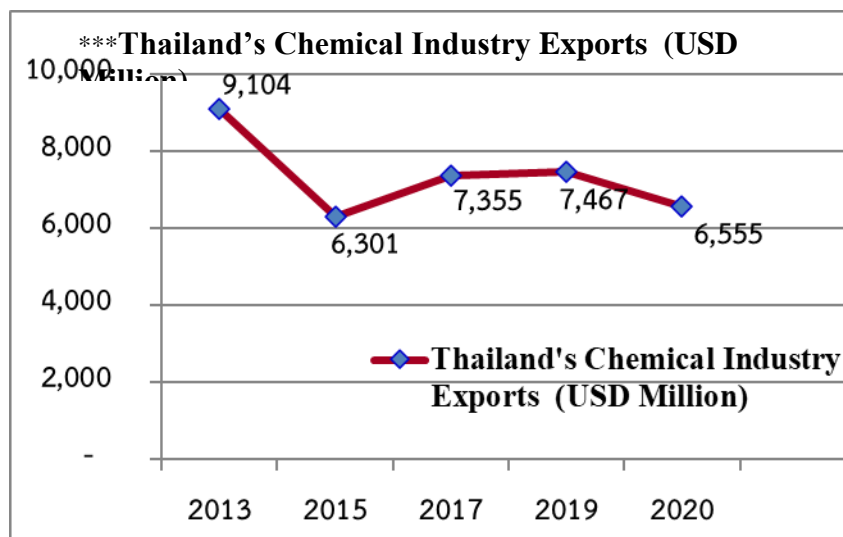

FIGURE 1
THAILAND'S CHEMICAL INDUSTRY EXPORTS (2013-2020)

Thailand's exports of chemical products have declined due to the fluctuation of the global economy and the slowdown in private investment due to uncertain economic conditions (Office of Industrial Economics of Thailand, 2015). Thailand's exports of chemicals were 6,555 million USD in 2020, a decline of 2,549 million USD or 28% from 9,104 million USD in 2013 and a decline of 912 million USD or 12% from 7,467 million USD in 2019 due to the global economic crisis following the spread of COVID-19 in 2020 to early 2021. (Ministry of Commerce of Thailand, 2020). As shown in Figure 1.

Based on the above evidence, there is an incentive to study the guidelines for organizational management in the chemical industry to deal with a changing environment in the digital economy.

Leading Change

Learning the principles of change management is a preparation that positively affects the readiness of business leaders to change their organization's behavior and the ability of these leaders to accommodate change (Clepper, 2018). Support from leadership, effective communication, recognition and rewards are used by management to keep employees engaged in the workplace and have a positive impact on change, thereby increasing employee efficiency and the stability of the organization (Adeyemi, 2018). Transformational leadership: CEO leadership has a great effect on the culture of innovation, employee training and the new product development process (Sattayaraksa & Boonitt, 2018). Effective VUCA (Volatile, Uncertain, Complex and Ambiguous) business environment leaders are responsive and improve employee well-being by improving employee training to keep up with a VUCA environment. (Rimita, 2019). Organizational management planning, strategy building and problem solving help an organization address competition and future changes. Effective meetings can make organization more effective. Leaders must be careful and thoughtful before speaking, controlling themselves and not favoring any side, having skill in speaking and summarizing issues for others to understand, having clarity of thought and making reasonable decisions (Sanrach & Silpjaru, 2020).

Innovation and Technology

New product and process innovation strategies have a positive influence on the organization's performance (Pelser, 2014). Creating value by integrating environmental sustainability into the chemical industry, including cost reduction, risk reduction, product differentiation and creation of new products is responsive to customer needs (Manda et al., 2016). There is a positive correlation between environmental conservation innovation and significant sustainable business performance of chemical companies in Malaysia (Omar et al., 2017). The heavily polluting petrochemical industry is harmful to the environment, therefore using innovative waste management principles, referred to as 4Rs principles (Reduce, Reuse, Recycle, Recovery) and applying an Environmental Management System would be an effective response (Thongpracum & Silpjaru, 2020). The use of information technology in warehouse management directly affects the internal control process. Technology can be applied as a strategy or business plan to drive businesses effectively to respond to customers' needs and contribute to a business's competitive advantage (Suyanang et al., 2020).

Marketing

Marketing capabilities such as low-cost advantage and product differentiation advantage have a positive impact on export performance (Tan & Sousa, 2015). The 7P marketing model (Product, Price, Place, Promotion, People, Process, Physical Evidence) is a marketing tool which enables structuring complex changes in the commerce and information services of an online store (Pogorelova et al., 2016). The use of a Marketing Analytics Platform has a positive impact on business revenue (White, 2017). Sustainable development strategies using innovation help to meet customer needs and focus on niche markets (The Boston Consulting Group, 2017). Marketing agility is important for emerging market firms in advanced markets. Marketing agility influences firm performance. The influence of marketing agility is stronger under high market complexity (Khan, 2020).

