THE EFFECT OF INFORMATION TECHNOLOGY AND DYNAMIC CAPABILITIES ON HUMAN RESOURCES COMPETENCIES AND INNOVATIVE PERFORMANCE

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Abstract

The objective of this research is to study the relationships and influences of information technology capabilities, dynamic capabilities, human resources competencies and the innovative performance of listed companies in the Stock Exchange of Thailand (SET), the largest capital market in the country. A quantitative research method was carried out using questionnaires as the instruments for data collection. Questionnaire respondents were either the president, managing director, assistant managing director, general manager, or human resources manager of their respective companies. The research results revealed that all observed variables of these companies are presently at a high level. PLS-SEM was used to assess the structural models and verify the research hypotheses. The research results revealed significant influences among three pairs of variables: (1) IT capabilities had a positive effect on Dynamic capabilities, (2) IT capabilities had a positive effect on HR competencies, and (3) HR competencies had a positive effect on innovative performance. Thus,

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this research provides useful information for companies, emphasizing the importance of supporting and developing IT capabilities and HR competencies to increase the organization's innovative performance, in turn supporting survival in a rapidly changing and highly competitive environment.

Keywords: Information Technology Capabilities, Dynamic Capabilities, Human Resource Competencies, Innovative Performance

1. INTRODUCTION

At present, organizations are focused on achieving, and learning how they can achieve, a sustainable competitive advantage. Organizations are constantly affected by changes, both inside and outside the environment of the organization. To achieve a competitive advantage, an organization must continue to develop, as a failure to do so would make the organization unable to resist its competitors and therefore to be unable to survive. The current business environment is dynamic, driving business organizations to compete (Altinay, Madanoglu, De Vita, Arasli, & Ekinci, 2016). The two main characteristics of environmental dynamism are unpredictability and instability, with the current environmental dynamism being a result of the introduction of new technology, variation in customer preferences, and fluctuations in product demand and material supply (Rojo, Stevenson, Lloréns Montes, & Perez-Arostegui, 2018). The larger the economic progress, the greater an organization's need to develop their capabilities to gain a competitive advantage.

Investing in information technology (IT) is an important decision for any company as it allows access to new IT, creating a competitive advantage (Arora & Rahman, 2017). IT will help to develop and change management in many areas, either in the service area, in building knowledge, or in driving forward to generate a lead in a particular area. However, IT investments can also bring risks to the accommodation business as new technologies tend to become rapidly obsolete and are complex to implement (Hua, 2020). Organizations realize the uses and applications of IT to continuously drive themselves towards their goals. Therefore, IT capabilities are essential in maintaining an organization's ability to continuously receive information regarding context changes (Cepeda & Arias-Pérez, 2019). This information will help an organization to sense opportunities before its competitors and assists in making excellent decisions in a turbulent environment.

Dynamic capabilities are another approach strengthening an organization by integrating technology, resources, and

knowledge, while creating new business models that are appropriate to take advantage of the available opportunities (Teece, 2018). In a competitive market environment with limited purchasing power, dynamic capabilities are essential for entrepreneurs as they can be used to seek business opportunities by detecting market changes before competitors (Schoemaker, Heaton, & Teece, 2018).

Human resource development enhances learning and facilitates change at the individual, group, organization, and societal levels to improve performance, and effectiveness, and build capabilities and expertise at every level (E. Ellinger & D. Ellinger, 2014). Human resource competencies are the capability of an organization's HR to carry out their duties and responsibilities with the support of suitable learning, training, and experience (Muda, et al., 2017). Furthermore, the last crucial variable is innovative performance which is the potential for creating innovation in the organization. Innovation is critical in securing a sustainable competitive advantage in the marketplace (Hanifah, Abdul Halim, Ahmad, & Vafaei-Zadeh, 2019). Therefore, the importance lies in how the organization will have better innovative performance.

As mentioned above, this shows that all variables contribute to creating a competitive advantage for an organization. This study originates from the research question of whether having IT capabilities and dynamic capabilities affects the organization's HR competencies and innovative performance. According to this research question, the research objectives are to perceive the level of IT capabilities, dynamic capabilities, HR competencies, and innovative performance among the companies listed in the SET, the largest capital market in the country, and to understand the relationship and influence of all the variables. The research results will form empirical information that can be used to shape organizational development and strategy, to make a competitive advantage.

2. LITERATURE REVIEW

2.1 Information Technology Capabilities

Following the sociological perspective, an information system is a formal and social system designed to assemble, process, cache, and distribute information. The information system consists of the four components of people, technology, work, and structure (Piccoli & Pigni, 2019). The information system determines the flow of information within the system. It is intended to provide administrative users with the appropriate information to collect, process, and communicate information with users of the organization's system (Ibrahim & Ma, 2017). The elements of the information system are hardware, software, humans, information, and

the networks that people create for the collection, generation, and distribution of useful information within an organization. Due to the rapid changes in IT that have affected the current business environment, and businesses' capability regarding the tools and processes used in data management, workers must be required to respond to these changes in their work. Such changes require workers to possess an ability for learning and adapting to change with speed, as well as requiring IT capabilities.

