Factors Influencing Implementation of Open Innovation Concept in Malaysian Industries

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***Abstract*—Malaysia needs to transform to an innovation-led economy. It needs to develop new policies focused on value creation and new concepts of innovation. A quantitative study conducted in Selangor, where 43.2% of the total firms are located. A questionnaire was used in data-gathering to investigate the relationship between the proposed factors and open innovation dimensions. The total number of respondents was 281. The study revealed that there are nine factors preventing the adoption of an open innovation and can be grouped under three areas, namely, IP management in Malaysian universities, Malaysian governmental policy and laws, and IP management in Malaysian industries. The finding had long term implication for policy-makers interested in the Malaysian innovation system. This study has identified the real obstacles preventing the industry sector from implementing open innovation.**

***Index Terms*—open innovation, intellectual property, Malaysian industries and commercialization**

I. Introduction

Over the past years, innovation has had a critical positive impact on industries. This is because innovation involves significant changes in both practices and industries. It refers to the development of new ideas and translating them into products and services [1]. Nowadays, because of the broad diffusion of the scientific research, knowledge monopoly has ended. So, innovation methodology needs more improvements in order to keep up with rapid changes [2]. As a result of intensive studies in the innovation field, a new concept of innovation which is called 'open innovation' has been developed in 2004. OI was promoted by Henry Chesbrough. It refers to the purposive use of inflows and outflows knowledge to accelerate internal innovation and expand the markets for external use of innovation [3]. The OI approach provides firms with a good opportunity to create value by using alternative paths to innovations as shown in Fig. 1 OI came to improve the old concept of closed innovation which depended on the internal R&D to improve products only.

Gassmann and Enkel [4] suggested two main types of OI approach. The first dimension is the outside–in approach that maximizes firm's knowledge and inventions by integrating it with external sourcing. The second dimension is the inside-out approach which refers to moving ideas to the markets in order to gain profits.

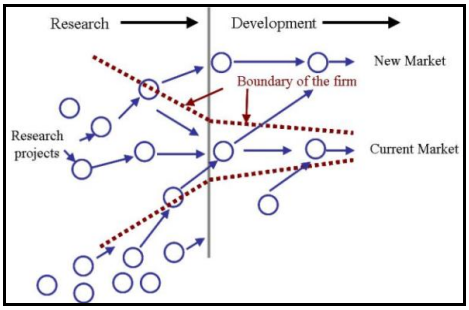

Figure 1. OI approach (Source: Chesbrough (2003)).

A. Innovation in Malaysian Industries

Malaysia has successfully transformed from an agriculture-based economy to a resource-based economy. Now, the time has come to transform to an innovation-led economy. From macroeconomic perspective, Govindaraju and Sundram [5] showed that Malaysia industries depend on importing new technology rather than developing it. Thus, Malaysia's industries started to specialize in high valued-added industry. Yet, until now, Malaysian polices did not focus on new concepts of innovation such as open innovation, therefore, Malaysia needs to develop new policies which are broader and and more focused on value creation [6].

B. IP Management

Intellectual property (IP) is a tool used to protect knowledge by creating control over its invention to prevent others from using it [3]. As other resources, IP is considered a valuable asset and should be managed carefully [7]. Smith and Hansen [8] emphasized that in the current knowledge economy, IP must be managed strategically, because it has positive influence on firms' performance [9]. Eterovic and Sweet [10] revealed that stronger IP systems create higher grade of economic complexity. Furthermore, policy makers need to promote the effective use of the IP by increasing the awareness of all IP system's elements [11]. The emergence of intellectual property rights (IPRS) reduces the risk of adopting OI to prevent the firm's competitive position. It becomes the critical element of OI, because IPRS leads to exchange of valuable knowledge which is the main characteristics of OI [12]. Chesbrough and Vanhaverbeke

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[13]'s report suggested that innovation policy needs to move outside the walls of the firms and consider the concept of IP in promoting open innovation environment. The report also suggested fostering IP intermediaries and rebalance of university IP polices. Thus, the critical question 'what are the key factors that influence the implementation of the open innovation concept in Malaysian industries?' should be answered. This study proposed a framework to improve the implementation of open innovation in the Malaysian industries by investigating the relationship between IP management and open innovation implementation in Malaysia.