Risk Control

Rapid technological change is a major risk to Small and Medium Enterprises (SMEs). The use of risk management processes in SMEs has a significant impact on their business strategies (Falkner & Hiebl, 2015). Export companies are affected by exchange rate fluctuations, financial instruments can effectively hedge exchange rate risk (Hericourt & Poncet, 2015). Market risk analysis and risk assessment models can optimize production by taking into account uncertainties such as raw material prices, electricity prices, product prices, changes in orders, and inventory (Chen & Murata, 2017). Uncertainty about the affects of chemicals on human health and the environment is an essential driver of chemical risk management to achieve high levels of liability protection (Jakobsson, 2017). One of the possibilities for an improved risk management strategy for dealing with hazardous chemicals is to explicitly address the re-use and re-entrance of chemicals into material chains when these chemicals are being registered for access to the market (Bodar et al., 2018). To effectively resolve safety issues arising from trace chemicals exposure, collaborative efforts are needed involving academia, government, consumer organizations, and industry. Further scientific evidence-based risk assessment is a critical approach to effectively manage trace chemical safety issues (Lee et al., 2020).

Objective

The objective of this study is to develop a Structural Equation Model (SEM) of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy.

Hypotheses

In accordance with the objective and related literature, the researchers determined five hypotheses based on the relavant theories as follows:

H_1 The Leading change factor has direct influence on the innovation and technology factor.

Transformational leadership has a positive impact on organizational innovation (Mokhber et al., 2015). Leaders who confidently deliver clear visions and goals and who motivate employees to be enthusiastic will achieve more product innovation for their organization. The more responsive a leader is to their employees' input the better the organization collaborates yielding increased product innovation (Alahmad, 2016). Inspirational leaders can motivate small businesses to increase innovation (Dunne et al., 2016).

H_2 The Leading change factor has direct influence on the marketing factor.

The democratic leadership style has an increased influence on customer satisfaction (Baptiste, 2017). Transformational leadership that drives marketing with Outside-in Marketing Capability is a strategy that focuses on customer needs, resulting in greater efficiency of the company's operations (Mu et al., 2018). Effective leaders encourage employees to develop skills and abilities to successfully implement environmentally friendly strategies. Transformational leadership that increases the focus on green marketing within the business organization will also promote green marketing to have a positive effect on competitive advantage (Papadas, 2019). The contemporary leadership style is a blend of transactional leadership, transformational leadership and employee engagement, which is a predictor of, and has a positive relationship to customer satisfaction (Melvin, 2020). The transformational leadership style has a great influence

on building quality organizational performance during periods of unpredictable market change (Whitmore, 2020).

> H_3 *The Leading change factor has direct influence on the risk control factor.*

In the risk management process, ethical leadership is highly associated with risk management (Campbell, 2015). Throughout the project management lifecycle, skilled project managers who adopt Integrated Risk Management Processes will help increase project success (Odeh, 2018). Managers, administrators and IT system controllers give very high importance to guidelines for the protection from computer crime threats in both light and heavy industry (Machim, Jariyapoom & Pornpundejwittaya, 2020).

> H_4 *The marketing factor has direct influence on the innovation and technology factor.*

Customer knowledge and customer needs have a positive effect on the participation of the customer as a contributor to innovation and as a innovator (Cui & Wu, 2016). Customer knowledge management has a high effect on service innovation capability (Janteng et al., 2018). Focusing on the market and the needs of the customer are the main features of modern marketing. Responding to changes in the marketplace has a critical role in a company's success and has a significant positive influence on market innovation (Alerasoul & Derogar, 2019). Focusing on understanding customer needs when innovating means responding to customers with innovation in order to maintain business sustainability (Fox, 2019). For successful product development, targeting specific market demographics is critical. Allowing customers to test innovative products before final product development resolves gaps between perceived and actual customer requirements and implementation problems (Azigbo, 2019). Encouraging customers to share innovative ideas is an essential part of the manufacturing and service process, creating innovative value and digital transformation (Xiaohan, 2020).

> H_5 *The risk control factor has direct influence on the marketing factor.*

Reducing the perceived risk to the customer helps improve customer satisfaction (Ghotbabadi et al., 2016). Perceived risk is uncertainty about the consequences of a consumer purchase decision. Financial risk is losing money or impression that buying now may not be worthwhile. These have a significant negative impact on customer satisfaction and willingness to pay a premium price (Casidy & Walter, 2016). The business recognition of customer risk and confidence has a direct impact on customer loyalty (Marakanon & Panjakajornsak, 2017). Recognizing and addressing the different types of risk which influence consumer attitudes towards new services increases their willingness to accept new services (Savas, 2017).