IT capabilities involve the abilities of the company to acquire, deploy, integrate, and reconfigure IT resources to facilitate and improve the business strategies and processes. These capabilities are a key catalyst in achieving business value by equipping the company with the IT resources to reinforce the company's strategies and processes (Cai, Huang, Liu, & Liang, 2016). IT capabilities cover: (1) Tangible resources consisting of physical IT infrastructure (e.g. databases, communication technology, servers, etc.), (2) Human IT resources (e.g. techniques, skills, management, etc.), (3) Intangible resources (e.g. knowledge assets, customer orientation, collaboration, etc.), and (4) the relationship asset that brings together trust, mutual respect, and understanding between the business and IT personnel (Arora & Rahman, 2017). Furthermore, IT capabilities are categorized into three categories: (1) Outside-in IT capability is focused outside the organization and represents the ability to develop IT connectivity with key business partners. (2) Inside-out IT capability develops the deployment of data, networks, and processing architecture, within the organization, increasing the organization's operational potential (3) Spanning IT capability which encompasses both inside and outside factors of the organization, emphasizes the ability to combine both internal and external IT capabilities (Wade & Hulland, 2004). This research considers the components of IT capabilities as an interesting dimension of IT capabilities and is a further development from Li and Chin's (2019) work. The components under consideration are:

1) *Digital platform capability*. The capability of a digital platform enables an organization to generate added value from the elements of IT infrastructure. Organizations adopting digital platforms to support operations will transform new market dynamics by developing their ordinary capabilities. Digital platform capability will create a new value creation path, improve organizational efficiency, provide an approach for accessing outside capabilities and resources, and enable more engagement (open innovation) (Li & Chin, 2019).

2) *IT management capability*. This capability refers to designing and implementing changes in operational processes, controlling IT practices and resources to be in alignment with the organization's priorities and goals. Responding to consumer needs and

corporate competitor strategies requires rapid re-configuration of IT resources. This capability uses difficult decisions and exchanges to achieve desired outcomes, such as new system strategies, capability development prioritization, or emerging technology selection (Li & Chin, 2019). Yeow, Soh, and Rina (2017) presented that IT management capabilities enable IT departments to update service portfolios regularly. The updated help supports new practices and resources such as automating and eliminating documents, reconfiguring a new collaborative business network, and creating new online distribution channels.

3) *IT knowledge management capability*. Fernandes (2018) suggested that organizations must have skills for transforming back and forth between tacit knowledge and explicit knowledge, in order to drive the development of innovation and products. With this finding, IT knowledge management capability is the ability of IT staff and management to transform and preserve IT knowledge and technical expertise, enabling the whole IT unit to deploy, coordinate and innovate with resources and practices in IT, while also improving the understanding of IT among the people of the organization (Li & Chin, 2019).

2.2 Dynamic Capabilities

Dynamic capabilities describe the sources of the competitive advantage of an organization, as well as advising managers to avoid the condition of loss of benefit which occurs when organizations face a highly competitive market (Teece, 2007). Teece, Pisano, and Shuen (1997), were the first to introduce this concept, defining dynamic capabilities as organizational abilities in the strategic integration of inside and outside resources in responding to rapidly changing environments. Teece (2009) classifies dynamic capabilities into three sub-capabilities: Sensing, as an analytical system to learn and recognize opportunities; seizing, as elements of the organizational structure design, business model design, processes, and incentives, which allow it to seize opportunities; and transforming, as the continuous organizational shaping and development of tangible and intangible assets (Brandon-Jones & Knoppen, 2018).

Gonzalez and Melo (2019) offer knowledge-based dynamic capabilities as a different perspective of dynamic capabilities. Their work presented four components, namely absorptive, generation, storage, and adaption capability. Knowledge absorption capability is defined as the process of acquiring, assimilating, transforming, and exploiting, external knowledge. Knowledge generation capability refers to the ability of an organization to refine and develop processes and activities that promote the creation of new knowledge through collaborations among companies, the knowledge and skills of the people in the organization, and the organization’s research and

development activities. Knowledge storage capability refers to the organizational memory formation process, in which knowledge is formally stored in the physical memory system and informally retained as values, norms, and beliefs, which are related to the culture and structure of the organization. Knowledge adaption capability is the organizational ability to integrate and apply internal and external knowledge, in the creation of an organizational competitive advantage. A superior adaptive ability can use the knowledge absorbed or created in activities that generate new knowledge. Furthermore, dynamic capabilities also classify sensing, learning, and reconfiguring (Teece, 1997).

Scholars in this area have presented several key components of dynamic competence, most of which are similar. In this study, three key components of dynamic capabilities are categorized:

1) *Sensing capability*. This capability encompasses an organization's ability to recognize and understand changes in the business environment (Teece et al., 1997). Awareness of opportunities and threats affecting the organization, and the organization's competency will affect understanding of approaches for survival and sustainability. Furthermore, this capability is important in the development and creation of new products and services, such as recognizing opportunities (and threats) from customer needs, business partnerships, and emerging technologies (Alford & Duan, 2018).