II. Research Framework

The proposed framework includes a relationship between two components, the factors and dimensions for IO implementation. To ensure the framework's validity as shown in Fig. 2, three Malaysian experts were consulted for discussing, evaluating and taking feedback about the proposed components. The first component of the research framework consists of twelve proposed factors that influence the implementation of OI practices in the Malaysian industries which were divided into three areas as follows:

- IP management in Malaysian universities.
- Malaysian governmental policies and laws.
- IP management in Malaysian industries.

The study examined the influence of the first two areas on the inward practices. The influence of the third area was investigated on the outbound OI practices.

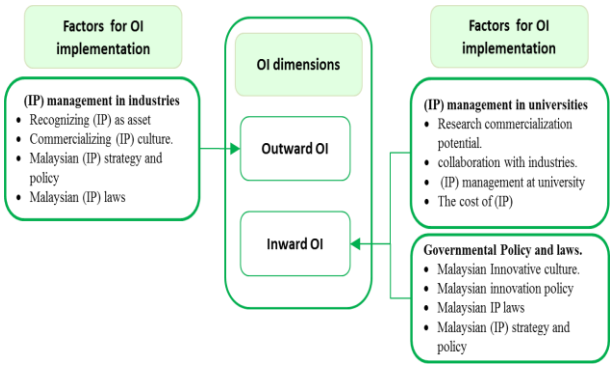

Figure 2. Factors for OI implementation.

III. Research Methodology

This study was conducted in Selangor state where 1100 firms, around 43.2% of the total Malaysian industrial firms are located in and included in the Federation of Malaysia Manufactures directory [14]. This study was implemented by using quantitative method because this method is more suitable to explain the relationship between the OI implementation factors and dimensions. Based on the proposed framework, a questionnaire was designed throughout several steps, to ensure the validity, reliability and clarity is accepted. The questionnaire consists of three key sections; the first section included general information section questions. The second section focused on Inward OI practices that contain five subsections. The third section of the questionnaire is similar to the second section, but it is related to the outward OI. The questionnaire used a scale from 1 to 10. This scale is a generally and largely accepted concept, and provides the respondent high flexibility and accuracy range to identify the correct answer. The questionnaire was presented to five experts in order to improve its component. Furthermore a pilot test was conducted. This test provided a trial run for the questionnaire, which involved measuring the effectiveness of the standard deviation to respondents. The pilot test was conducted by collecting 28 respondents. The data collected was analyzed by statistical package for the social science (SPSS 21). The results of the pilot test referred to the strong relationship between framework factors and have an acceptable reliability.

The study sampling techniques used the stratified random sampling. In this technique, every unit of the population has the same probability of being selected. This research used the self-administrated survey method, by filling the questionnaire through face-to-face interviews. The data was collected by filed visits to the targeted firms and conducting a short meeting with the person in charge to explain the research objectives and questionnaire items. Based on the data collection plan the researcher has conducted 400 visits to the targeted firms and succeed in having 281 respondents. The ratio of the respondents was 70.25. This high rate was because the researcher depends on direct visits to the targeted firms. Finally, the data was analyzed using (SPSS 21).

A. Parametric Tests (One-sample T Test)

T.test was used to determine if the means of a statement is significantly different from a hypothesized value 6 (Approximately the middle value of numerical scale 1-10). If the P-value (Sig.) is smaller than or equal to the level of significance, then the means of a statement is significantly different from a hypothesized value 6. The sign of the Test value indicates whether the means is significantly greater or smaller than the hypothesized value 6 in which the questionnaire used a scale from 1 to 10. It is a general and largely used concept for rating things, people, places, ideas, and so on.