METHODOLOGY

This study was designed as inductive research with mixed methodology:

1. Qualitative research with in-depth interviews: The population in this research included nine experts who were selected through the purposive sampling method with the criteria of the qualifications of the experts determined by the Doctor of Business Administration Program, Faculty of Administration, King Mongkut's University of Technology North Bangkok, Thailand. There were three groups of these experts: (1) three representatives of business organizations, (2) three representatives of the government sector, and (3) three representatives of academic institutions.
2. Quantitative research: The population used in this research was defined as managers in the chemical industry who were registered with the Department of Business Development, the Ministry of

Commerce with a total population of 8,307 businesses (Department of Business Development, 2021). The sample size was determined using the criteria of the research, elemental analysis or Structural Equation Model (SEM). 500 samples were selected (Comrey & Lee, 2013) using a multi-stage sampling method for statistical analysis, comprising 250 data from large enterprises and 250 data from small and medium enterprises (SMEs). The research tools for the quantitative component were survey questionnaires which used five Likert's scales (Tanin, 2020). Data analysis was conducted through descriptive statistics by SPSS (Statistics Package for Social Sciences). Multivariate Statistical Analysis employed SEM by using the Analysis of Moment Structure Program (AMOS) while evaluating the Data-Model Fit in four levels including (1) Chi-Square Probability Level over 0.05, (2) Relative Chi-Square less than 2, (3) Goodness of Fit Index over 0.90, and (4) Root Mean Squared Error of Approximation less than 0.08.

3. The model of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy was approved by eleven experts using focus group analysis techniques in qualitative research with the criteria of the qualifications of the experts undertaken by the Doctor of Business Administration Program, Faculty of Administration, King Mongkut's University of Technology North Bangkok.

RESULTS

The results of analysis of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy are described as follows.

1. The business executives of both SMEs and large enterprises gave importance to the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy, the research showed a high importance level overall of 3.90 and 4.07 respectively (Table 1). When considering each aspect for SMEs, every factor was of high importance with the highest being Marketing at 3.97 followed by Leading Change at 3.95 then Risk Control at 3.85 and Innovation and Technology at 3.84. For large enterprises the business executives gave high importance to every factor with the highest on Leading Change at 4.14 followed by Marketing at 4.11 then Risk Control at 4.02 and Innovation and Technology at 3.99.

2. The comparison of importance levels of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy between SMEs and large enterprises using independent t-test statistics in SPSS showed a significant difference at the statistical level of 0.05 between the mean of the factors importance levels.

3. The evaluation of Structural Equation Modeling (SEM) of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy showed that the Chi-Square Probability level at 0.000, Relative Chi-Square at 2.186, Goodness of Fit Index at 0.644 and Root Mean Squared Error of Approximation at 0.049 which did not pass the criteria of the SEM.

Table 1 MEAN AND STANDARD DEVIATION FOR THE ORGANIZATION MANAGEMENT GUIDELINES IN THE CHEMICAL INDUSTRY TO DEAL WITH A CHANGING ENVIRONMENT IN THE DIGITAL ECONOMY						
Factors of simulation model of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy	**Small and Medium Enterprises**			**Large Enterprise**		
	$\overline{X}$	**S.D.**	**Significant Level**	**$\overline{X}$**	**S.D.**	**Significant Level**
Overall	3.90	0.44	High	4.07	0.30	High
1. Leading Change	3.95	0.48	High	4.14	0.32	High
2. Innovation and Technology	3.84	0.56	High	3.99	0.36	High
3. Marketing	3.97	0.45	High	4.11	0.42	High
4. Risk Control	3.85	0.44	High	4.02	0.38	High

Thus, the researchers revised the simulation model by considering modification indices suggested by Arbuckle (2016). After the revision of the simulation model, it was found that Chi-

Square Probability Level equaled 0.102, Relative Chi-Square was 1.106, Goodness of Fit Index was 0.953, and Root Mean Squared Error of Approximation was 0.015 passing the criteria of the model fitting with the empirical data as shown in Figure 2.