2) *Learning capability*. This refers to the ability to generate, acquire, and share knowledge in response to opportunities and threats from the environment (Chukwuemeka & Onuoha, 2018). Learning capability positively contributes to organizational performance (Pham & Hoang, 2019). In Migdadi's (2021) work, organizational learning capability is classified into five components: managerial commitment and empowerment, openness and experimentation, risk-taking, interaction with the external environment, and knowledge transfer and integration. It also has a positive effect on creating organizational innovation and performance.

3) *Innovation and reconfigurtion capability*. Transforming capability is the ability to remodel, migrate, blend, or integrate, resources and capabilities to create new capabilities, in turn leading to the creation of new products, services, and processes, that benefit the organization (Teece, 2018). Ma, Lang, Sun, & Singh (2020) explain that as the environment changes, the organization will build its capabilities to adapt to the changing situation. Combining organizational capabilities and resources into value, organizations must develop purposeful and continuous processes to create and maintain a competitive advantage. Innovative capability is a unique organizational competence that enables the firm to adapt to new ways of doing things and introduces new products and services in response

to changes in the business environment (Agyapong, Mensah, & Ayuuni, 2018).

2.3 Human Resources Competencies

Competencies are important characteristics of people, classified into five characteristics: (1) Motives are the things that a person consistently thinks about or needs that cause action, and drive, direct, and select behavior toward certain actions or goals, (2) Traits are physical determinants and lead to consistent responses to information or situations, (3) Self-Concept refers to personal self-image, values, or attitudes, (4) Knowledge is information that a human has in specific content fields, while (5) Skill is the proficiency to operate a certain mental or physical task. When applying these Competencies to the iceberg model, skills and knowledge are found on the iceberg above the surface, while self-concept, traits, and motives lie on the other side. The part that floats above the water represents skills and knowledge including expertise and specializations in various areas, which a person has acquired by learning, and which can be easily observed and measured. Contrastingly, the other capabilities are more difficult to observe and are represented by the part of the iceberg below water (Spencer & Spencer, 1993).

Competency can be used in many human resource development areas such as recruitment, the remuneration process, training, job performance management, and elaboration of a development program. Competency-based human resource management is regarded to be an effective means of people management (Staškeviča, 2019). On the other hand, HR competencies include human capital, skills, artisanship, knowledge, education, ideas, reasoning, energy, and spirit (Ali, Qureshi, Memon, Mari, & Ramzan, 2021). HR competencies are the abilities of HR to carry out the duties and responsibilities delegated to them with the support of their prior learning, training, and experience (Muda, et al., 2017). HR Competencies are the abilities of HR to directly or indirectly affect organizational performance (Pastgoo, 2016).

In building future human resource competencies, the people (employees) themselves must be involved in acquiring the new competencies. According to review of the relevant literature, seven vital components of HR competencies can be classified for used in this study:

1) *Adaptability*. This refers to the proficiency to adapt to organizational culture, flexibility, and swift orientation to a variable environment, as well as the proficiency to work under pressure and to tight deadlines (Tepavicharova, Dikova, & Zahars, 2019). Thus, adaptability is the ability to change in a wide range of situations, adapt to suit different groups of people, to understand and accept changes, demonstrate a willingness to take responsibility for changes, and changing workflow in

order to achieve the required goals.

2) *Creativity and Innovativeness*. In their work Tepavicharova et al. (2019) merged creativity, initiative, ingenuity, and lateral thinking, into the creativity factor. Therefore, this component refers to the ability to present new ideas, seek opportunities to learn and develop oneself for initiatives in work, change workflow in response to mistakes leading to success in a task, and to bring about new work procedures to practice and apply, as new ways of working.

3) *Motivation*. This refers to a positive work attitude and enthusiasm (Tepavicharova et al., 2019) which is important to improve the performance of employees (Pastgoo, 2016). Thus, motivation in this study refers to the ability to activate an action, demonstrate enthusiasm, or focus for collaborative goals.

4) *Teamwork*. This is a vital characteristic of more modern types of organizations, such as lean manufacturing and semi-autonomous groups (Gonzalez & Melo, 2019). Cooperation, conflict resolution, sociability, and the ability to build relationships are merged in this component (Tepavicharova et al., 2019). Thus, teamwork refers to the process of gathering people with different qualities, such as knowledge, skills, expertise, or experience, to work together.

5) *Leadership*. This is a force that leads the organization, with many skills in managing, planning, decision-making, motivating people, bargaining, etc. (Tepavicharova et al., 2019). Transformational leadership is particularly relevant in motivating and inspiring workforces to develop innovative behaviors (Rasheed, Shahzad, & Nadeem, 2021). Therefore, leadership encompasses the influences on people or colleagues to perform their tasks with willingness and enthusiasm.

