

# Effects of Open Innovation and NPD Network on Innovation Based Performance in the SMEs of Thailand

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## Abstract

The aim of the current study is to check the effects of open innovation and the NDP network on the innovation-based performance of SMEs in Thailand. The data were received from the employees that are currently working in the department of R&D in the SMEs of Thailand and data were collected with the help of questionnaires and Smart-PLS was employed for the analysis of the collected data from the respondents. The findings exposed that the network profile has a positive link with the innovation-based performance of the firms. The results also indicated that the ideal profile also has a positive link with the innovation-based performance of the firms. These outcomes are useful for the employees who implemented the policies in the organization and also for the regulators who formulate policies related to the innovation.

**Keywords:** Open Innovation, NDP Network, Network Profile, Ideal Profile, Innovation-based Performance

## Introduction

The subject of the study is to examine how small and medium enterprises (SMEs) in Thailand interact with their partners in the NDP network to attain superior innovation-based performance in the market of this highly competitive age. This network is the group of commercial persons who work together in co-operation for the development of new products and so as to attain superior performance. If small and medium enterprises want the successful development of new products, they must co-operate with others in the business working. This need of co-operation among business entities arises from the fact that firstly, it's necessary for small and medium enterprises to innovate their performance to compete for a higher position in the marketplace

and secondly, these enterprises have to improve their capabilities for work efficiency (Aragón-Correa, García-Morales, & Cordon-Pozo, 2007).

SMEs themselves are unable to do everything without collaboration with others. The large-scale research approves that collaborating with other firms' management puts positive effects on a firm's own performance. Different scholars place the argument that diversity in networks enhances the frequency of positive outcomes firms' innovation-based capabilities (Rosenbusch, Brinckmann, & Bausch, 2011). Deep research makes it clear that business organizations should make their collaboration better with the competitors of equal rank but having different capabilities as it helps them to use technology in such a way as to get maximum financial gain. The knowledge gained from co-operation with other firms proves to be beneficial especially in the production of new higher quality products (Bain, Mann, & Pirola-Merlo, 2001).

Small and medium enterprises, in Thailand, are extensively undertaking activities for open innovation which is the source of the best quality products. The term open innovation, its application in production and management and its impacts on

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firms' performance has considerably been discussed. Different scholars have presented different views on this topic. In a firm, open innovation is to acquire knowledge from outsiders to speed up the rate of internal innovation and to share their own knowledge with the outsiders to increase the marketing opportunities for the production. When, in practical life, business enterprises try to apply the concept open innovation they have to face many hindrances. For instance, when small and medium enterprises attain knowledge from outsiders or share information with external persons, many organizational problems and cultural issues may arise (Bossert, 1998). There may be a risk to lose competence, internal innovative techniques, strategies, and the skills to use technology for the maximum financial gain. There may be a leakage of some secret information that may risk firms' survival. But open innovation becomes compulsory for the firms which are facing difficult times, for competing against competitors in the market. That's why, the firms that implement open innovation need to establish relationships with other organizations on a sound basis being constantly alert (Damanpour & Evan, 1984).

Alliance literature highlights that sometimes outside parties do not contribute to knowledge according to the firm's expectations. Outsiders may have negative thoughts and poor perceptions about the business mechanism. There may be differences in sensibility and understanding. The outside parties may have the opposite interest (Pitt & Tucker, 2008). There may be different timing in delivering knowledge. There may be managerial problems and a lack of certainty. The working of alliances in co-operation affects performance. The failures of alliances indirectly cause the failures in the innovation of products of other members of the network (Salter & Torbett, 2003). Large scale research has been made to find out in which combinations variables of the network should be arranged so that they help in the development of new innovation-based products. The main purpose of this research is to lead the firms in the network towards the achievement of superb. This research throws light on a large number of features of the NPD network taking into account their effects on innovation-based performance. This research discusses all the network features. It does not focus on individual features of the NPD network. Furthermore, this research builds configuration theory (Darroch, 2005).

