Finding Determinants of Big Data and Internet of Things Driven Competitive Advantage: An Empirical Study of Pharmaceutical Sector of Thailand

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ABSTRACT
The study aimed to know the impact of process sophistication on competitive advantage. The impact of infrastructure sophistication on competitive advantage and also the impact of information privacy on competitive advantage. The study took big data analytics capabilities and internet of thing capabilities as a mediator. The study also considered past relevant studies and conducted critical literature review on them to draw certain hypothesis. The researcher collected relevant information from the Pharmaceutical Sector of Thailand and selected a sample of 316 individuals. The data was analyzed using SPSS and AMOS. Moreover, the analysis proved that the impact of process sophistication on competitive advantage is not significant. The impact of infrastructure sophistication on competitive advantage is significant and the impact of information privacy on competitive advantage is not significant as well.

The analysis showed that overall big data analytics capabilities and internet of thing capabilities are significant mediators except for the fact that mediation of internet of thing capabilities between information privacy and competitive advantage is not significant. The study is significant in case for the industries that need their competitive advantages to enhance to a significant level. However, the sector makes the study limited and the sample size is small as well.
Keywords: Determinants, Big Data, Internet of Things Driven Competitive, Pharmaceutical, Thailand
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INTRODUCTION

Thailand is one of the fast-growing countries. The living standard is gradually improving also the economy is on the track of continuous growth. The country has work hard to move from low income country to high income country in small period of time. The efforts made by the government to reduce poverty were excellent and they are appreciated across the borders. Along with other sectors, country is growing in the field of pharmaceutical. Health care is one of the important sectors for any country that is why Thailand pays special attention to health care and pharmaceutical. The quality of medicine produced by pharmaceutical sector of Thailand is best and more than two-third production of this sector is consumed domestic hospitals. The pharmaceutical sector of Thailand is performing competently and there are further opportunities to growth. This sector of Thailand attracts foreign direct investment as well. The expectations for increase market share are high as shown in figure.
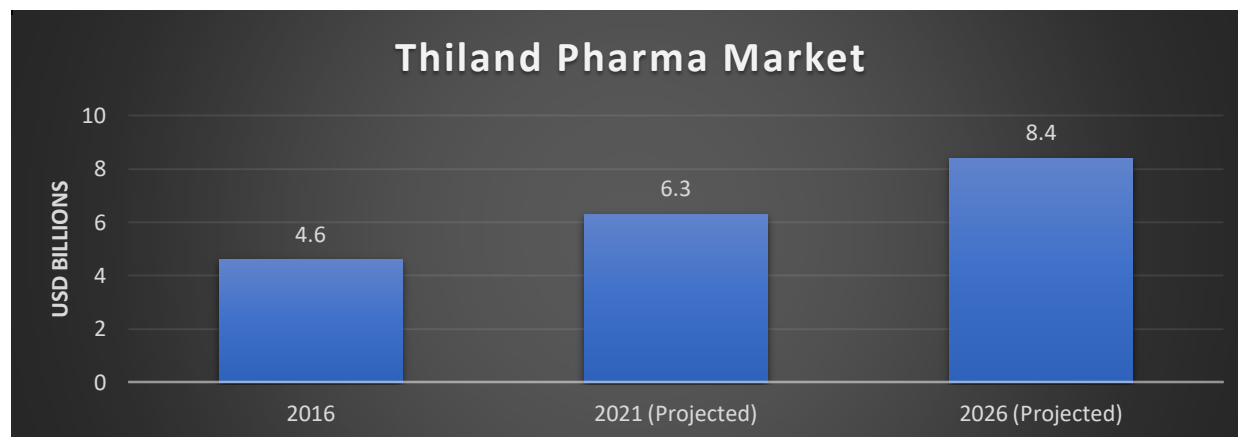

Figure 1 Growth expectations for pharmaceutical industry of Thailand in USD billions

The competent ways of production are required to grab further markets and to increase exports. There is a need to identify and understand the demands of external customers in order to serve them best. Moreover, competition is increasing continuously, if sector will not pay attention to the facts and figures regarding growth of other's, the sector

of other growing economies can replace pharmaceutical sector of Thailand. Moreover, with growth in population and increase in the level of income, purchasing power of natives are improving as compare to past. This situation requires quality products from pharmaceutical as well as high production.