6) *Communication.* This consists of clarity and fluency in speaking, efficient argumentation, expression, and discussion, among others (Karnouskos, 2017). Communication and dialogue among individuals, groups, and sectors, will particularly encourage the workforce to inspect and practice their skills and knowledge, increasing the knowledge generation of the company (Gonzalez & Melo, 2019). Thus, communication refers to exchanging information, understanding content, and coordinating the exchange of information.

7) *Decision making*. There are many levels of decision-making from a beginner that uses their skills, knowledge, and principles to develop a solution, to an expert that uses their intuition to solve the problem (Ali, Qureshi, Memon, Mari, & Ramzan, 2021). Thus, decision-making refers to choosing alternatives and seeking solutions.

2.4 Innovative Performance

To achieve sustainable economic development, policymakers must work on creating and improving traditional innovation systems, developing organizational competencies for innovation

processes, and enhancing innovative performance (Ortega & Serna, 2020). Innovative performance incorporates the assessment of technological innovation activities and application of knowledge in an organization. There are two meanings related to this notion. First, innovative performance is the knowledge of technology, innovation, and invention. The other refers to the concept of the production and processing of innovation performance (Rahimnia & Molavi, 2021). This is in line with the concept of Lu, Yu, Zhang, and Xu (2021) who define innovative performance as the success an organization has achieved through innovations such as new products, services, and technology. At present, many organizations have realized the importance of innovation and have begun increasing investment in research and development to improve innovation. Furthermore, the involvement of external organizations providing firms with heterogeneous resources is a key strategy to optimize innovative performance. In this research, the components of innovative performance consist of three types of innovation:

1) *Product Innovation.* This relates to the introduction of novel or improved products or services into the market, as well as emphasizing management of product quality, identifying new customer needs, and developing an effective market strategy (Rahimnia & Molavi, 2021). It also relates to new designs and the use of materials in improving the characteristics of a product, such as duration, appearance, quality, and price (Su, Cheng, Chung, & Chen, 2018).

2) *Process innovation*. This refers to the adoption of new or improved methods in the production of goods and services (Rahimnia & Molavi, 2021). Furthermore, it relates to the use of advanced technologies and new skills in the production process, increasing production speed, accuracy, and efficiency (Su et al., 2018).

3) *Marketing innovation*. This refers to commercial innovation (non-technological innovations) related to new marketing methods, including changes in product design and packaging, promotion, placement, and methods for pricing goods and services (Molina-Castillo, Meroño-Cerdan, & López-Nicolás, 2020). Successful marketing innovations are good at marketing management and strategy, as well as depending on unique organizational culture, which is difficult to replicate or imitate (Ren, Xie, & Krabbendam, 2010).

2.5 Hypothesis Development

Digital platforms promote learning through a variety of channels such as e-learning, web meetings, customization tools, etc. (Linzalone, Schiuma, & Ammirato, 2020). These channels are essential to increase the learning potential of the organization. IT management capability helps organizational leaders to understand customer needs and corporate competitor strategies which require rapid re-configuration (Li & Chin, 2019). Organizations require IT

knowledge management in order to apply tacit knowledge in developing products and innovation (Fernandes, 2018). IT capabilities support knowledge exchange between the parent company and its subsidiaries, and between a multinational corporation and its external network (Cepeda & Arias-Pérez, 2019). These networks are built to share information and recognize rapid changes in the business environment. This creates an opportunity that the organization can seize to gain a competitive advantage and improve sustainability (Teece, 2018). Therefore, this research proposes the following hypothesis:

Hypothesis 1: *IT capabilities have a positive effect on dynamic capabilities.*

Organizational IT capabilities support the creation and operation of HR information systems, defined as the composition of computer applications, databases, hardware, and software, which relate to HR data. Furthermore, it involves HR processes, such as recruiting, selecting, evaluating, developing, and assisting the organization (Mauro & Borges-Andrade, 2020). IT platforms help to improve communication efficiency; as a result, they improve the accuracy of decision-making. Customer relationship management integrated into an IT platform can send information to increase HR competencies in developing recruitment and management systems regarding the workforce (Cavusoglu, 2019). Thus, this research proposes. the following hypothesis:

Hypothesis 2: *IT capabilities have a positive effect on HR competencies.*

According to HR duties and responsibilities, such as support of learning, training, and experience of employees (Muda, et al., 2017), organizations with strong IT capabilities will be able to promote these HR activities. The digital platform facilitates IT knowledge, while IT knowledge management also encourages IT knowledge among corporate employees (Li & Chin, 2019), absolutely including HR staff. In other words, HR departments can take advantage of IT capabilities to increase HR competencies in terms of knowledge generation, communication, collaboration (Gonzalez & Melo, 2019), creativity, adaptation (Tepavicharovaet al., 2019), and decision-making (Ali et al., 2021). Based on the results mentioned above, this study presents the following hypothesis:

Hypothesis 3: *Dynamic capabilities have a positive effect on HR competencies.*

The driving forces of globalization and technological developments have increased the intensity of competition; as a result, organizations must accelerate their decision-making and operating processes for growth and survival (Rahimnia & Molavi, 2021). IT capabilities are a vital catalyst in achieving business value by supporting the organization's methods and strategies (Cai et al.,

2016). IT capabilities help develop skills in transforming tacit knowledge into explicit knowledge and vice versa. This in turn drives product development and innovation (Fernandes, 2018). The IT tools deployed in organizations are often not fully utilized. Developing organizational IT capabilities will, therefore, support employees' innovative behaviors, foster the exploration of new opportunities, and enable the generation of innovations (Bourdeau, Aubert, & Bareil, 2021). Accordingly, this research proposes the following hypothesis:

Hypothesis 4: *IT capabilities have a positive effect on innovative performance.*

At present, the business environment has become more volatile, uncertain, complex, and ambiguous (VUCA). Organizations should emphasize product and process developments, as well as business model innovation that leverages their dynamic capabilities. Dynamic capabilities assist the organization in observing its outer environment, evaluating the endurance of the current business model, innovation, and new product development (Schoemaker, Heaton, & Teece, 2018). Dynamic capabilities are a prerequisite for companies to create innovation by continuous learning, converting the information received into knowledge, and using it in the production process (Hermawati, 2020). Organizations with strong dynamic capabilities are able to innovate effectively (Ilmudeen, Bao, Alharbi, & Zubair, 2020). Thus, this research proposes the following hypothesis:

Hypothesis 5: *Dynamic capabilities have a positive effect on innovative performance.*

The improvement of innovation requires continuous adaptation of the personal skills and professional capabilities of the workforce (Tepavicharova et al., 2019). HR competencies support staffing and training activities which focus on personal growth and prepare the workforce for the VUCA environment, through design and through operating efficient training and development activities (Xiu, Liang, Chen, & Xu, 2017). Strategies connected with HR competencies include cost, innovation, and customer intimacy. Appropriate attitudes to improve innovation consist of greater risk-taking, higher tolerance for ambiguity, driving by learning, and anti-bureaucratic processes (Gates & Langevin, 2010). Organizations with high HR competencies probably attempt to accomplish growth-oriented activities through presentation of original creativity and innovation (Cuéllar-Molina, García-Cabrera, & Déniz-Déniz, 2019). Therefore, this research proposes the following hypothesis:

Hypothesis 6: *HR competencies havea positive effect on innovative performance.*

3. METHODOLOGY

3.1 Research Design

This research focuses on the companies listed in the Stock Exchange of Thailand (SET), the country's largest capital market. These companies are interesting to study as they have a good governance system, with independent directors and audit committees within their business operations. As a result, the information obtained is reliable. Therefore, the population of this research encompasses the entire list of companies in the SET, focusing on 8 sectors: agriculture and food, consumer products, financial business, industrial products, real estate and construction, resources, services, and technology. The population consists of 320 companies (November, 2020). It was decided to use a recommended rule of thumb (Jackson, 2003) to calculate the minimum sample size; this is based on a ratio of cases to the number of model parameters that require statistical estimates. Accordingly, an ideal sample size-to-parameters ratio would be 20:1. There are 6 parameters in the research model, therefore the minimum sample size is 120 companies.

Data collection was carried out by mailing random companies from the population. Suitable respondents were defined as the president, managing director, assistant managing director, general manager, or human resources manager, all of whom would have sound understanding of all factors involved in the study. The investigation of data followed the collection of the completed questionnaires. A total of 134 complete questionnaires were received (41.88%). The descriptive characteristics of the respondents and their respective businesses included in this research are shown in Table 1.

This study is a quantitative research based on data collected via survey utilizing a questionnaire developed from the associated literature review. The content validity of the questionnaire was assessed by 5 experts with in-depth knowledge of IT, HR, and innovation management, and by investigating the questionnaires to determine an index of consistency for each item. Data collection was carried out among 30 companies to determine the accuracy of the questionnaire items, investigating their reliability using the Cronbach's alpha coefficient. Each question item had a value higher than 0.8. Therefore, the questionnaire was determined to have adequate content validity and reliability. Bias was tested for by comparing 30 sets of data at the first and final times. The results revealed that there was no significant difference, and the data therefore had a non-response bias.

3.2 Measurement

The questionnaire consisted of five parts, namely the characteristics, and the question items on IT capabilities, dynamic capabilities, HR competencies, and innovative performance in the organization. The

Table 1. The Descriptive Characteristics of Sample

Characteristics	Frequency	%
Work Position		
Managing director / Assistant managing director	10	7.46
General manager	27	20.15
HR manager	97	72.39
Work Experience		
Less than 5 years	15	11.19
5 - 10 years	28	20.90
11-15 years	31	23.13
More than 10 years	60	44.78
Industrial sectors		
Agriculture and food industry	25	18.66
Consumer products	26	19.40
Financial business	18	13.43
Industrial products	22	16.42
Real estate and construction	25	18.66
Services	18	13.43
Total	**134**	**100.00**

question items in parts 2-5 were answered using a 5-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree). All model structures were measured from the indicator starting from IT capabilities (12 questions), dynamic capabilities (12 questions), HR competencies (35 questions), and innovative performance (12 questions). The observed variables included three levels according to the mean of the data. Values of 1.00-2.33 were designated to be at a low level, while the moderate level was 2.34-3.66, and the high level was 3.67-5.00.