Configuration theory assumes that organizational features are designed on the basis of

the features of the NPD network. The organizational features of an enterprise must also be according to the business nature and environment of the enterprise so as to drive superior performance. Configuration theory focuses on the concept of 'fit'. 'Fit' is the set of combinations in which different organizational components are for the achievement of higher innovation-based performance. The effects of 'fit' on firms' performance in network collaboration have been observed among their organizational components like environment and structure, learning and strategies. The configuration theory is like a system approach to the concept of fit as it puts emphasis on the interdependent relationship of internal and external organizational components (García-Morales, Matías-Reche, & Hurtado-Torres, 2008). The small and medium enterprises in the NPD network show in their profiles the innovation-based resources, like up-to-date technology, equipment, and instruments, etc, the innovation-based capabilities like high-level skills, learning processes, best techniques to run innovative technology and innovation-based technology, etc and combinations of organizational components held at a high level. But, in fact, their technology, techniques, strategies, arrangement of organizational factors and their apparent performance may not comply with their profile. Open innovation would be helpful for SMEs in the attainment of innovation-based superior performance only when their actual working, techniques, and organization of resources and other factors are similar to their profile from all sides. Thus this study refers to the contingency theory which states the uncertainty found in the production and marketing environment (Grawe, Chen, & Daugherty, 2009). In Thailand, many small and medium enterprises are applying open innovation. They are working in different networks for the development of new products. They attain knowledge and information from their partners in the network and apply them in the production of new items and in the organization of different components for the maximum financial gain (Otero-Neira, Lindman, & Fernández, 2009). They share their own knowledge with the firms in the network to win their confidence and to raise marketing. If the partner enterprises in the network simultaneously perform according to their ideal profile which consists of features of the NPD network, it will enable SMEs to attain innovation-based performance. Similarly, if the appliances' perceptions, structures, managerial abilities, and performance do not fulfill the requirements of ideal

profiles, it may put negative effect on SMEs' performance. But the research on working performance of SMEs engaged in NPD network has

made it clear that mostly open innovation has positive effects on performance (García-Morales, Ruiz-Moreno, & Llorens-Montes, 2007).

Table 1. Venture Investing in BlockChain Technology in Thailand.

	VC funding	Company count
Block chain innovations	1.1	0.81
Bit coin payment	0.45	0.45
Bitcoin exchanges	0.42	1.1
Bit coin wallets	0.4	0.41
Bitcoin mining	0.3	0.25
Bitcoin trust services	0.21	0.21
Bit coin infrastructure	0.15	0.55
Bitcoin Financial Services	0.15	0.55
Bitcoin big data	0.05	0.02
Bitcoin data services	0	0.22
Bitcoin gambling services	0	0.2
Bitcoin services	0	0.15

### Venture Investing in Blockchain Technology

Venture Scanner

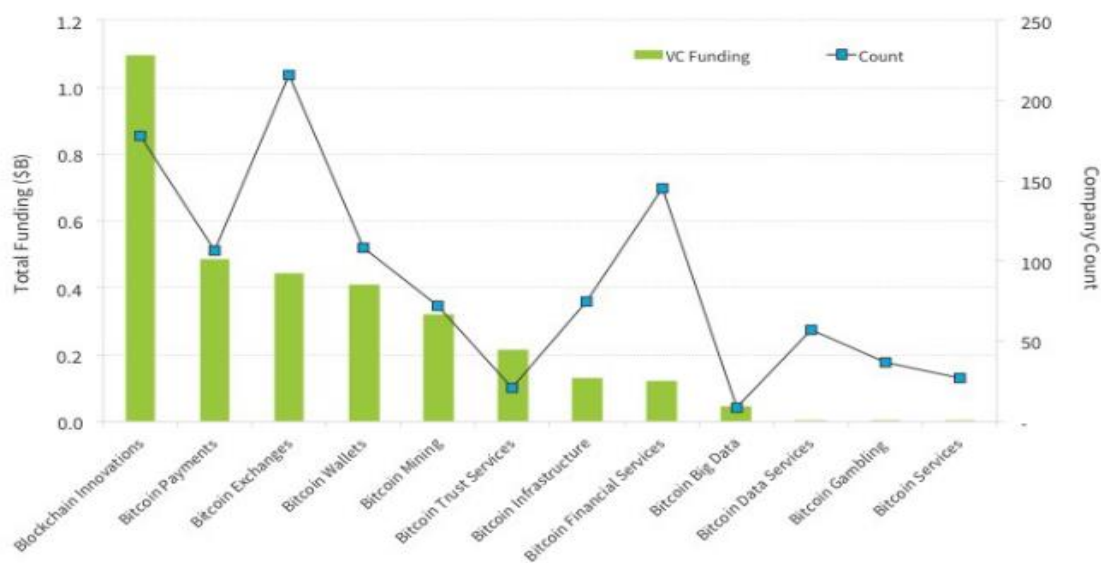


Figure 1. Venture Investing in Blockchain Technology in Thailand.

