

## FACTORS INFLUENCING THE OUTCOMES OF COMMERCIALLY-ORIENTED ACADEMIC-INDUSTRY ENTREPRENEURIAL COLLABORATIONS

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### ABSTRACT

*This study seeks to analyse the experience of academicians from foreign branch campuses and private universities in Malaysia and point out the multi-level factors that influence the outcomes of commercially-oriented academic-industry entrepreneurial collaborations. This study is cross-sectional and follows an explanatory factor analysis research design. Data was collected from 510 academics from 36 foreign branch campus universities and private universities using a simple random probability sampling method. First, only two multi-level factors, 'age' and 'readiness to collaborate,' are significant when testing the relationship between cross-functional engagement and the performance factor 'effective knowledge transfer'. Second, only two multi-level factors, 'age' and 'readiness to collaborate,' are significant when testing the relationship between cross-functional engagement and the performance factor 'effective knowledge transfer'. It categorises the various types of commercially-oriented academic-industry collaboration activities. Secondly, it illustrates the consequences of each kind of commercially-oriented academic-industry collaboration. Lastly, it measures the performance of commercially-oriented academic-industry collaboration against the performance variables in developing nations like Malaysia.*

## **INTRODUCTION**

This paper reports the findings on the factors influencing the outcomes of commercially oriented academic-industry entrepreneurial collaborations using theoretical approaches, specifically, the socio-psychological, the behavioural, and the resource-based view and the organisational learning. All over the world, universities are critical participating stakeholders in nations via participation in academic entrepreneurial undertakings whilst performing their traditional duties of knowledge dissemination (teaching), knowledge generation (research) as well as carrying out administrative and management functions (Laukkanen, 2003; Venkataraman, MacMillan and McGrath, 1992). At the topmost level, governments have been instituting policies geared toward commercialisation of knowledge as a pathway to achieving national competitiveness and innovation successes via academic-industry entrepreneurial collaborations across academic disciplines (Bianchini et al., 2016; Bikard et al., 2019).

Furthermore, engagement in commercialising Academic Intellectual Property (AIP) is now regarded as another avenue to stimulate economic growth and development (Huges et al., 2016). Inadvertently, university academicians and management teams are under some degree of pressure to seek out academic-industry entrepreneurial collaborations while keeping in mind the need for project viability and a decent Return on Investment (ROI) (Czarnitzki et al., 2015; Czarnitzki et al., 2015) to justify the various entrepreneurial academic-industry collaborative activities (Hottenrott and Lawson, 2017). Globally, previous studies on academic-industry entrepreneurial collaborations have illustrated consistent challenges in establishing and operating these engagements (Barbieri et al., 2018).

One possible reason could be that the participating universities or the industries are themselves not monolithic, with differences

existing between the academic disciplines and various industrial entities (Peças and Henriques, 2006; Rosli et al., 2018; Wirsich et al., 2016). The participants in academic-industry entrepreneurial collaborations have each a plethora of diverse goals, motivations, cultures, and timelines, as well as divergent expectations for outcomes (Bern, 2018; Fraser and Mancl, 2017; Garousi et al., 2019).

This study aims to analyze the experiences of academicians from foreign branch campuses and private universities in Malaysia, with a specific focus on commercially-oriented academic-industry entrepreneurial collaborations. The objective is to identify and examine the multi-level factors that influence the outcomes of these collaborations. Malaysia has been chosen as the location of this study because globally, this country is a top-tier destination for higher education. In it also has various types of tertiary institutions, namely, government, private and foreign branch campuses. Furthermore, the universities involved in the aforementioned academic-industry entrepreneurial collaborations receive numerous benefits: knowledge sharing, access to financial resources, intellectual property protection, and technical know-how support (Schaeffer, Öcalan-Özel, Pénin, 2020).

In this study we advance new understanding on commercially-oriented academic-industry entrepreneurial collaborative initiatives by exploring various schools of thought on factors affecting it, namely, individual level factors (Ajzen, 1988; Bolton and Lane, 2012; Covin & Slevin, 1989), organisational level factors (Chiva et al., 2007; Gomez et al., 2004) and inter-organisational level factors (Garstka et al., 2012) that influence academicians' involvement, performance and outcomes (Calvert and Patel, 2003; D'Este and Patel, 2007; Glassman et al., 2003). All this is done with a sample of 510 academicians from private universities in Malaysia using the aforementioned theoretical approaches to entrepreneurship in the context of commercially-oriented academic-industry

entrepreneurial collaborations. The rationale for our argument being: First, the development and utilisation of appropriate frameworks will enable academicians involved to overcome challenges to get best possible outcomes for long-term project sustainability. Second, each sanctioned university-industry entrepreneurial collaboration is unique thus need different forms for safety value mechanisms to work out.