3.3 Data Analysis Methods

The data analysis in this research was divided into two parts: Part 1) primary data analysis, which included the fundamental data using descriptive statistics to elaborate on the sample and variables, which included mean, minimum, maximum, variance, skewness, and kurtosis of each variable; and Part 2) inferential statistics, providing elaboration or conclusions regarding the characteristics of the population, included an analysis of each observed variable describing the existing levels of the companies. PLS-SEM was used to analyze the relationships and influences of the studied variables.

4. RESULTS

4.1 Data Analysis

According to the data collection, the characteristics of information distribution of each observed variable are as indicated in Table 2. Considering the mean of each

variable, and comparing it with the consideration criteria given above, reveals that all observed variables of the companies are presently at a high level.

4.2 Measurement Model

The confirmatory factor analysis of the data using PLS-SEM is shown in Table 3. The factor loading of each observed variable should have a value higher than 0.5 (Hair, Black, Babin, & Anderson, 2010). The results indicate that the loading of each observed variable is concordant with the given criteria. The construct reliability of the measurement model can be considered from Cronbach's alpha which is determined by having a value higher than 0.600 (Hair, Tomas, Ringle, & Sarstedt, 2017), rho_A must be higher than 0.700 (Dijkstra & Henseler, 2015), and the composite reliability (CR) must be higher than 0.800 (Hair et al., 2010). The research results indicate that each variable is concordant with the given criteria. In conclusion, the measurement model has good values of construct reliability.

Convergent validity can be considered from average variance extracted (AVE) which is determined by having a value higher than 0.500 (Hair et al., 2010). The result indicates that almost all of the latent variables are concordant with the given criteria.

If AVE is less than 0.5, but CR is higher than 0.6, convergent validity of the construct is acceptable (Fornell & Larcker, 1981) . Therefore, the measurement model has acceptable

Table 2. Sampling Distributions

Constructs	Level	Mean	Min	Max	Var	Skew	Kurt
IT capabilities							
Digital platform capability	High	4.313	3.000	5.000	0.323	-0.912	0.361
IT management capability	High	4.326	3.000	5.000	0.288	-1.374	1.408
IT knowledge management capability	High	4.358	3.000	5.000	0.413	-0.904	-1.142
Dynamic capabilities							
Sensing capability	High	4.354	3.000	5.000	0.269	-0.881	0.837
Learning capability	High	4.424	3.000	5.000	0.296	-1.015	0.909
Innovation & reconfiguring capability	High	4.392	3.000	5.000	0.318	-0.903	0.385
HR competencies							
Adaptability	High	4.378	3.600	5.000	0.172	0.407	-1.250
Creativity & innovativeness	High	4.393	3.200	5.000	0.174	-0.389	0.096
Motivation	High	4.494	3.400	5.000	0.183	-0.365	-0.696
Teamwork	High	4.542	3.400	5.000	0.207	-0.342	-1.332
Leadership	High	4.588	3.800	5.000	0.118	-0.305	-0.935
Communication	High	4.549	3.600	5.000	0.205	-0.331	-1.587
Decision making	High	4.591	3.400	5.000	0.194	-0.520	-1.094
Innovative performance							
Product innovation	High	4.228	3.750	5.000	0.090	1.066	0.819
Process innovation	High	4.392	4.000	5.000	0.122	0.323	-1.162
Marketing innovation	High	4.498	4.000	5.000	0.122	-0.020	-1.089

convergent validity.

Considering the discriminant validity ensures that the different variables actually measure different characteristics. The criteria of Fornell and Larcker (1981) were used in the evaluation, as shown in Table 4. The AVE is shown in the diagonal of the table and must be higher than the correlation value in the same row or column. The results reveal that each variable is concordant with the given criteria. Another criterion to co-consider is the heterotrait-monotrait ratio (HTMT), given that it must be lower than 0.900 (Henseler, Ringle, & Sarstedt, 2015). The result reveals that each variable is concordant with the given criteria. In conclusion, each

Table 3. Construct Reliability and Convergent Validity

Constructs	Factor loading	Cronbach's Alpha	rho_A	CR	AVE
IT capabilities		0.855	0.991	0.941	0.842
Digital platform capability	0.929				
IT management capability	0.933				
IT knowledge management capability	0.891				
Dynamic capabilities		0.934	0.937	0.958	0.883
Sensing capability	0.946				
Learning capability	0.941				
Innovation & reconfiguring capability	0.933				
HR competencies		0.821	0.834	0.860	0.473
Adaptability	0.523				
Creativity & innovativeness	0.768				
Motivation	0.740				
Teamwork	0.747				
Leadership	0.759				
Communication	0.539				
Decision making	0.688				
Innovative performance		0.815	0.861	0.888	0.727
Product innovation	0.775				
Process innovation	0.935				
Marketing innovation	0.841				

Table 4. Discriminant validity.