IV. Results and Discussion

A. The Relationship between the "IP Management in Malaysian Universities" Area and Inward OI

Table I shows that the means of the factor #4 = 6.82 (68.19%), Test-value = 7.30, and P-value = 0.000 which is smaller than the level of significance . The sign of the test is positive, so the means of this factor is critically greater than the hypothesized value 6. The researcher concludes that the respondents agreed that the high cost of IP in the Malaysian industries prevents the implementation of inward OI, and this factor is considered a critical one. The P-value of factors #1, #3 is less than the level of significance. Meanwhile, the sign of the test value is positive. Thus, the means of these two factors is significantly greater than the hypothesized

value 6. The researcher concludes that the respondents agreed that these two factors are also preventing the implementation of inward OI practices. The results were consistent with previous findings on IP management in Malaysian universities studies [15] and [16]. The means of factor #2 = 5.61 (56.10%), Test-value = -2.92, and P-value = 0.002 is smaller than the level of significance. The sign of the test is negative, so the means is critically smaller than the hypothesized value 6. The researcher concludes that the respondents disagree that this factor prevents the implementation of inward OI. Thus, the researcher concludes that Malaysian universities are interested in collaborating with the industrial sector. The results are consistent with [6] the study which stated that Many Malaysian companies did not see the local university as a strong source of new ideas. Thus, we conclude that the universities had the interest to collaborate with the industry, but did not have the enough capability to supply innovations to the industry sector. Overall, the means of this area = 6.30 (63.03%), Test-value = 3.81, and P-value=0.000 which is smaller than the level of significance is significantly different from the hypothesized value 6. The researcher concludes that the respondents agree that this area influenced and prevented inward OI in Malaysian industries.

TABLE I. MEANS AND TEST VALUES FOR AREA "IP MANAGEMENT IN MALAYSIAN UNIVERSITIES"

#	Factor	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Low commercialization potential of university research	6.23	62.27	2.13	0.017*	1
2.	Universities are not interested in collaborating with our firm	5.61	56.10	-2.92	0.002*	4
3.	Absence of IP management & Idea commercialization of university	6.55	65.49	5.08	0.000*	3
4.	High cost of IP	6.82	68.19	7.30	0.000*	2
5.	All factors of the area	**6.30**	**63.03**	**3.81**	**0.000***	

B. *The Relationship between the Area "Malaysian Governmental Policy and Laws" and Inward OI*

Table II shows that the means of factor #3 = 6.90 (69.01%), Test-value = 8.25, and P-value = 0.000 is smaller than the level of significance. The sign of the test is positive, so the means of this factor is critically greater than the hypothesized value 6. The researcher concluded that the respondents agree that this factor prevents implementation of inward OI, and this factor has a significant impact. The results were consistent with previous findings in Malaysian studies [6], [5], [17]. The means of factor #4 = 6.50 (64.98%), Test-value = 4.43, and P-value = 0.000 is smaller than the level of significance. The sign of the test is positive, so the means of this factor is greater than the hypothesized value 6. The researcher concludes that the respondents agreed that this factor also prevents the implementation of inward OI. The means of factors #1, 2 equals 5.90 (59.03%), 5.99 (59.89%) Test-value = -0.83, -0.09 and P-value = 0.205, 0.466 respectively, which is greater than the level of significance. The means of this area is insignificantly different from the hypothesized value 6. The researcher concludes that the respondents have a neutral opinion on these factors. The result is consistent with Pawanchik, Sulaiman [6] who showed that current policy did not focus on new approaches of innovation such as OI and IP laws in which Malaysia are not well established. Overall, the means of this area equals 6.32 (63.23%), Test-value = 3.93, and P-value= 0.000 is smaller than the level of significance. The means of this is critically different from the hypothesized value 6. The researcher concludes that the respondents agree that this area influence and prevents the implementation of inward OI practices.

TABLE II. MEANS AND TEST VALUES FOR AREA "MALAYSIAN GOVERNMENTAL POLICY AND LAWS."