From Figure 2, it was found that the Structural Equation Model (SEM) of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy after adjustment consisted of four latent variables; (1) One exogenous latent variable which was the Leading Change factor, and (2) Three endogenous latent variables which were the Innovation and Technology, Marketing and Risk Control factors.
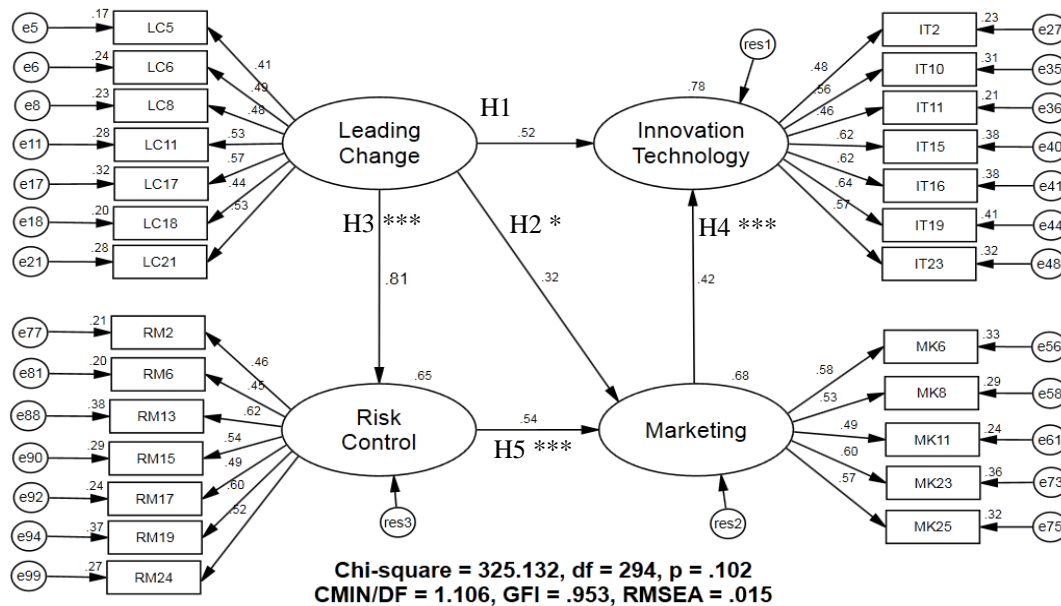

FIGURE 2
ORGANIZATION MANAGEMENT GUIDELINES IN THE CHEMICAL INDUSTRY TO DEAL WITH A CHANGING ENVIRONMENT IN THE DIGITAL ECONOMY

Table 2 STATISTICAL DETAILS OF STRUCTURAL EQUATION MODEL					
Variables	**Estimate Standard Regression Weight**	**R²**	**Variance**	**C.R.**	**P-value**
Leading Change			0.14		
Risk Control	0.81	0.65	0.04	6.45	***
Marketing	0.32	0.68	0.08	2.50	.013 *
Innovation and Technology	0.52	0.78	0.04	4.37	***
Risk Control		0.65	0.04		
Marketing	0.54	0.68	0.08	4.00	***
Marketing		0.68	0.08		
Innovation and Technology	0.42	0.78	0.04	3.99	***
Leading Change			0.14		
LC5	0.41	0.17	0.69		
LC6	0.49	0.24	0.51	7.03	***
LC8	0.48	0.23	0.43	6.99	***
LC11	0.53	0.28	0.44	7.29	***
LC17	0.57	0.32	0.31	7.56	***

LC18	0.44	0.20	0.49	6.67	***
LC21	0.53	0.28	0.53	7.31	***
Innovation and Technology		0.78	0.04		
IT2	0.48	0.23	0.54		
IT10	0.56	0.31	0.52	8.67	***
IT11	0.46	0.21	0.47	7.66	***
IT16	0.62	0.38	0.44	9.12	***
IT15	0.62	0.38	0.45	9.11	***
IT19	0.64	0.41	0.45	9.30	***
IT23	0.57	0.32	0.47	8.74	***
Marketing		0.68	0.08		
MK6	0.58	0.33	0.50		
MK8	0.53	0.29	0.49	9.17	***
MK11	0.49	0.24	0.41	8.55	***
MK23	0.60	0.36	0.34	9.90	***
MK25	0.57	0.32	0.49	9.54	***
Risk Control		0.65	0.04		
RM2	0.46	0.21	0.42		
RM6	0.45	0.20	0.53	7.22	***
RM13	0.62	0.38	0.41	8.58	***
RM15	0.54	0.29	0.48	8.02	***
RM17	0.49	0.24	0.38	7.60	***
RM19	0.60	0.37	0.38	8.49	***
RM24	0.52	0.27	0.42	7.86	***

Noted: *** Significant level at 0.001   * Significant level at 0.05

From Figure 2, the Leading Change factor was found to have a variance of 0.14. It directly influenced (H1) the Innovation and Technology factor with a standardized regression weight of 0.52, at a statistically significant level of 0.001, a squared multiple correlation (R^2) of 0.78 and a variance of 0.04, (H2) the Marketing factor with a standardized regression weight of 0.32, at a statistically significant level of 0.05, a squared multiple correlation (R^2) of 0.68, and a variance of 0.08, and (H3) the Risk Control factor with a standardized regression weight of 0.81, at a statistically significant level of 0.001, a squared multiple correlation (R^2) of 0.65, and a variance of 0.04.

The Marketing factor directly influenced (H4) the Innovation and Technology factor with a standardized regression weight of 0.42, at a statistically significant level of 0.001, a squared multiple correlation (R^2) of 0.78, and a variance of 0.04.

The Risk Control factor directly influenced (H5) the Marketing factor with a standardized regression weight of 0.54, at a statistically significant level of 0.001, a squared multiple correlation (R^2) of 0.68, and a variance of 0.08.