Constructs	Fornell-Larcker Criterion				Heterotrait-Monotrait Ratio (HTMT)			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
(1) IT capabilities	0.842							
(2) Dynamic capabilities	0.673	0.883			0.891			
(3) HR competencies	0.092	0.044	0.473		0.246	0.119		
(4) Innovative performance	0.112	0.115	0.303	0.727	0.345	0.369	0.610	

Table 5. Variance inflation factors (VIF).

Constructs	IT capabilities	Dynamic capabilities	HR competencies	Innovative performance
IT capabilities				
Digital platform capability	3.8392			
IT management capability	3.8760			
IT knowledge management capability	2.2916			
Dynamic capabilities				
Sensing capability		4.6501		
Learning capability		4.1681		
Innovation & reconfiguring capability		3.4271		
HR competencies				
Adaptability			1.8183	
Creativity & innovativeness			2.9113	
Motivation			3.0699	
Teamwork			3.8645	
Leadership			6.1545	
Communication			5.1662	
Decision making			4.1932	
Innovative performance				
Product innovation				2.2835
Process innovation				3.3071
Marketing innovation				1.7663

construct in the model has a different characteristic measurement. The observed variables were tested for multicollinearity generating variance inflation factors (VIF) as shown in Table 5.

4.3 Structural Model

PLS-SEM was used to calculate the structural equation model to evaluate the developed hypotheses by their relationships and the influences of the IT capabilities, dynamic capabilities, HR competencies, and innovative performance that occur in the sample. Figure 1 shows the results of the PLS-SEM. Consideration of the direct relationships between the latent variables, indicates that IT capabilities have a significant positive effect on the dynamic capabilities (β = 0.820, t = 19.722, p = 0.000). Therefore, H1 is not rejected. IT capabilities also had a significant positive effect on HR competencies (β = 0.407, t = 2.010, p = 0.045), thus H2 is also not rejected. Similarly, the HR competencies had a significant positive effect on innovative performance (β = 0.506, t = 4.452, p = 0.000). H6 is thus accepted. The other direct relationships were not significant. Therefore, H3, H4, and H5 were rejected. Furthermore, it can be concluded that HR competencies are a mediating variable, with an indirect relationship between IT capabilities and innovative

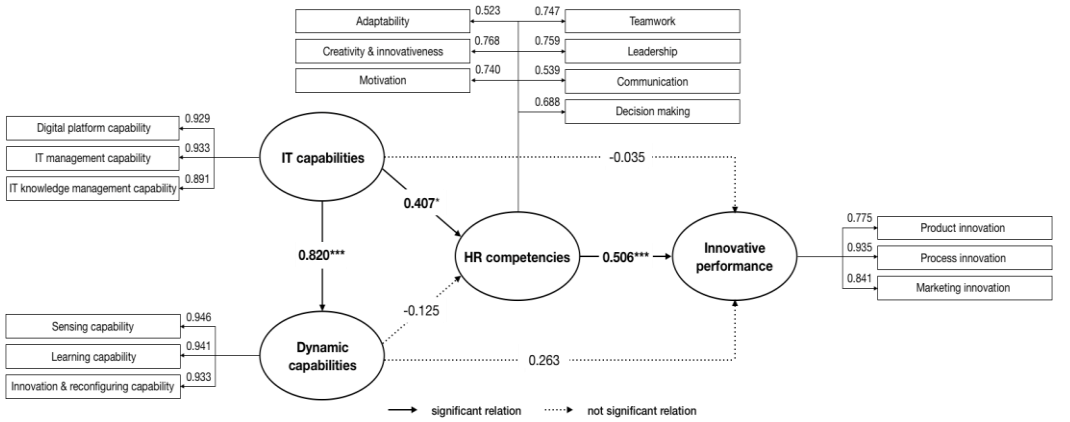

Figure 1. The structural model.

Table 6. Direct Relationships.

Hypotheses	Effect	Path Coefficient	t-Statistic	p-Value	Result
H1	IT capabilities -> Dynamic capabilities	0.820***	19.722	0.000	Accepted
H2	IT capabilities -> HR competencies	0.407*	2.010	0.045	Accepted
H3	Dynamic capabilities -> HR competencies	-0.125	-0.236	0.813	Reject
H4	IT capabilities -> Innovative performance	-0.035	-0.604	0.546	Reject
H5	Dynamic capabilities -> Innovative performance	0.263	1.850	0.064	Reject
H6	HR competencies -> Innovative performance	0.506***	4.452	0.000	Accepted

Note: * Significant at 0.05, ***Significant at 0.001

performance. All values are shown in Table 6.