Thus, the following study aims:

- to establish the various forms of commercial-oriented academic-industry entrepreneurial collaborations
- to find out the multi-level factors that influence academicians' engagement in these collaborations

This paper presents several notable contributions. Firstly, it enhances the methodological approach used in prior studies by expanding the sample size to encompass all private universities within Malaysia, thereby providing a more comprehensive analysis. Second, it identifies the various antecedents and consequences of commercially oriented academic-industry entrepreneurial collaborations. Third, this study utilised primary data as opposed to secondary panel data. Fourth, it identifies how multi-level factors influence the outcomes of commercial-oriented academic-industry entrepreneurial collaborations in developing nations like Malaysia. The results revealed that enhanced reputation and resources and effective knowledge transfer significantly affect academicians' engagement in commercial-oriented academic-industry entrepreneurial partnerships in developing countries.

This section provides an overview of the paper's structure. The following section reviews the theories employed in the study and explains how hypotheses were developed. It also discusses the methodology, including data collection and analysis processes. Lastly, the final section elaborates on the theoretical and managerial implications derived from the conclusions.

## **THEORETICAL REVIEW AND HYPOTHESES DEVELOPMENT**

### ***Social-psychological approach to entrepreneurship***

Derived from the realm of psychology, an associated concept suggests that individuals and the broader community are interrelated. This implies that individuals are driven to fulfill the needs of the community as a means to achieve their own objectives. Two academic branches emerged, namely, psychologists focused on sociology (Bolton and Lane, 2012; Covin and Slevin, 1989; Rauch et al., 2009) and psychologists focused on psychology (Ajzen, 1985; Ajzen and Fishbein, 2005; Sheppard et al, 1988) combine to become Socio-psychology.

### ***Behavioural approach to entrepreneurship***

This approach focuses on the environmental situation and stimulates entrepreneurs' responses that enable them in activities geared towards new venture creation (Byrgave and Hofer, 1991). Previous studies illustrate how behaviours of the entrepreneurs (their actions instead of who they are and determine the various conditions impact their participation in entrepreneurial undertakings (Gartner, 1988).

### ***Resource-based view approach to entrepreneurship***

Supporters of this theory argue some firms perform better than others in their business eco-system, a phenomenon called competitive advantage due to their unique tangible and intangible capabilities and resources (Barney, 1991; Amit and Shoemaker, 1993).

### ***Organisational learning approach to entrepreneurship***

This approach looks at how individuals and organisations utilise knowledge in their possession. It's of the notion that your performance is based on how they utilise their

situations by creating, exploiting, retaining and transferring knowledge (Crossan et al., 1999). The key takeaway from here is that effective organisational learning must be management-driven and goal-oriented.

### Commercially-oriented academic-industry entrepreneurial collaborations

This study utilised survey instruments to measure the academicians' involvement in seventeen activities, as shown in Table 1.

**Table 1** Commercially-oriented academic-industry entrepreneurial collaborations activities

| Form of collaboration    | Activities  |
|--------------------------|---|
| Teaching-related         | <ol style="list-style-type: none"> <li>1. External teaching for financial reward</li> <li>2. Initiating the development of new degree programs with advice from industry</li> <li>3. Placing students as trainees in the industry</li> <li>4. Conducting seminars and training sessions for industry</li> <li>5. Teaching a subject that involves significant interactions with industry (for example, capstone/ final year projects, guest lectures)</li> <li>6. Sitting on the committee of industry/ trade bodies.</li> </ol>  |
| Research-related         | <ol style="list-style-type: none"> <li>1. Research-based consultancy for industry through the university</li> <li>2. Research-based consultancy privately (but without forming a company)</li> <li>3. Joint-research projects with industry</li> <li>4. Developing products/services with the potential for commercialisation</li> <li>5. Providing research-related assistance to small business owners</li> <li>6. Working in the industry while being attached to the university</li> <li>7. Acquiring funding from government, non-governmental or international bodies, through collaborations with industry partners</li> </ol> |
| Company-creation related | <ol style="list-style-type: none"> <li>1. Contributing to the formation of university centres designed to carry out commercialisation activities</li> <li>2. Contributing to the formation of spin-off company/(s) (university is the owner)</li> <li>3. Contributing to the establishment of university incubators and/or science parks</li> <li>4. Forming joint-venture/(s) privately through collaboration with industry</li> <li>5. Forming own company/(s)</li> </ol>   |

We seek to point out the key determinants of academicians involvement and performance in commercially-oriented academic-industry entrepreneurial collaborations activities analysed against specific multi-level factors against the hypothesized constructs below. Therefore, we hypothesize:

**H<sub>1</sub>:** The engagement of academics in commercially oriented entrepreneurial collaborations mediates the relationship between multi-level factors and the performance variable of enhanced reputations and resources.