### Literature Review

This study on open innovation in SMEs in Thailand demonstrates the four basic dimensions of an industrial sector which are stated with the reference of capital such as social, strategic, cultural and economic capital. These dimensions determine four features of an ideal NPD network which all the alliances must-have for the achievement of innovation-based performance. The features of the sound network are the complementarity of partners' goals, the complementarity of their resources, attainment of

confidence in customers and strengthening the structure of the network. These features are related to superior innovation-based performance in small and medium enterprises in Asian country Thailand. This study throws light on the point that there is a close relationship between these features of the network and innovation-based performance (Hervas-Oliver, Sempere-Ripoll, & Boronat-Moll, 2014).

This study focuses on the achievement of innovation-based performance by establishing an NPD network. The term innovation can be defined

as the newness and up-to-datedness achieving by the procedure involving the repetition of steps according to the up-to-date requirements of the market and new social preferences. The research on innovation of performance proves that innovation-based performance can be measured by analyzing whether the objectives regarding the development of products achieved. This measure of innovation-based performance is not limited to a certain span of time and it depends on the scale of the project. This is how the performance of small and medium enterprises in NPD networks can be measured (Theyel, 2000).

The superb innovation-based performance can be achieved through collaboration and sharing knowledge among copartners. The purposes of copartner firms and their strategies should be stated clearly. The common understanding of these goals should be established among the members of the network. They should co-operate with each other for the achievements of these goals (Yeniyurt, Henke, & Yalcinkaya, 2014). These goals and motives must be corresponding and complementary to each other. Such correspondence of objectives encourages the flow of knowledge for the development of new quality-based products. The well-designed objectives provide a sound basis for the co-operation among SMEs in Thailand (Hitt, Hoskisson, & Ireland, 1994).

The higher the complementarity of motives, the more fruitful is the influence of the relation among SMEs. But this complementarity does not mean that these goals must exactly be the same. The goals must be complementary but not competing. These motives can be similar but not of the same nature though these motives should be achieved through some common model. If the goals are of opposite nature, there may be a chance of arising conflicts which would hinder the information sharing between the alliance and other partners (Ndubisi & Iftikhar, 2012). The copartners would not even think of alternative resources until they have complementary goals in their minds. The research on the application of open innovation in the management of small and medium enterprises stresses the point to which extent the partners' objectives should complement each other. The higher the level of complementarity in objectives, the higher is the innovation-based performance (Hogan & Coote, 2014).

The achievement of the set motives in the NPD relationships of SMEs requires the exchange of resources whether they are physical or organizational. The firms can innovate their performance by finding out new innovative

resources or new processes to arrange and utilize existing resources. These resources of SMEs improve the activities needed for the attainment of innovation as these resources help in getting more information. Similarly, new knowledge required for solving managerial and production problems accelerates the innovative activities of companies (Naranjo-Valencia, Jiménez-Jiménez, & Sanz-Valle, 2016). Manufacturing new innovation-based products are not possible only in the presence of resources but it also needs the presence of an innovation-based process to organize the resources in appropriate combinations to utilize them to the largest possible extent for maximum profits (Silva, Styles, & Lages, 2017). In actuality, the exchange of resources between an alliance and its copartners in collaboration impart innovative effects on performance in two ways. Firstly, the alliance taking external resources whether they are physical or organizational extends its technological capability which increases the development of new quality products. Secondly, additional capabilities are taken from the other partners to raise the rate of innovation in product development (Jansen, Van Den Bosch, & Volberda, 2006).