Table 2 shows the estimated regression weight between factors of the simulation model. Squared multiple correlations (R^2) identify the statistical relation between variables and P-values as a statistical criteria for evaluating the significance level between variables. The estimated regression weight of observed variables can be explained as follows:

The Leading Change factor consists of the seven observed variables: (1) Modify the policy, structure and operations to be in line with the change (LC17) of 0.57, (2) Giving reward, praise, recognition to motivate employees for the success of the organization (LC21) of 0.53, (3) Focus on creating a vision for personnel within the organization so that they have a good understanding of the future that the change will bring about (LC11) of 0.53, (4) Consensus between executives and managers about the change (LC6) of 0.49, (5) Create a team or working

group to focus on solving problems resulting from changes affecting the organization (LC8) of 0.48, (6) Decentralization of management (LC18) of 0.44 and (7) Inspire and encourage colleagues to adapt themselves to respond to change quickly and effectively (LC5) of 0.41.

The Innovation and Technology factor consists of the seven observed variables: (1) There is an information technology system that has a fast response time and is stable and consistent (IT19) of 0.64, (2) Aquiring various knowledge to be innovative by technology transfer or joint research in a strategic alliance (IT16) of 0.62, (3) Innovation paradigm shift: taking action and accepting failure as part of the learning process that helps organizations grow (IT15) of 0.62, (4) Using knowledge based systems to develop and create new innovations (IT23) of 0.57, (5) Bringing innovation to the design of new modern packaging (IT10) of 0.56, (6) Encouraging the establishment of research and development units to increase competitiveness (IT2) of 0.48 and (7) The use of information technology to analyze consumer and marketing needs (IT11) of 0.46.

The Marketing factor consists of the five observed variables: (1) Deploying a sales and marketing team with technical expertise in chemical products to serve customers (MK23) of 0.60, (2) Having a wide variety of products (MK6) of 0.58, (3) Organizing social activities to protect the environment to create a corporate image of social and environmental responsibility (MK25) of 0.57, (4) Retaining customers by giving credit on sales or flexible financing (MK8) of 0.53 and (5) Selling of high value added or specialty products which are more profitable (MK11) of 0.49.

The Risk Control factor consists of the seven observed variables: (1) Having an insurance contract against damages that may arise in the event of a possible or unexpected risk (RM13) of 0.62, (2) Developing communities surrounding the factory to have a better life in order to be socially responsible and reduce the risk of complaints from these communities (RM19) of 0.60, (3) Managing the risk of purchasing raw materials by making long-term contracts (RM15) of 0.54, (4) The risk management process is communicated, clarified, and understood by employees as well as their individual responsibilities. This training emphasizes the link between risk management and corporate strategy (RM24) of 0.52, (5) Inventory management by monitoring reports of product storage, spare parts, or excess non-movement to reduce liquidity risks (RM17) of 0.49, (6) Management emphasizes the importance of risk management by defining it as a policy (RM2) of 0.46 and (7) Employees at all levels are involved in identifying potential risks that may arise from business operations (RM6) of 0.45.

DISCUSSION

The most important conclusion derived from research results of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy are for businesses to study and learn in order to establish guidelines that focus on managing organizations in a rapidly changing environment. These guidelines will facilitate business growth and opportunities for long-term success if successfully implemented. A discussion of the research results together with a review of related literature in six respects follows.

1. From the research results, when comparing the overall results of components of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy among the SMEs versus large enterprises, they were statistically different at a significance level of 0.05. The good management characteristics of large industries are: management strategies; continuous quality improvement; learning; systematic review; and the ability to continuously create knowledge of best practices in the organization for sustainability (Meza–Ruiz et al., 2017). This differs from SMEs that have a gradual approach to quality management in their organizations, in line with

Deploying Business Excellence research: Success Factor for High Performance (Tickle, Mann & Adebanjo, 2016).

2. From the results of hypothesis testing, it was found that the Leading Change factor directly influenced Risk Control factor with the highest standardized regression weight of 0.81. The results of the study provide empirical evidence of the influence of the Leading Change factor on risk management. When top management communicates risks in a standard format and regularly communicates about the top risks, this assures that financial performance will be positive (Soto, 2018). Corporate leaders who adopt risk management in their organization add sustainable value to their company (Maurine, 2020).

3. From the results of hypothesis testing, it was found that the Leading Change factor overall (Direct and Indirect) influenced the Innovation and Technology factor with the highest standardized regression weight of 0.83. The results of the study indicate that Leaders can promote innovative behavior in employees by encouraging creativity and rewarding employees' innovative behavior. This is the most important conclusion (Koziot-Nadolna, 2020). Leaders who develop a positive mental state that helps define positive organizational behavior, care for their subordinates, and focus on helping their subordinates reach their full potential, improve business performance. The psychological capital of leadership positively influences the innovative behavior of employees (Wang et al., 2021).