#	Factor	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	Lack of an innovative culture in Malaysia	5.90	59.03	-0.83	0.205	3
2.	Lack of Malaysian innovation policy	5.99	59.89	-0.09	0.466	4
3.	Inadequate enforcement of IP laws	6.90	69.01	8.25	0.000*	1
4.	Lack of a deliberate IP strategy and policy in Malaysia	6.50	64.98	4.43	0.000*	2
5.	All factors of the area	**6.32**	**63.23**	**3.93**	**0.000***	

C. *The Relationship between the Area IP Management in Malaysian Industries and Outward OI*

Table III shows that the means of factor #2 = 7.01 (70.14%), Test-value = 9.99, and P-value = 0.000 is smaller than the level of significance. The sign of the test is positive, so the mean of this factor is critically greater than the hypothesized value 6. The researcher concludes that the respondents agreed that the absence of commercializing IP culture factor prevents the implementation of outward OI practices in Malaysia. The results were consistent with previous findings on IP management in Malaysian industries [6], [5], [17]. One of the Innovation inhibitors in Malaysia is IP culture and laws, according to these studies. The P-value of factors #1, 3, 4 is less than the level of significance. Meanwhile, the sign of the test value is positive. Thus, the means of these factors is greater than the hypothesized value 6. The researcher concluded that the respondents agreed that these factors also influence and prevent the implementation of outward OI in the Malaysia. Thus, all

factors of IP management in Malaysian industries are considered a preventing factor from implementing outward OI. The means of the area "IP management in Malaysian industries" equals 6.79 (67.93%), Test-value = 6.59, and P-value=0.000 is smaller than the level of significance. The sign of the test is positive, so the means of this area is greater than the hypothesized value 6. The researcher concluded that the respondents agreed that the area of "IP management in Malaysian industries" influence and prevent outward OI practices.

TABLE III. MEANS AND TEST VALUES FOR THE AREA "IP MANAGEMENT IN MALAYSIAN INDUSTRIES"

#	Factor	Mean	Proportional mean (%)	Test value	P-value (Sig.)	Rank
1.	IP asset is not recognized as collateral for purposes of obtaining funds	6.75	67.47	6.53	0.000*	3
2.	Absence of commercializing IP culture.	7.01	70.14	9.99	0.000*	1
3.	Lack of a deliberate IP strategy and policy in Malaysia.	6.83	68.30	8.33	0.000*	2
4.	Inadequate enforcement of IP laws	6.58	65.85	5.82	0.000*	4
5.	All factors of the area	**6.79**	**67.93**	**6.59**	**0.000***	

The study revealed that there are nine factors preventing Malaysian industries from adopting OI as shown in Table IV. While the study showed that the university-industry collaboration factor did not prevent the implementation of OI practices in Malaysia, local universities are suffering from low of commercialization potential of research. Furthermore, Malaysia has a moderately innovative culture and policy in the absence of commercialization, IP culture needs to redevelop to include the new approach to innovation.

TABLE IV. SUMMARY OF RESULTS

Malaysian factors in implementation OI			
Factors		Influencing	OI dimensions
IP management in Malaysian universities	Research commercialization potential	Prevent	Inward OI practices
	Collaboration with industries	Supported	
	IP management at university	Prevent	
	Cost of IP	Prevent	
Malaysian governmental Policy and laws.	Malaysian Innovation culture	Neutral	
	Malaysian innovation policy	Neutral	
	Malaysian IP laws	Prevent	
	Malaysian IP strategy and policy	Prevent	
IP management in Malaysian industries	Recognizing IP as an asset	Prevent	Outward OI practices
	Commercializing IP culture.	Prevent	
	Malaysian IP strategy and policy	Prevent	
	Malaysian IP laws	Prevent	

V. CONCLUSIONS

The study showed that the implementation of the OI concept in Malaysia faced many obstacles that prevent the adoption of this concept. These factors are grouped into the following three areas: 1) IP management in Malaysian universities, 2) Malaysian governmental Policies and laws and 3) IP management in Malaysian industries. First obstacles are related to the local university, in which scientific research at local universities has low commercialization potential. Industry firms are interested to collaborate with them. The second obstacle is related to local policy, characterized by the lack of a local IP strategy and policy in addition to inadequate enforcement of IP laws. Finally, the analysis showed the absence of commercializing IP culture in Malaysian industrial firms. IP management is a key factor for successful implementation of the OI.

The study found that the innovation culture and policy in Malaysia are strong. So this factor will support the implementation of OI.

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