5. DISCUSSION AND CONCLUSION

5.1 Discussion

This research inspected the level of IT capabilities, dynamic capabilities, HR competencies, and innovative performance in the listed companies of the SET, showing that all were at a high level. According to this result, it can be concluded that these companies have supported all components of IT capabilities, dynamic capabilities, and HR competencies. Furthermore, the companies are also innovation firms because of their high level of innovative performance.

When investigating the observed variables used to measure IT capabilities, dynamic capabilities, HR competencies, and innovative

performance, the statistical analysis results reveal that these observed variables describe the factors well and are concordant with the literature review conducted. This study found a direct positive relationship between IT capabilities and dynamic capabilities. These companies studied have used digital platforms, IT management, and IT knowledge management capabilities to increase their learning potential. These capabilities will help the organization to understand customer needs, and corporate competitor strategies (Li & Chin, 2019), as well as providing the knowledge to develop products and innovation (Fernandes, 2018). This knowledge will support the effectiveness of the organization's dynamic capabilities, whether sensing, learning, or innovative and reconfiguring capabilities. The research also found a direct positive relationship between IT capabilities and HR competencies in terms of knowledge generation, communication, collaboration (Gonzalez & Melo, 2019), creativity, adaptation (Tepavicharovaet al., 2019), and decision-making (Ali et al., 2021). Knowledge gained from IT capabilities will support the strength of HR competencies, including IT utilities, which will support HR tasks. A direct positive relationship was also found between HR competencies and organizations' innovative performance. HR competencies support staffing and training activities that focus on personal growth and prepare the workforce for the VUCA environment via the design and operation of efficient training and development activities (Xiu, Liang, Chen, & Xu, 2017). The results confirmed that organizational HR competencies, such as adaptability, creativity and innovativeness, motivation, teamwork, leadership, communication, and decision making will directly support the development of the organization into an innovation firm.

Although the conceptual model is well developed based on the literature review, three differences have been identified. IT capabilities are not relevant to innovative performance. Neither are dynamic capabilities relevant to HR competencies and innovative performance. These results are surprising. However, there are some possible explanations. The finding that IT capabilities have no direct influence on innovative performance conforms to the finding of Kosasih and Nugroho (2021), whereby some employees, especially seniors, resist digitalization. Some employees think the existing workflow is good enough and are not confident in technology usage. The organizational HR competencies act as a medium to motivate and enhance their IT skills. The employees must become aware that digitalization will empower their company to survive in a turbulent environment (Brunetti, Matt, Bonfanti, De Longhi, Pedrini, & Orzes, 2020). Moreover, most companies in the collected sample develop innovation through R&D rather than developing their IT capabilities. Although the organizations have high dynamic

capabilities, these may not have sufficient integration with organizational functions, including HR, R&D, and NPD. Darawong's (2018) work, which studied large manufacturing industries in Thailand, found that companies which had high learning, integration, and coordinating capabilities, had significantly enhanced efficiency of the NPD team, while sensing capability did not affect this feature. This results in business opportunities being perceived but not realized. If the organizations can improve the use of their dynamic capabilities, they would have a more positive effect in terms of innovation, performance, and sustainability. Another possible explanation is that this study collected data from companies in Thailand that may have different corporate cultures or operations compared with Western organizations, and as a result, this has led to some different findings. Furthermore, the collection of data from companies in eight industries (agriculture and food, consumer products, financial business, industrial product, real estate and construction, resources, services, and technology) results in a variety of industries, which may affect the results. Future research could be used to address concerns regarding this point more clearly.

5.2 Limitations and Future Research Directions

This study has revealed some limitations which should be addressed in future research. Firstly, the research used cross-sectional data collection, while the causal relationships identified may change in the long term. Longitudinal studies could solve this limitation and confirm the results of the study. Secondly, all factors were based on examining the correlations among the constructs in the context of Thai companies. Other contexts could deliver a clearer image of the relationships among the constructs. Thirdly, this study collected data from various industries, with different business practices. Future research may use the model of this study among similar operating companies to compare the findings. Fourthly, in terms of statistical criteria, this study used HTMT for measuring the discriminant validity. This method has been developed to HTMT2 (Roemer, Schuberth, & Henseler, 2021). Furthermore, the VIF criterion in this study used values above 10 to indicate a high correlation, but should be closer to 3 or lower (Hair, Risher, Sarstedt, & Ringle, 2019). These issues can therefore be identified as the limiting points of this work. Finally, this study only researched the components of all factors that were revealed in the literature review. In future, there may be other perspectives or components complementing each factor to be more complete.

5.3 Conclusion

Developing IT capabilities, dynamic capabilities, and HR competencies will certainly increase

the sustainable competitive advantage in the marketplace. Therefore, this research can guide company executives and policymakers regarding the guidelines for improving their IT capabilities, dynamic capabilities, and HR competencies, becoming a more innovative firm. As a result, the company will be able to compete and survive in a turbulent environment.

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