The resources of companies in NPD can be affected in two ways. First, the way the resources are used and secondly, the way they are developed. There is a difference between firms' resources which can be used and their resources which can be developed in external co-operation. These resources may be idiosyncratic or complimentary (Montes, Moreno, & Morales, 2005). The idiosyncratic firms' resources are developed at the time of collaboration. These resources are non-substituting and they help the alliance and the copartners in combining their resources. Complementary resources are the learning, knowledge, organizational methods and managerial capabilities of copartners of NPD network which applied to remove the deficiencies found in each other's collection of resources. The presence of both types of resources is necessary for the positive effects of open innovation on business performance (Jiménez-Jiménez & Sanz-Valle, 2011). The effectiveness of complementary resources and idiosyncratic resources can be to measure the profit of organizations. In Thailand, small and medium enterprises in an NPD network are applying both types of resources for the achievement of innovation-based performance. Small and medium enterprises in Thailand are constantly trying to maintain the confidence of existing firms and to achieve the confidence of new customers so as to raise the market for

their products. For the achievement of such confidence, it is necessary for the firms to remove deficiencies in their resources thus in their production (Koellinger, 2008).

To work on the same projects in co-operation, it is compulsory for men to trust one another. Trust can be defined as one's belief that someone's actions will result in the same way as one thinks. They should trust on the occurrence of positive good ends of their co-operation. At least, they should believe that there will be no loss and if there arises any loss, they will be compensated fully and in time. In the NPD network, trust is of two types: (1) Competence Trust. (2) Goodwill Trust. Competence trust is a company's trust in the abilities of its copartners that they will show performance according to mutual agreement. Goodwill trust is the company's trust on the intentions of its copartners that they will surely follow the contents of mutual agreement. The belief that they will co-operate heart and soul and that they will intent to cheat or fraud. It is found by the research that competence trust is a necessary condition for undertaking future transactions with copartners (McDermott & Prajogo, 2012). And goodwill trust is an inevitable condition to implement the rules set in the mutual agreement. Trust among copartners that developed with the passage of time may bring them unpredicted benefits, though the set goals are not achieved within the given period of time. Trust is important to determine commitments in the mutual agreements. It helps small and medium enterprises to implement the contents of mutual agreement and thus to raise the rate of profits by minimizing the total cost. A sound form of trust is required for undertaking any transaction among partners in which resources (whether they are physical or organizational) are interexchange simultaneously (Lanoie, Laurent-Lucchetti, Johnstone, & Ambec, 2011).

The large-scale research has been made about trust development and measurement of its effects on SMEs' performance in the market. This research demonstrates that trust should be based on perceptions and thoughts of partners, their behavior and emotions. Keeping in mind the personal trust and organizational trust among alliances who work together for the development of new products and the effects of this trust on their performance trust has been defined as the belief that copartners will prove to be reliable in performing their duties, they will show predictable behavior and they will not try to cheat, fraud and conspire against others even when there is chance

to take advantage from the situation and to exploit others, but they will act honestly and fairly. A point is raised from the definition that trust has three main dimensions predictability, reliability, and fair dealings. The trust formation among the partner firms has largely been discussed (Lau, Tang, & Yam, 2010). SMEs in Thailand measure the effectiveness of trust relation by examining whether the copartners are fulfilling their obligations sincerely, whether they are representing predictable behavior and whether they are dealing fairly and they are not hatching conspiracies to exploit others. This type of measurement of organizational trust among small and medium enterprises in a network has widely been adopted by many countries like Thailand in the South Asian Region. Research about the effectiveness of networks (established for the development of new products) has proved that this an effective and efficient way of measuring trust (inter-organizational and inter-personal) among partner firms. Moreover, this measurement of trust has been making a large number of contributions to the organization and management of small and medium enterprises in Thailand (H. Li & Atuahene-Gima, 2002). This measurement is based on sound knowledge and research. Having made research, many renowned and highly qualified scholars have checked this measurement of trust in the NPD network and made improvements in it with the passage of time. In spite of all discussion given above, when the measurement of trust has gone through empirical testing, some scholars view that trust has just two dimensions instead of three: (1) Fairness (2) Reliability. Reliability states that copartners should prove to be reliable in performing their duties and Fairness focuses that the co-partners should work honestly, they should not try to cheat others, fraud and conspire against others even when there is a chance to take advantage from the situation and to exploit others. Their dealings must be fair. This research proves that the partner firms' trust having high fairness and reliability ensures the innovation-based superb performance (Mazzola, Bruccoleri, & Perrone, 2012).