Pharmaceutical sector of Thailand needs to understand the importance of information for further growth and to compete with foreign firms of same sector. Big data analytic capabilities can help manufacturing firms of pharmaceutical in Thailand to utilize information in best way to identify the trends, purchase patterns and preferences of customers. Similarly, forecasting models can be helpful by utilizing the data of past and current years. These trends will help pharmaceutical firms to understand the current situation, opportunities and threats in near future. However, for this purpose, process of productions should be competent. The systems of production utilized by pharmaceutical firms need to be well defined in order to work best. Similarly, work in this area can help firms to lead in cost because; independent flexible work processes produce high quality goods in less time. Along with process efficiency, use of information technology is required (Heo, Kim, & Kang, 2019; Kaur, Singh, & Singh, 2019; Ramanathan, 2018). Firms can monitor the inner interactions of firm, functionality of departments and communication with external customers. The use of information technology increases the pace of growth for firm. However, firms need to pay attention to the security of their information. As pharmaceutical firms continuously work to identify new drugs with better quality, it is essential to keep such records confidential so that it is not easy to replicate or hack it. High security mechanisms are required to protect such sensitive data. Moreover, the concept of automation should be adopted by these firms. Internet of things is helpful for pharmaceutical as it is beneficial for others. So, to keep and maintain competitive advantage, it is necessary to focus on these areas. The study has following objectives.

1. To analyze the impact of Process sophistication on competitive advantage in pharmaceutical sector of Thailand.
2. To analyze the impact of IT infrastructure sophistication on competitive advantage in pharmaceutical sector of Thailand.
3. To analyze the impact of information privacy on competitive advantage in pharmaceutical sector of Thailand.
4. To analyze the mediating role big data analytic capabilities between process sophistication, IT infrastructure sophistication, information privacy and competitive advantage in pharmaceutical sector of Thailand.
5. To analyze the mediating role IOT between process sophistication, IT infrastructure sophistication, information privacy and competitive advantage in pharmaceutical sector of Thailand.

This study contributes to the literature in various ways. Internet of things is an emerging concept and till now it hasn't received the required attention. This study will measure the impact of various independent factors on internet of things, which will be a contribution. Moreover, the mediating role of big data analytics and internet of things is not studied before with information privacy, IT infrastructure sophistication and process sophistication. So, this study will help scholars to understand and elaborate various antecedents of internet of things and big data analytic capabilities.

The study includes different sections. Part two includes theoretical support and hypotheses development for variables of study. Part three covers methodology and techniques of data collection. Part 4 includes data analysis and results obtained. Conclusion, limitations and implications are given in part five.

Literature Review and Resource base view
Resource base view (RBV) is one of the oldest and important concepts in explanation of what can help a firm to succeed. The whole view revolves around the concept that sustainable competitive advantage arise from inside organization. The factors possessed by an organization that are hard for others to imitate and replicate are the base of competitive advantage. Also these are the factors that are difficult to substitute. Basically firm have two options to peruse. On the one hand, a firm goes for leading in the area of cost, and it is followed by effective process of production, adoption of latest technology, competent human skills and strong external networks. On the other hand, there is an option to be different from others in services which is followed by strong external image and robust engineering competencies. On the whole, all inner intangible and resources like management skills, technological advancement, effective strategies, information processing and research and development activities are associated with competitive advantage, according to resource based view. With continuous research on topic, the view is now serving as umbrella which has further theories and concepts under it (Albzeirat et al., 2018; Arnett, Sandvik, & Sandvik, 2018; Chamsuk, Fongsuwan, & Takala, 2017). However, all of these support and elaborate the initial concept of RBV. The main source that is knowledge and information is studied as having a strong impact on performance. All fields of life manufacturing industries, transports, health care, research and development even the Governments required accurate and valid information and knowledge to perform their best. The strategies to grow, tactics to compete and schemes to maintain market share are linked with updated data.

Process sophistication and competitive advantage
Process sophistication is defined in different ways. In general it deals with composition, non-dependency of parts and effective management of functions of processes. Process sophistication is basically about the complexity and information dependency required by a system. Studies show that, higher level of process sophistication in a system