4. In the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy, the Leading Change factor had the highest mean of 4.05, indicating the importance of Leading Change. Some of the characteristics of transformational leaders are the use of inspiration and intellectual stimulation. Leaders at all levels of an the organization should adopt a transformational leadership approach (Mgqibi, 2019). Key strategies used by change leaders are change communication, change management, planning, coaching, mentoring, and a supportive corporate culture so that a business can survive and succeed in a rapidly changing industry (Tackie, 2019).

5. The item in organization management guidelines in the chemical industry to deal with a changing environment in the digital economy with the highest mean of 4.42 was to find products or services that respond to customer needs, indicating the importance of this variable. Consistent with the research, a Customer Relation Management system (CRM) can improve customer relationships, helping to retain customers, improve customer satisfaction, and win new customers (El Farmawi, 2018). There is a strong positive relationship between service quality and customer satisfaction (Panditharatne & Gamage, 2019).

6. From the results of correlation analysis between the variables of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy, after adjusting the Structural Equation Model, it was found that the variable of Information Technology System with a fast response time and continuous stability had the highest correlation with the variable of Apply Various Knowledge to be innovative by technology transfer or joint research in a strategic alliance with the value of 0.781. In accordance with the research, a real-time monitor can be used to respond quickly to technology operations and improve air monitoring performance in chemical plants (Chen, 2018). Operational Knowledge can be applied to develop technology, systems, programs, and an operational alarm system which applies drone technology for inspecting high-risk structures such as chimneys (Dhason, 2018).

CONCLUSION

This the study found that the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy consists of four factors i.e. Leading Change, Innovation and Technology, Marketing and Risk Control.

The development of the Structural Equation Model (SEM) showed the empirical data met the passing criteria of the SEM model. It found that Chi-Square Probability levels equaled 0.102, Relative Chi-Square was 1.106, Goodness of Fit Index was 0.953 and Root Mean Square Error of Approximation was 0.015.

The comparison of importance levels of the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy between Small

Medium Enterprises (SMEs) and large enterprises showed a significant difference at the statistical level of 0.05.

The hypothesis results showed the following influencing factors: Leading Change had direct influence on Risk Control at the statistically significant level of 0.001, Innovation and Technology at the statistically significant level of 0.001, and Marketing at the statistically significant level of 0.05. Risk Control had direct influence on Marketing at the statistically significant level of 0.001 and Marketing had direct influence on Innovation and Technology at the statistically significant level of 0.001.

The results of testing direct influence, indirect influence and overall influence found that Leading Change had the most direct influence on Risk Control with a standardized regression weight of 0.81. The overall influence analysis results found that Leading Change had the most overall influence on Innovation and Technology with a standardized regression weight of 0.83.

Therefore, the organization management guidelines in the chemical industry to deal with a changing environment in the digital economy are guidelines that focus on organizational management for competitiveness, business adaptation to changing environments and supporting an operating environment in which volatility, uncertainty, complexity and ambiguity (VUCA) are always present. In this situation of ambiguity, there are opportunities in the form of new products and services**.

Suggestion for Further Study

Nowadays, the focus is on the development of the environmental chemical industry (Bio-Industry) which is an industrial operation to create added value to agricultural products. Therefore, it would be interesting to study the guidelines for sustainable environmental management of the chemical industry.

From the current state of the chemical industry, the plastic waste problem is a global problem including Thailand. Therefore, further research is needed which focuses on sustainable plastic packaging management guidelines, such as packaging design (Design), materials used in the production of packaging (Material), and waste management (Waste Management).

REFERENCES

Adeyemi, A. (2018). *Strategies business managers use to engage employees in the chemical industry*. Unpublished doctoral disseratation, Management and Technology, Walden University.

Alahmad, Y. (2016). *Understanding the relationship between transformational leadership styles: idealized influence, intellectual stimulation, inspirational motivation, individualized consideration and product innovation among manufacturing and services firms: The role of open system*. Unpublished doctoral dissertation, Manufacturing M and Technology Management, University of Toledo.

Alerasoul, A., & Derogar, M. (2019). The impact of market orientation and organizational intelligence on performance: the mediating role of marketing innovation. *In Proceedings of 52nd International Business Research Conference 4 July 2019, LIUC-Universita Cattaneo, Milan, Italy.*

Arbuckle, J.L. (2016). *IBM SPSS Amos user's guide.*

Azigbo, U. (2019). *Strategies for new product development in an emerging market.*

Baptiste, M. (2017). *Leadership styles' impact on employee satisfaction, customer satisfaction, and customer loyalty.*

Bodar, C., Spijker, J., Lijzen, J., Waaijers-van der Loop, S., Luit, R., Heugens, E., Janssen, M., Wassenaar, P., & Traas, T. (2018). Risk management of hazardous substances in a circular economy. *Journal of Environmental Management*, *212*, 108-114.

Campbell, K. (2015). Can effective risk management signal virtue-based leadership?. *The Journal of Business Ethics, 129*, 115-130.