The deep study of the literature regarding the features of the network indicates that the structural nature of the network is of great importance in relation to the innovation-based performance. The effectiveness of open innovation on the performance of firms is dependent on the structural design of the NPD network. The structured nature depends on the existence of structural holes and its density. Still, there is a lack of a sound measure for the measurement of the

structural nature of a network. The structure that strengthens the relationships of small and medium enterprises (SMEs) in a network attracts the attention of scholars (Y. Li, Zhao, & Liu, 2006).

The effectiveness of the network structure can be measured by the number of links which is known as the density of the network. The increase in the density affects communication across the partner firms and their expectations. The greater the density, the more efficient is the communication. The greater the numbers of firms, the greater are the expectations to achieve innovation-based performance. Ignoring one's position, the higher number of alliances restricts the presence and usage of varieties, but the low number of alliances does not allow the incorporation of diversity sufficiently (Lindgreen et al., 2008).

In Thailand, many companies are working together in 'ego' networks. In the ego network, only one alliance is directly connected to all the other actors. This alliance is known as the ego. All the other members of the network are not directly connected to one another. These members alter. It is the ego that negotiates between alters. It is the ego that connects alters. The ego works as a broker in the network. The firms which have better position the network and which can fill the structural holes are able to perform better in the market as they have more information than others due to their direct connection with others. The enterprises in the network which has many structure holes are able to get up-to-date information from all distant areas of the network. They can utilize that information to achieve their objectives. As a result, networks having a large number of structural holes can give more new information and discover the best managerial opportunities (Löf & Heshmati, 2006).

The above-mentioned literature on the features of the network indicates that when the network features are examined separately, they show a relationship with innovation-based performance. Similarly, if we consider network features in isolation it becomes clear that the simultaneous features of organization in actual life and of network determine high-level superior performance. If these features are different to some an extent, they might not directly affect the performance (Löf, Heshmati, Asplund, & Nåås, 2001).

From the above-mentioned discussion, it becomes clear that neither network features nor feature of alliances alone helps to achieve innovation-based performance. But the combined

features of network and organization in actual life drive innovation-based performance. Moreover, the comparison between the features of network profile and ideal profile (complementarity of motives, complementarity of resources, belief among partners and strong position in-network) should be made to analyze at what degree the features of network profile effect the innovation-based performance and at what degree the four basic features of ideal profile help to drive innovation-based performance (López-Nicolás & Meroño-Cerdán, 2011). The above-mentioned literature supports the theories given below:

**H1.** The network profile has a positive relation with innovation-based performance in SMEs of Thailand.

**H2.** The ideal profile has a positive relation with innovation-based performance in SMEs of Thailand.

### Research Methods

The aim of the current study is to check the effects of open innovation and the NDP network on the innovation-based performance of SMEs in Thailand. The data were received from the employees that are currently working in the department of R&D in the SMEs of Thailand and data were collected with the help of questionnaires and Smart-PLS was employed for the analysis of the collected data from the respondents. The questionnaire method that was adopted firstly needs to get permission that is obtained by the researcher after that 450 questionnaires were distributed by personal visit and also through the mail but out of them only 305 were returned and used for the analysis that is around 67.77 percent response rate. The variable like innovation-based performance (IBP) has 10 items while the variable such as network profile (NP) has 25 items and the last predictor like ideal profile (IP) has 12 items and these variables are shown in Figure 2.

### Findings

The findings are shown the convergent validity along with reliability and the values show that the reliability, as well as convergent validity, are valid because the Alpha values are more than 0.70, the loadings are more than 0.40, composite reliability (CR) values are higher than 0.70 and the values of AVE are larger than 0.50. These are all the pieces of evidence of valid convergent validity and reliability that show items are highly correlated. Table 2 shown below have all the values.