is linked with better products and services. The situation is opposite for systems with low level of process sophistication. In this time of competition, firms try to maintain process sophistication in order to serve and perform better than rivals (Ramayah, Ling, Taghizadeh, & Rahman, 2016; Rashidirad, Salimian, & Soltani, 2018a, 2018b; Wongtianchai, Ussahawanitchakit, & Jhundra-indra, 2017). The process sophistication deals with soft skills such as management and information requirement. So, according to resource base view, such production systems with high sophistication can lead to better performance. Demand of sophistication is consistency in the process. The understanding and utilization of process should be same in all those working with process. The inconsistences in understanding and utilization result in products of different qualities which lead to standardization issues. Similarly, optimization of system is an element of process sophistication (Fosso Wamba, Gunasekaran, Bhattacharya, & Dubey, 2016; Kafetzopoulos, Gotzamani, & Gkana, 2015; Kharub & Sharma, 2017). The robustness of system is measured in strong association with superior performance. Moreover, automation is a consequence of process sophistication. The systems that are well defined produce far more than those which are not. These well-defined systems can be automatic which increase their capability to produce. This characteristic of automation results in better quality of products and security of sensitive data. Other studied consequences of automation are improved cycles of production and minimized cost to handle the process. Likewise, return on investment is linked with automation of processes. It is considered strategically favorable for the firms to have process sophistication. So, with the help of given arguments, this study proposes following hypothesis

H1: Process sophistication has a significant impact on competitive advantage.

IT infrastructure sophistication and competitive advantage

The current era is era of technology. Tools of IT are not only utilized by the IT firms only, they have become a part of all organizations and individuals work and routine life. IT Infrastructure sophistication is generally the way an organization display IT tools for workplace. Technological machines that are linked with information, other software and hardware are essential part of a competing firm now. All organization requires their IT infrastructure to be sophisticated in order to keep a check on services and to improve them. Similarly, the direct connection with customers requires proper handling of these tools. The IT departments are continuously required to check and balance the technological activities of firm, to support creativity. The presence of sophisticated IT infrastructure confirms the hold of firm on every aspect of work in organization. It enables the process of continuous monitoring, work behaviors, functionality of departments and the way end users are treated by the employees. Similarly, the continuous monitoring and evaluation allow

firms to identify the place where they are standing, which in turn initiate a comparison between the desired and actual performance. Due to these evaluations firms increase the efforts to attain the desirable standard of performance while reducing the errors and imperfections. Likewise, according to resource base view the adoption of latest technology helps in attaining a competitive position in market as technology increase the pace of growth. So, with the help of reviewed literature, this study proposes following hypothesis

H2: It infrastructure sophistication has a significant impact on competitive advantage.

Information Privacy and competitive advantage

Information privacy is also known as data privacy. The protection of information is essential for success of firms. Information privacy is defined as act to regulate the type and extent of information that should be shared or protected. This concept is originated from information technology, as the main source of information generation; collection and dissemination are the tools of IT. Businesses have various types of records in their systems about products and services, procedures, formulas, employees, customers, and networks. The information hold by an organization is necessary to be protected as a requirement of privacy. Current era is the era of succeeding through technology. The knowledge, early collection and application of information can make a difference. According to resource base view, the information possess by organization can be a cause of its competitive advantage over others. The latest technologies, offer protection of sensitive information like about production process and techniques. However, at the same time, the risks of information loss have also been increased (Maleka, Nyirenda, & Fakoya, 2017; Maware & Adetunji, 2019; Mohammad & Oduoza, 2018). Hacking systems are also better than before. The information that is generated through research and development department of organization is key of success, for organization. The ideas to generate new products are services and information about process techniques is sensitive for organization, the firm that obtains the accurate and valid information before others is the one who adopt it in process first, and in turn, lead the market. Therefore, it is essential to keep such information private, to safe it and act upon it earlier than others. So, with the help of analysis of previous studies, this study proposes following hypothesis.

H3: Information privacy has a significant impact on competitive advantage.

Mediating role of big data analytic capabilities

Big data analytics is an emerging field of study. It deals with in depth investigation and breakdown of large and complex data. The reason behind performing these analytic procedures on data is to extract useful information, trends, relations and association. These analytics are performed on raw data about firm's performance, customer preferences, and investment or purchase decisions. These analyses