**H<sub>2</sub>:** The engagement of academics in commercially oriented entrepreneurial collaboration mediates the relations between the multi-level factors and the performance variable of influential knowledge transfer.

## METHODOLOGY

### Study design and population sample

In this study, the researchers utilised a cross-sectional survey design based on a sample of 510 full-time academicians from private universities foreign branch campus universities and private universities form part of a statistical population of 13,737 from the Malaysian Ministry of Higher Education data bank (MoHE, 2012). A criteria was developed for the selection of target respondents in the present study, namely, Respondent must be a full-time employee of the eligible academic institution in Malaysia; Must holds a standard academic rank and Must give consent to be a participant in the proposed study. All participants were given 90 days to complete

the self-completing survey questionnaire. After the elapse of this time period we sent out reminder emails in which we requested them to return copies of completed questionnaires.

### **Measurements and questionnaire**

The research employs a survey questionnaire as its primary data collection tool based on pilot studies indicating its effectiveness and efficiency. The survey aims to measure the perceptions of academicians regarding commercially-oriented academic-industry collaboration activities, with a focus on several key variables. These variables include academics' readiness to collaborate with industry, their individual entrepreneurial orientation, the capability of their organizations to learn, the entrepreneurial orientation at the organizational level, the strength of inter-organizational ties, and the performance of the collaborations. The survey consists of items that assess these theoretical constructs, encompassing demographic characteristics, social-psychological factors, organizational-level factors, inter-organizational factors, commercially-oriented academic-industry collaboration activities, and the performance of such collaborations.

The measurement scales used in the study were adapted from validated data collection tools employed in previous research. To capture responses related to multi-level factors, a five-point Likert rating scale was utilized. The scale ranged from (1) Strongly disagree to (2) Disagree, (3) Neither agree nor disagree, (4) Agree, and (5) Strongly agree. Regarding the scales measuring academicians' engagement in commercially-oriented academic-industry collaboration

activities, a four-point level of participation Likert rating was used. The rating options included (1) No, never, (2) Yes, engaged in the last 12 months, (3) Yes, engaged in the last 3 years, and (4) Yes, engaged in both the last 12 months and 3 years..

### **Data management and analysis**

After the 90-day period, 5000 questionnaires were distributed, and out of those, a total of 538 questionnaires were returned. The collected questionnaires underwent screening for missing values and multivariate outliers using the Statistical Package for Social Sciences (SPSS) 19.0 software. As a result, only 510 questionnaires were deemed usable. This indicates a final response rate of 10.2 percent. To investigate the hypothesized relationships among the variables being studied, the data from the questionnaire was subjected to factor analysis, reliability testing, analysis of variance, and multiple regression analysis.

## **RESULTS**

**H<sub>1</sub>:** The engagement of academicians in commercially oriented entrepreneurial collaborations mediates the relationship between multi-level factors and the performance variable of enhanced reputations and resources.

Sobel test results revealed that all the three multi-level factors and the performance variable 'enhanced reputation and resources' had cross-functional engagement as a significant indicator. These factors are academic attainment', 'readiness to collaborate', and 'collaborative environment'. See Table 2.

**Table 2** The results summary of mediated regression testing of cross-functional engagement as a mediator between multi-Level factors and enhanced reputation and resources.

|                             | Model 1<br>Reputation & Resources<br>(Without Mediator) | Model 2<br>Cross-functional | Model 3<br>Reputation & Resources<br>(With Mediator) | Sobel Test of<br>Significance |
|-----------------------------|---|-----------------------------|--|-------------------------------|
| (Constant)                  |   |                             |  |                               |
| Gender                      | .055  | -.013                       | .021   |                               |
| Age                         | .037***   | .012/.042                   | .220***  |                               |
| Academic                    | .048***   | .453***/.054                | -.237***   | 2.626***                      |
| Position                    | .039  | -.114**/.045                | .080   |                               |
| Innovative & Risk-taking    | .043  | .035                        | -.059  |                               |
| Readiness to Collaborate    | .044***   | .146***/.050                | .206***  | 2.008**                       |
| Proactive                   | .046  | .021                        | -.027  |                               |
| Learning Orientation        | .052***   | .038                        | -.257***   |                               |
| Collaborative Purpose       | .048***   | .048                        | .321***  |                               |
| Collaborative Environment   | .055**  | .217*/.062                  | -.143***   | 2.170**                       |
| Breadth of cross-functional |   |                             | .174***  |                               |