Casidy, R., & Walter, W. (2016). A risk worth taking : Perceived risk as moderator of satisfaction, loyalty, and willingness-to-pay premium price. *Journal of Retailing and Consumer Services, 32*, 89-197.

Chen, D., & Murata, T. (2017). Risk management of chlor-alkali industry based on CVaR. *Proceedings of the International Multi Conference of Engineers and Computer Scientists 2017.* .

Chen, M. (2018). *Optimal design and scheduling for chemical industry and environmental sustainability*.

Clepper, J. (2018). *Impact of preparatory leadership change management skill development in leading sustainable lean change process*. Unpublished doctoral dissertation, Oklahoma City University.

Comrey, A.L., & Lee, H.B. (1992). *A first course in factor analysis (Second Edition)*. Hillsdale, NJ: L.

Cui, A., & Wu, F. (2016). Utilizing customer knowledge in innovation: Antecedents and impact of customer involvement on new product performance. *Journal of the Academy of Marketing Science, 44,* 516-538.

Department of Business Development. (2021). DBD Datawarehouse. Retrieved January 8, 2021, from https://datawarehouse.dbd.go.th/

Dhason, S. (2018). *An advanced context aware operator support system (CAOSS) for chemical plant operation*.

Dunne, T.C., Aaron, J.R., McDowell, W.C., Urban, D.J., & Geho, P.R. (2016). The impact of leadership on small business innovativeness. *Journal of Business Research*, *69*(11), 4876-4881.

ElFarmawi, W. (2018). *Correlation between customer relationship management system usage, product innovation, and customer satisfaction*.

Export-Import Bank of Thailand. (2014). *Consumer trends of the world 2014*. Retrieved November 01, 2018, from https://www.ryt9.com/s/exim/1886040

Falkner, E., & Hiebl, M. (2015). Risk management in SMEs: A systematic review of available evidence. *The Journa of Risk Finance, 16*(2), 122-144.

Fox, Z. (2019). *Effective manufacturers' strategies for service innovations*. The Degree of Doctor of Business Administration. Walden University.

Ghotbabadi, A., Feiz, S., & Baharun, R. (2016). The relationship of customer perceived risk and customer satisfaction. *Journal of Social Sciences, 7*(1S1), 161-173.

Hericourt, J., & Poncet, S. (2015). Exchange rate volatility, financial constraints and trade: Empirical evidence from Chinese firms. *World Bank Economic Review, 29*(3), 550-578.

Jakobsson, M. (2017). *Exploring drivers of chemical risk management in Sweden*.

Janteng, J., Tan, C., & Fernando, Y. (2018). Boosting quality performance through customer knowledge management and service innovation capability in the automotive industry. *Conference: 6th International Conference on Management, Leadership and Governance. Bangkok University, Thailand.*

Khan, H. (2020). Is marketing agility important for emerging market firms in advanced markets?. *International Business Review, 29*(5).

Kozioł-Nadolna, K. (2020). The role of a leader in stimulating innovation in an organization. *Administrative Sciences, 10*(3), 1-18.

Lee, B.M., Kwon, S., Cho, Y.M., Kim, K. B., Seo, K., Min, C.S., & Kim, K. (2019). Perspectives on trace chemical safety and chemophobia: risk communication and risk management. *Journal of Toxicology and Environmental Health, Part A, 82*(3), 186-199.

Lyu, B., Hong, S., Oh, S., & Moon, I. (2018). Raw material supply strategy for petrochemical process under market uncertainty. In *Computer Aided Chemical Engineering* (Vol. 44, pp. 1519-1524). Elsevier.

Machim, K., Jariyapoom, T., & Pornpundejwittaya, P. (2020). Guidelines for the protection of computer crime threats in the industrial business. *Academy of Strategic Management Journal, 19*(4), *1-13.*

Manda, B. K., Bosch, H., Karanam, S., Beers, H., Bosman, H., Rietveld, E., Worrell, E., & Patel, M. K. (2016). Value creation with life cycle assessment: an approach to contextualize the application of life cycle assessment in chemical companies to create sustainable value. *Journal of Cleaner Production*, *126*, 337-351.

Marakanon, L., & Panjakajornsak, V.(2017). Perceived quality, perceived risk and customer trust affecting customer loyalty of environmentally friendly electronics products. *Kasetsart Journal of Social Sciences, 38,* 24-30.

Maurine, D. (2020). *Exploring the use of risk management by leaders in an Arizona credit union*.

Melvin, L. (2020). *Effects of Contemporary Leadership Styles and Employee Engagement on Customer Satisfaction: A Quantitative Study*.

Meza-Ruiz, I. D., et al. (2017). Measuring Business Sustainability Maturity-Level and Best Practices. *Procedia Manufacturing, 11*, 751-759.