identify the possible solutions, which help business to make effective decision (Somjai & Jermsittiparsert, 2019; Xu, Shang, Yu, & Liu, 2019). Various tools and techniques are required for such analysis of data e.g. statistical tool, foretelling models and numerical procedures. The availability of software regarding big data analytics have made it easier for the firms. These analysis help firm in maximizing profit, early return on investments, better techniques for production, effective strategies of marketing and better quality of operations. Evidence is available that firms with high market share and high profits are involved in big data analytics to improve their internal and external performances. The data is also collected from customers in order to identify latest trends liking and preferences, similarly, data is collected to identify their image in consumer's verses competitors' image (Mubarak, Shaikh, Mubarik, Samo, & Mastoi, 2019; Sahoo, 2019; Sharma & Modgil, 2019). The analysis of such data enable to firm to engage in defensive or offensive strategies for their product according to the need of situation. The process of production is also utilized for collection of data to identify techniques and methods that produce more than others. Similarly, the availability of IT services is connected with big data analytics. IT services employed by organization enable it to collect latest reviews about firm from online. Moreover, work patterns are also considered through it. The monitoring of these IT tools results in latest data, which is analyzed through big data analytic technique. However the information is only useful if it is kept protected. Such analysis of data results in the decisions that are more informed and lead to better performance. So, with the help of given arguments, this study propose following hypothesis.

H4: Big data analytic capability has a mediating role between process sophistication and competitive advantage.

H5: Big data analytic capability has a mediating role between IT infrastructure sophistication and competitive advantage.

H6: Big data analytic capability has a mediating role between information privacy and competitive advantage.

Mediating role of Internet of thing capabilities

Internet of things is broadly defined as the combination of various technological machines to manage and transfer data without human interaction. This combination of devices can send and share information as well. This automatic procedure of Internet of things (Iot) is transforming the working patterns of firms. These Iot are boosting the pace of production, limiting the time required to manufacture and enhancing the qualities of offerings. Objects, humans and processes can interact with the help of Iot without restriction of time (Shehata & Montash, 2019; Shrafat & Ismail, 2019). These Iot are helpful in making processes independent and automatic which increases performance (Saengchai & Jermsittiparsert, 2019). Moreover, these Iot activities are result of improved IT services. However, information security is required to protect these Iot as these functions are automatic. By increasing the pace of growth and development, Iot can help firm in attaining a sustainable competitive advantage. So, with help of argument given, this study proposes following hypothesis

H7: Iot has a mediating role between process sophistication and competitive advantage.

H8: Iot has a mediating role between IT infrastructure sophistication and competitive advantage.

H9: Iot has a mediating role between information privacy and competitive advantage.
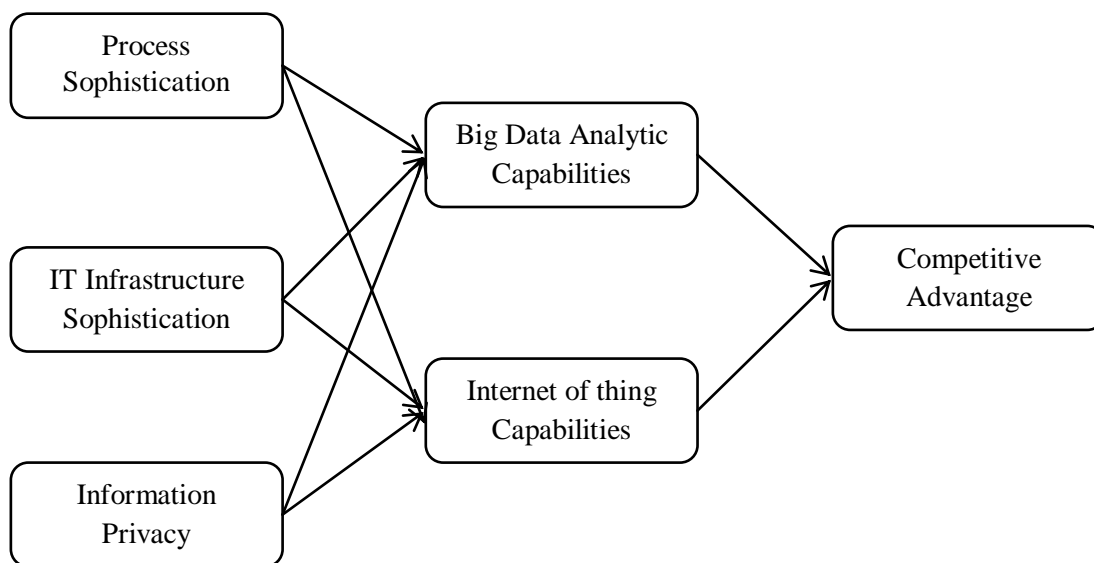
Conceptual framework