## Theoretical Framework

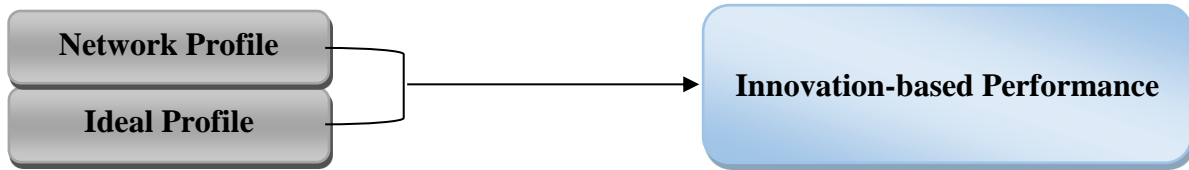


Figure 2. Theoretical Framework

Table 2. Convergent Validity

Constructs	Items	Loadings	Alpha	CR	AVE
Innovation-based Performance	IBP1	0.581	0.920	0.934	0.588
	IBP10	0.787			
	IBP2	0.765			
	IBP3	0.843			
	IBP4	0.646			
	IBP5	0.812			
	IBP6	0.797			
	IBP7	0.780			
	IBP8	0.814			
Network Profile	IBP9	0.802	0.962	0.966	0.558
	NP1	0.833			
	NP10	0.804			
	NP11	0.707			
	NP12	0.832			
	NP13	0.780			
	NP14	0.758			
	NP15	0.822			
	NP16	0.781			
	NP17	0.822			
	NP18	0.806			
	NP19	0.802			
	NP2	0.779			
	NP20	0.707			
	NP21	0.776			
	NP24	0.760			
	NP25	0.816			
	NP3	0.422			
	NP4	0.470			
	NP5	0.482			
NP6	0.476				
NP7	0.837				
NP8	0.821				
NP9	0.823				
Ideal Profile	IP1	0.782	0.930	0.933	0.540
	IP10	0.724			
	IP11	0.728			
	IP12	0.640			
	IP2	0.664			
	IP3	0.651			
	IP4	0.780			
	IP5	0.705			
	IP6	0.815			
IP7	0.698				
IP8	0.825				
IP9	0.773				

The values of Fornell Larcker shown that the constructs are not highly correlated because the values are, in case of the variable itself greater while other variables are small that is the indication of valid discriminant validity and shown in Table 3.

Table 3. Fornell Larcker

	IBP	NP	IP
IBP	0.767		
NP	0.540	0.747	
IP	0.380	0.376	0.735

The values of cross-loadings shown that the constructs are not highly correlated because the values are, in case of variable itself greater while other variables are small that is the indication of valid discriminant validity and shown in Table 3.

Table 4. Cross-loadings

	IBP	NP	IP
IBP1	0.581	0.307	0.362
IBP10	0.787	0.480	0.303
IBP2	0.765	0.488	0.310
IBP3	0.843	0.446	0.300
IBP4	0.646	0.271	0.282
IBP5	0.812	0.455	0.321
IBP6	0.797	0.393	0.246
IBP7	0.780	0.404	0.245
IBP8	0.814	0.440	0.272
IBP9	0.802	0.390	0.277
NP1	0.477	0.833	0.282
NP10	0.454	0.804	0.291
NP11	0.341	0.707	0.249
NP12	0.453	0.832	0.307
NP13	0.389	0.780	0.272
NP14	0.407	0.758	0.306
NP15	0.401	0.822	0.242
NP16	0.304	0.781	0.210
NP17	0.464	0.822	0.332
NP18	0.473	0.806	0.309
NP19	0.457	0.802	0.288
NP2	0.299	0.779	0.207
NP20	0.354	0.707	0.248
NP21	0.393	0.776	0.272
NP24	0.402	0.760	0.301
NP25	0.401	0.816	0.241
NP3	0.287	0.422	0.310
NP4	0.388	0.470	0.212
NP5	0.280	0.482	0.326
NP6	0.263	0.476	0.312
NP7	0.463	0.837	0.284
NP8	0.453	0.821	0.301
NP9	0.466	0.823	0.342
IP1	0.203	0.149	0.782

IP10	0.117	0.074	0.724
IP11	0.095	0.121	0.728
IP12	0.096	0.141	0.640
IP2	0.421	0.485	0.664
IP3	0.434	0.488	0.651
IP4	0.201	0.157	0.780
IP5	0.263	0.197	0.705
IP6	0.221	0.189	0.815
IP7	0.261	0.194	0.698
IP8	0.225	0.214	0.825
IP9	0.143	0.165	0.773

The figures of Heterotrait Monotrait (HTMT) ratio show that the constructs are not highly correlated because all the values of HTMT ratio are lower than 0.90 and proved the discriminant validity and shown in Table 5.