Mgqibi, N. (2019). *Relationship Between Transformational Leadership and Organizational Change Effectiveness.* The Degree of Doctor of Business Administration, Walden University, October.

Ministry of Commerce of Thailand, (2016). *Industry index*. Retrieved December 1, 2017, from http://www.oie.go.th

Mokhber, M., Wan Ismail, W., & Vakilbashi. (2015). Effect of Transformational Leadership and its Components on Organizational Innovation. *Iranian Journal of Management Studies, 8*(2), 221-241.

Mu, J., Bao, Y., Sekhon, T., Qi, J., & Love, E. (2018). Outside-in marketing capability and firm performance. *Industrial Marketing Management*, *75*, 37-54.

Odeh, M. (2018). *The effect of integrating risk management on large-scale information technology projects using an integrated software risk management tool*.

Office of Industrial Economics of Thailand, (2015). *Industry Economic Report*. Retrieved December 1, 2017, from http://tradereport.moc.go.th/Report/Default.aspx?Report=MenucomRecode& ImExType=1&Lang=Th

Omar, S., Othmaliah, N., & Jabar, J. (2017). Effect of eco-innovation practices on sustainable business performance. *Science & Technology, 25*,123-128.

Panditharatne, V., & Gamage, P. N. (2019). Impact of service quality on customer satisfaction: evidence from boiler water and cooling tower water treatment chemical industry in Sri Lanka. In *Proceedings of 10th International Conference on Digital Strategies for Organizational Success*.

Papadas, K.K., Avlonitis, G.J., Carrigan, M., & Piha, L. (2019). The interplay of strategic and internal green marketing orientation on competitive advantage. *Journal of Business Research*, *104*, 632-643.

Pelser, T. (2014). Sustaining industry leadership through innovation strategy archetypes. *International Business & Economics Research Journal, 13*(4), 697-714.

Pogorelova, E., Yakhneeva, I., Agafonova, A., & Prokubovskaya, A. (2016). Marketing Mix for E-commerce. *International Journal of Environmental & Science Education*, *11*(14), 6744-6759.

Rimita, K. (2019). *Leader readiness in a volatile, uncertain, complex, and ambiguous (VUCA) business environment*.

Sanrach, R., & Silpjaru, T. (2020). A structure equation modeling of guidelines on effective meeting management in industrial business sector. *Applied Science and Engineering Progress*, *13*(2).

Sattayaraksa, T., & Boonitt, S. (2018). The roles of CEO transformational leadership and organizational factors on product innovation performance. *European Journal of Innovation Management*, *21*(2), 227-249.

Savas, S. (2017). *Perceived risk and consumer adoption of service innovation*. Unpublished doctoral dissertation, Florida Atlantic University.

Soto, E. (2018). *Risk communication: Communicating effectively to top management about enterprise risk management in a German, nonfinancial organization*.

Suki, N. (2013). Green awareness effects on consumers' purchasing decision: Some insights from Malaysia. *IJAPS, 9*(2), 49-63.

Suyanang, P., Pornpundejwittaya, P., & Silpcharu, T. (2020). The guideline of optimizing warehouse management in business and industry sector in Thailand. *International Journal of Advanced Science and Technology, 29*(7), 3897-390.

Tackie, T. (2019). *Organization development and change practices used by leaders of small printing companies: A Phenomenological study*. Unpublished doctoral dissertation, Colorado, Technical University.

Tan, Q., & Sousa, C. (2015). Leveraging marketing capabilities into competitive advantage and export performance. *International Marketing Review, 32*(1), 78-102.

Tanin, S. (2020). Research and statistics analysis by SPSS and AMOS. *SR Printing Mass Product*.

The Boston Consulting Group. (2017). *Making a Business Case for Sustainability in Chemicals*. Retrieved November 1, 2018, from http://image-src.bcg.com/Images/BCG-Making-Business-Case-Sustainability-in-Chemicals-Apr-2017_tcm9-152223.pdf

Thongpracum, S., & Silpjaru, T. (2020). Pollution crisis management guideline for industrial plant in industrial estate in Thailand. *Academy of Strategic Management Journal, 19*(2).

United Nations Environment Programme (UNEP). (2018). Single-Use Plastic: A Roadmap for Sustainability. Retrieved December 1,2017, from https://wedocs.unep.org/bitstream/handle/handle/20.500.11822/25496 /singleUsePlastic_sustainability.pdf

Wang, Y., Chen, Y., & Zhu, Y. (2021). Promoting innovative behavior in employees: The mechanism of leader psychological capital. *Frontiers in Psychology, 11*(598090), 1-12.

White, R. (2017). Marketing Change Management : Switching Technology for Better. Retrieved November 5. 2518, from https://trackmaven.com/blog/marketing-change-management-technology/

Whitmore, M. (2020). *Leadership styles and change management during a market change*.

Xiaohan, S. (2020). *Customer participation in digital transformation, value co-creation and firm performance: An empirical study in china information communication & technology industry*.