RESEARCH METHODOLOGY

Population and Sampling

This research study has been accompanied for observing the impact of process sophistication, IT infrastructure sophistication and information privacy on competitive advantage, in mediating role of big data analytics capabilities and internet of thing capability. Researcher selects the pharmaceutical sector of Thailand as population of study because pharmaceutical contributes a lot in economy of Thailand as it makes the Thailand as second largest economy in southeast Asia. As a large number of pharmaceutical companies has been operating in Thailand that's why it is difficult to achieve competitive edge. In order to earn competitive advantage, researcher proposed few parameters such as determinants of Big data and internet of things capabilities. Sampling frame of this research study is composed of three leading pharmaceutical companies such as Pfizer, GSK and MSD because these companies incorporate information technology in their business operations that's why it is beneficial to collect data about role of concerned variables. Further, researcher accompany purposive sampling technique for selecting managerial employees of these three companies, as it enables to selects only those who have knowledge about process sophistication, IT infrastructure sophistication and information privacy role in competitive advantage. Researcher distributes 400 questionnaires among respondents, out of which only 327 have been responded but after deleting invalid and incomplete outcomes only 316 valid responses have been attained.

Data Collection Procedure

In this research study, researcher follows survey questionnaire as most suitable data collection procedure, as it enables researcher to collect primary, quantitative and objective data about the impact of concerned variables of proposed research study. Researcher has to categorize questionnaire into closed ended questions such as variable scale items and demographic questions, because he or she desired to collect objective response rather than open ended questions which deduced subjective and descriptive responses. All survey items originally written in English language but for data collection from Thailand population, researcher has to translate it into native Thai language. After data collection, researcher has to translate questionnaire back into English language for data analysis. Further, content validity of survey items has been checked through feedback of industrial practitioner and understandability of survey items has been verified by conducting pilot study on 30 respondents. Afterwards, finalized from of questionnaire has been administered through self-administering technique because it might happen that respondents were not able to understand few technical terms of questionnaire that's why researcher personally visit respondents in order to deduced accurate outcomes.

Measures

In the proposed research study, for measuring the impact of concerned variables, researcher adapts survey items from much related research study of different authors in previous literature due to the authenticity and validity of these measurement items. For measuring the process sophistication (independent variable), researcher adapts 8 survey items from research work of (Setia, Setia, Venkatesh, & Joglekar, 2013) & (Karimi, Somers, & Bhattacherjee, 2007) and researcher measured the role of IT infrastructure sophistication in research study by 4 survey items, which have been adapted from (Ravichandran, Lertwongsatien, & Lertwongsatien, 2005). Another independent variable such as information privacy has been measured through 5 measurement items, which have been taken from (Hsu & Lin, 2016). Further, mediating role of big data analysis capability has been measured through 10 survey items and these have been adapted from (Setia et al., 2013) & (Wixom & Todd, 2005) and mediating role of Internet of thing capability has been measured by adapting 9 survey items from (Popovič, Hackney, Coelho, & Jaklič, 2012). Researcher measures dependent construct such as competitive advantage through 6 measurement items, which have been taken from (Schilke, 2014). All these measurement items have been measured on the bases of 5-point Likert scale, in which responses ranges from 1 = strongly disagree to 5 = strongly agree.

Data Analysis Techniques

For data analysis, researcher has been accompanied two main software such as SPSS and AMOS, under them researcher performed various test which checked validity, reliability and authenticity of outcomes. SPSS has been taken into consideration for performing regression test, correlation test, descriptive statistics test and reliability test. As far as reliability test is concerned, it has been based on two criteria such as (1) Composite reliability and (2) Cronbach's alpha, both must have values greater than 0.70 threshold limit, as above its internal consistency and items reliability can be ensure. Further, AMOS has been taken into account for carrying out two tests such as confirmatory factor analysis and structure equation modeling. CFA is conducted for the assessment of model fitness, discriminant validity and convergent validity. On the other hand, SEM has been accompanied for hypothesis testing and it reports which hypothesis get accepted or which get rejected.

RESULTS AND ANALYSIS

Prior to formally switching towards the formal estimation, the researcher conducted post estimation analysis of data. The author estimated the frequency distribution of the data to analysis the share of respondents according to gender, age and education. The valid data size comprised on 316 respondents of Thailand. In the total dataset, the share of male and female respondents are almost equally divided. The share of male respondents, in total dataset is 52.2 percent, whereas the share of female respondent in total data set is 47.8 percent. Moreover, in order to analyze the

share of respondents according to ages the researcher estimate the frequency distribution based on ages. The results indicate that share of respondents more than 50 year constitute about 15.6 percent of total data set. The share of respondents fall under the age range of 41-50 is 30.7 percent. Therefore, it can be assumed that most of the respondents belongs to middle age group. As far as age of is concerns, the holders of master and post graduate degree constitute about 33.2 and 43.4 percent share , respectively. The high educated and learned respondents are good for primary data as they easily understand the nature and scope of questionnaire.