Table 5: Heterotrait Monotrait Ratio

	IBP	NP	IP
IBP			
NP	0.562		
IP	0.323	0.306	

The results of path analysis show that positive link among the network profile and innovation-based performance because positive beta, greater than 1.64 t-statistics and lower than 0.05 probability values and accept the H1 while one percent change in network profile, the innovation-based performance will also change by 0.463 percent and vice versa. Moreover, the results of path analysis show that positive link among the ideal profile and innovation-based performance because positive beta, greater than 1.64 t-statistics and lower than 0.05 probability values and accept the H2 while one percent change in ideal profile, the innovation-based performance will also change by 0.463 percent and vice versa. These values are shown in Table 6.

### Discussions

The findings exposed that network profile has positive link with the innovation-based performance of the firms. The results also indicated that ideal profile also has positive link with the innovation-based performance of the firms. These outputs are same as the past studies who also indicated the positive association among the network profile and innovation and performance. These outcomes are useful for the employees who implemented the policies in the organization and also for the regulators who formulate polices related to the innovation.



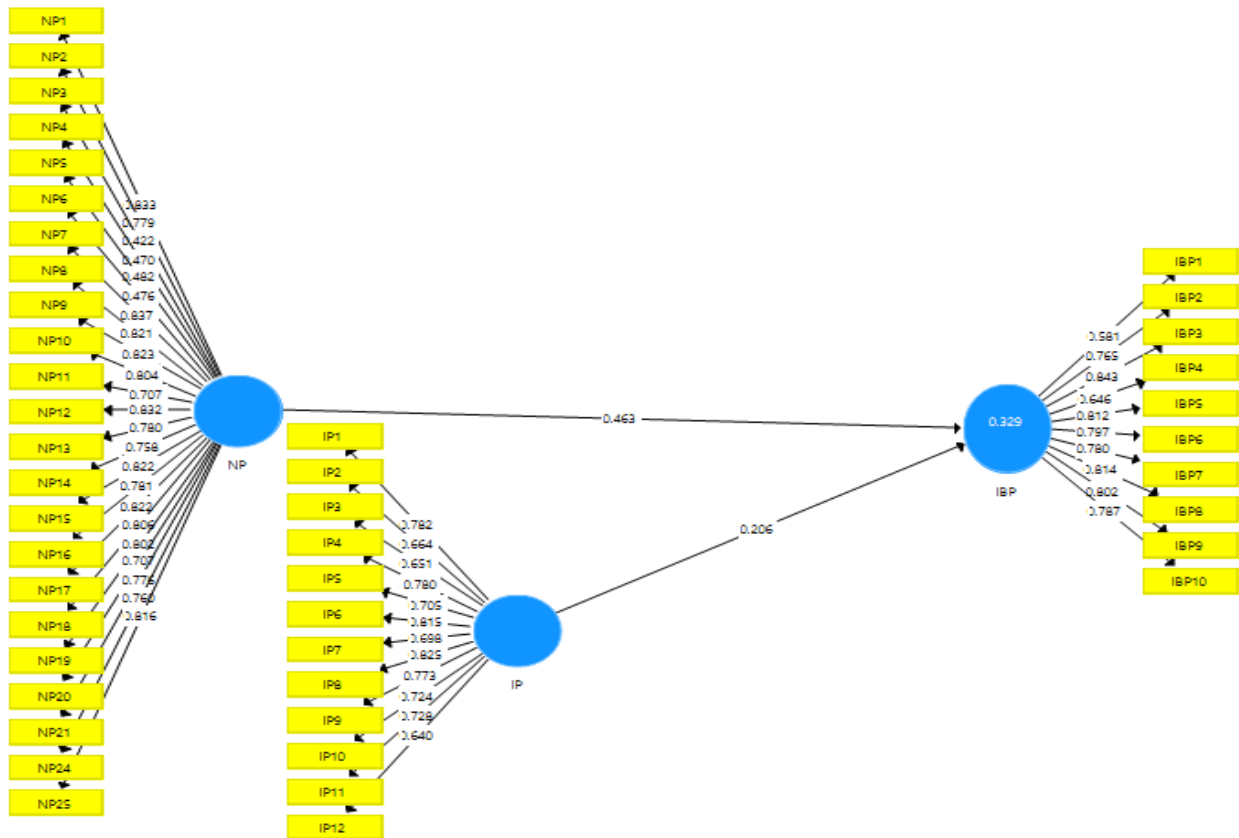


Figure 3. Measurement Model Assessment

Table 6: Path Analysis

	Beta	S.D.	t-values	p-values	L.L.	U.L.
NP -> IBP	0.463	0.047	9.685	0.000	0.387	0.538
IP ->IBP	0.206	0.050	4.191	0.000	0.131	0.299

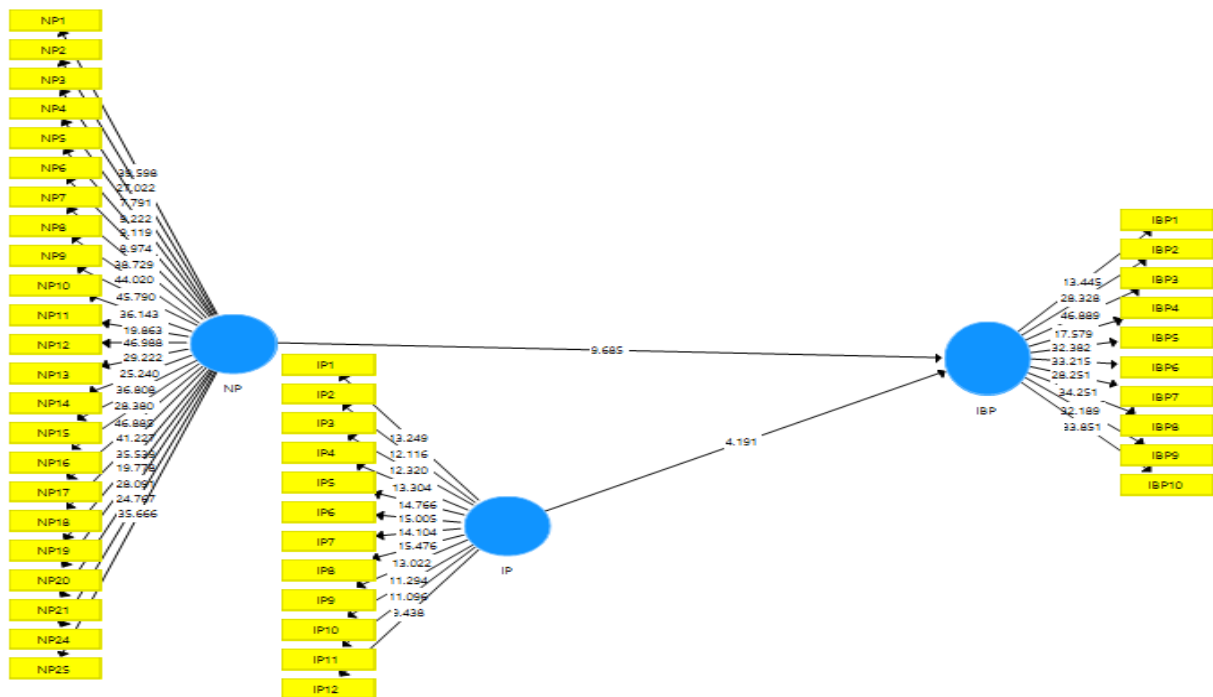


Figure 4. Structural Model Assessment

### Conclusion

This study reach to the conclusion that the firms in Thailand have very effective ideal as well as network profile to adopt the innovation in the firm that is the reason they were adopted high quality innovation in the firm that enhance the performance of the firm among all other companies that are behind away in term of implementation of innovation in the companies.

### Limitations and Future Directions

This study takes only health sector under investigation along with only one country like Thailand and suggested to the future studies that they should expand their focus. The more predictor should use by the other study is the suggestion from this study that is included in the limitations of the existing study.

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