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error
PS	316	1.00	5.00	3.5597	1.08537	-.851	.137
IS	316	1.00	5.00	3.5090	1.15029	-.700	.137
IP	316	1.00	5.00	3.5778	1.10543	-.800	.137
BC	316	1.00	5.00	3.4362	1.10261	-.552	.137
IC	316	1.00	6.33	3.3481	1.06691	-.224	.137
CA	316	1.00	5.00	3.5005	1.03871	-.831	.137
Valid N (listwise)	316						

In order to conduct the detail analysis of data of each variables, the researcher presents the summary statistic of data. Table 1 indicates the descriptive analysis of variables that include average, minimum, maximum and standard deviation, and skewness of variables' data. Minimum values of all the variables is 1 and the maximum value of all the variable is 5, which illustrate that variables response are recorded on five point Likert scale. The average values of all the variables drifted around 3.3-3.6 which indicates that high proportion of respondents are neutral of slightly agree with the statement. In addition, the values of skewness endorse the normal distribution in all variables' data as threshold value of skewness lies in the range of -1 and 1 for normal distribution.

Table 2: Factor Loading and Convergent Validity

	Component							
	BC	IC	PS	CA	IP	IS	CR	AVE
BC6	.861						0.914	0.789
BC5	.843							
BC3	.842							
BC4	.842							
BC2	.835							
BC7	.821							
BC1	.799							
BC8	.787							
BC9	.785							
BC10	.760							
IC6		.808					0.939	0.638
IC1		.806						
IC5		.805						
IC8		.797						
IC3		.783						
IC7		.748						
IC2		.735						
IC9		.723						
IC4		.722						
PS6			.822				0.958	0.741
PS4			.819					
PS5			.816					
PS3			.813					
PS7			.811					
PS8			.809					
PS2			.743					
PS1			.668					
CA6				.799			0.915	0.641
CA5				.797				

CA4	.792			
CA2	.763			
CA3	.750			
CA1	.742			
IP3		.867	0.946	0.777
IP2		.836		
IP1		.826		
IP4		.815		
IP5		.790		
IS3			.805	0.941	0.799
IS4			.798	
IS2			.798	
IS1			.745	

Table 2 represents the results of component factor analysis (CFA) by showing the rotated component matrix of variables. The statistics of CFA test also support that all variables have valid construct as the load factors are higher than 0.7, which is threshold value for validity of variable. Besides, the issue of cross loading has also not identified. In addition, the "convergent and discriminant" test also authorize the validity of measures.

Table 3: Discriminant Validity

	IC	PS	IS	IP	BC	CA
IC	**0.799**					
PS	0.501	**0.861**				
IS	0.316	0.583	**0.894**			
IP	0.369	0.505	0.613	**0.881**		
BC	0.624	0.493	0.372	0.420	**0.889**	
CA	0.397	0.543	0.576	0.457	0.454	**0.801**

The findings of "convergent and discriminant" validity is presented in table 3. The statistics of AVE and CR confirm of convergent validity. The threshold value of AVE and CR for convergent validity is 0.75 and 0.7, respectively. The oblique CR values endorse that variables are relatively more related with itself than other variables. The high value of digits oblique digits than values of off oblique digits in table indicate the discriminant validity of indicators.

Table 4: Model Fitness Indices and KMO

CFA Indicators	CMIN/DF	GFI	IFI	CFI	RMSEA	KMO
Threshold Value	≤ 3	≥ 0.80	≥ 0.90	≥ 0.90	≤ 0.08	0.6 – 1.0
Observed Value	2.281	0.801	0.939	0.939	0.064	0.940

Table 4 demonstrates the results of Kaiser-Meyer-Olkin (KMO) and Bartlett's Test. The KMO test is a measure to ascertain how suited data is for Factor Analysis. The test estimate sampling adequacy for each indicator in the model and for the complete model. The results of KMO also confirms adequacy in sample data. The threshold range is lies between 0.6 - 1.0 for Confirmatory Factors Analysis. The observed values of KMO of all the variables are 0.90, which confirms adequacy in data.
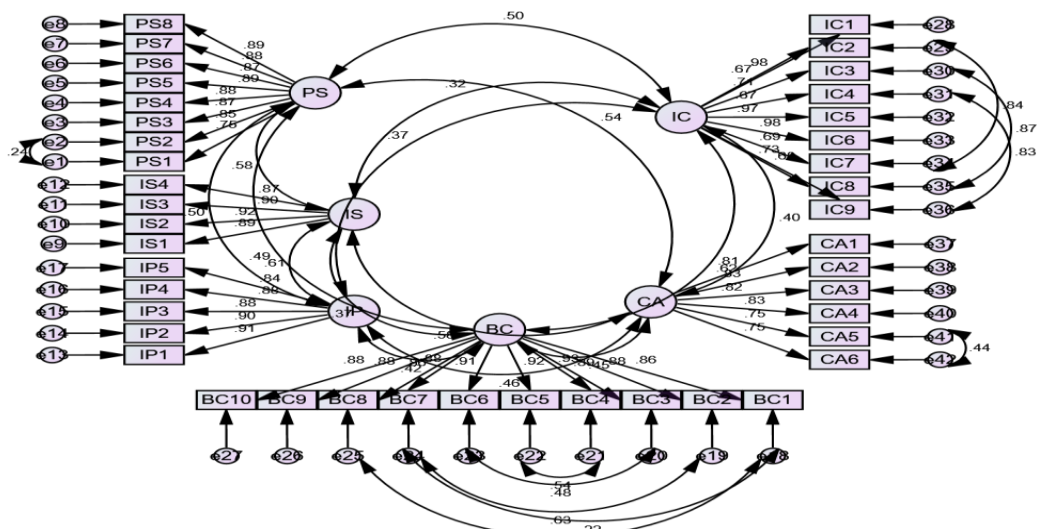
Figure 2: CFA

Table 5 presents the results of the theoretical model estimated by using SEM model. The SEM model is run on AMOS. The model is used to explore the significance of relationships between independent anad dependent varibles. The results indicate that the direct impact of all the variables except IT infrastrute spohistication on competetive advantage is insignificant. The direct impact of IT infrastrute spohistication on competetive advantage is significant as p-value is less that 0.05. The coeffcient indicates that 1 unit increase in IT infrastrure sophistical will enhace the competitive advantage of pharmacutical in Thailand by 33.8 percent.Where as the indirect impacts of all the variables through the chanel of "Big data analysis Capabilities" are significant on competitive advantage of pharmacuticals in Thailand, as p-value is less than 0.05. The

coeffcient values indicate that one unit increase in "Big data analysis capabilities" will increase the competetive advantage of pharmacuricals about 9.4 percent , 7.7 percent, and 5.3 percent through process sophistication, IT infrastrure sophistication, and Information Privacy, respectively. Besides, the indirect impact of all the variables through the chanel of "Internet of Thing capabilities" are insignificant on Competitive advantage of pharmacutical in Thailand, as p-value is higher than 0.05. Therefore, it can be inferred that mediating impact of "Big data analysis capabilities" strengthens the relationships of process sophistication, IT infrastrure sophistication, and Information Privacy with competitive advantage of pharmacutical in Thailand.

Table 5: Structural Equation Modeling

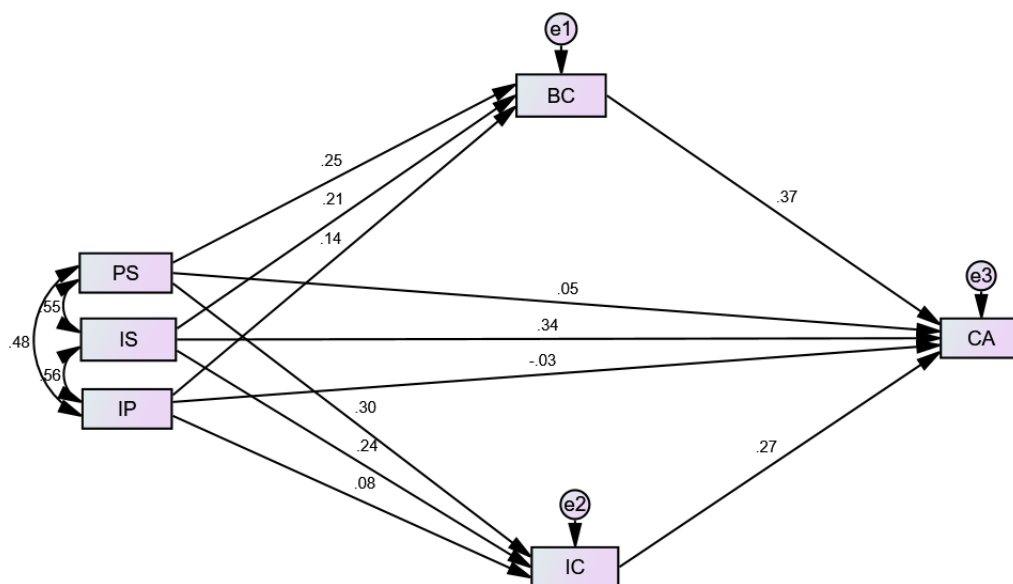| Hypothesis	B-Value	SE	P-Value	Decision
PS→CA	.052	.045	.272	Rejected
IS→CA	.338	.044	.000	Accepted
IP→CA	-.033	.042	.462	Rejected
PS→BC→CA	.094	.061	.000	Accepted
IS→BC→CA	.077	.061	.001	Accepted
IP→BC→CA	.053	.060	.018	Accepted
PS→IC→CA	.081	.058	.000	Accepted
IS→IC→CA	.063	.058	.000	Accepted
IP→IC→CA	.021	.057	.166	Rejected

Figure 3: SEM

DISCUSSION AND CONCLUSIONS
DISCUSSION

The author of this study formulated few hypotheses in this research paper to establish and test the impact of various factors on the pharmaceutical sector of Thailand through the mediating effects of capabilities and facilities provided through the technologies of big data and internet of things. The first and third hypotheses which stated that process sophistication and information privacy have a significant impact on the competitive advantage respectively, of a pharmaceutical company was rejected and have no significant direct impact. Similar results can be seen in various studies (Malik & Kanwal, 2018; Price & Cohen, 2019). The second hypothesis which stated that sophistication of the IT infrastructure has a significant impact on the competitive advantage of a pharmaceutical company was accepted and exerted a significant direct impact of 34 percent. Similar results were depicted in the study by Wang, Kung, and Byrd (2018). Hypotheses four through six show the mediating impact of big data through the three independent variables and all the three showed positive significant and similar results can be seen in other studies as well (Bughin, Livingston, & Marwaha, 2011; Cattell, Chilukuri, & Levy, 2013). Hypothesis seven through to the last hypothesis nine show the mediating effects of internet of things through independent variables on the competitive advantage from which the last hypothesis, that stated that information privacy has an impact on the competitive advantage in pharmaceuticals through mediating effects of the capabilities of internet of things, was rejected, while other two were accepted. Alagarsamy, Kandasamy, Subbiah, and Palanisamy (2019) showed similar results.

CONCLUSION

Today's advanced technologies like IOT and big data capabilities have impacted all kinds of business sectors including pharmaceuticals. In this study, the author has focused on a few determinants of technology, which include process sophistication, privacy of information and the sophistication of IT infrastructure, on the competitive advantage of pharmaceutical companies in Thailand, through mediating effects of big data and IOT capabilities. The data was collected from the pharmaceuticals in Thailand and a sample of 316 respondents was selected. The collected data was analyzed and scrutinized by applying several statistical and analytical tests. From the results of these tests, it was found out that the impact of determinants of IOT and big data was established in this study. Based on these results, several theoretical, practical and policy making implications have been identified by the author.

Implications

As in this study, impacts of determinants of technology was investigated on the level of competitive advantage that a pharmaceutical company has in Thailand's market, it has several implications in theoretical, practical and policy making contexts. It will provide enough literature on the concepts of the above mentioned concepts that can be used by the other researchers or authors in their studies. Other than that, this study assists in increasing technical capabilities in the companies that make medicine in Thailand. In addition, governments are provided assistance for developing policies and regulations that will support the increase of competitively among pharmaceuticals.

Limitations and Future Research Recommendations

Various limitations and boundaries allow for generation of future recommendations that can be employed by the future researchers in their researches and studies to improve the volume and quality of information. The first limitation is this study is that a limited set of determinants of technology have been selected in this study which can be increased or may be changed in future studies. Moreover, this study is set in Thailand and can be broadened by including a region based analysis. Moreover, the tests that have been used in this study are very few and specific. The other researchers may experiment with other tests and approaches so that more accurate results are obtained.

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