Note: \*\*\* represents significant level at 0.01 or below; \*\* represents significant level at 0.05 or below; \* represents significant level at 0.1 or below

**H<sub>2</sub>**: The engagement of academics in commercially oriented entrepreneurial collaboration mediates the relations between the multi-level factors and the performance variable of influential knowledge transfer.

The Sobel test results revealed that only two multi-level factors, 'age' and 'readiness to collaborate,' are significant when testing the relationship between cross-functional engagement and the performance factor 'effective knowledge transfer. See Table 3.

**Table 3** The results summary of mediated regression testing of cross-functional engagement as a mediator between multi-level factors and effective knowledge transfer

|                             | Model 1<br>Knowledge Transfer<br>(Without Mediator) | Model 2<br>Cross-functional | Model 3<br>Knowledge Transfer<br>(With Mediator) | Sobel Test of<br>Significance |
|-----------------------------|---|-----------------------------|--|-------------------------------|
| (Constant)                  |   |                             |  |                               |
| Gender                      | -.021   | -.013                       | -.020  |                               |
| Age                         | .110**  | .012/.042                   | .109**   |                               |
| Academic                    | .010  | .453***/.054                | -.039  |                               |
| Position                    | .021  | -.114**/.045                | .033   |                               |
| Innovative & Risk-taking    | .035  | .035                        | .031   |                               |
| Readiness to Collaborate    | .140***   | .146***/.050                | .145***  | 2.529***                      |
| Proactive                   | .020  | .021                        | .017   |                               |
| Learning Orientation        | -.073   | .038                        | -.077  |                               |
| Collaborative Purpose       | .289***   | .048                        | .284***  |                               |
| Collaborative Environment   | .042  | .217*/.062                  | .031   |                               |
| Breadth of cross-functional |   |                             | .107**   |                               |

Note: \*\*\* represents significant level at 0.01 or below; \*\* represents significant level at 0.05 or below; \* represents significant level at 0.1 or below

## DISCUSSION

In this study, hypothesis  $H_1$  was subjected to a test of multiple regression analysis. The results revealed that the only activities with a positively significant relationship with the performance variable under study are research-related.

This finding aligns with other studies that attributed successful academic-industry entrepreneurial collaborations accruing benefits for the parties involved. Well documented benefits include; access to cutting edge technology and facilities, access to knowledge and technical specialists, access to intellectual property, enhanced institutional reputation and asset acquisition, mentoring of skilled human resources and driving sustainable economic growth and development (D'Este et al, 2019; Schaeffer et al., 2020; Thursby et al., 2010; Tijssen et al., 2016).

In this study, hypothesis  $H_2$  was subjected to a test of multiple regression analysis. The results revealed only two activities, teaching-related and research-related, have a significant positive relationship with the performance variable. This phenomenon is attributed to organisational learning attained through organisational systems and management team practices (lorio et al., 2017).

The positive relationship provides empirical evidence that commercially-oriented academic-industry research-related collaboration activities are pathways for effective transfer of knowledge between partners. This is due to the free flow of tangible and intangible resources in an enabling environment that enables acquisition, operationalisation in multiple formats and archiving (Callaert et al., 2015; Blind, Pohlisch and Zi, 2018). A study on academic-industry collaboration innovation in the United Kingdom conducted at the turn of the century revealed that 10% of new products and services went from concept to final product minus significant delays due to university-

driven research and development (R&D) (Mansfield (1998). Furthermore, previous studies found that in addition to the expected financial benefits for commercially-oriented academic-industry collaborations, they also gain unexpected non-financial benefits from engaging in activities co-currently (Bianchini et al., 2016; Bilkard et al. 2019).

The positive relationship provides empirical evidence that commercially-oriented academic-industry teaching-related collaboration activities are consistent with findings in previous studies (Dolan et al, 2019; Steyn, 2004). These scholars attributed this to the primary academic function of teaching being a medium for knowledge transfer by skilling schemes at all learning levels and across disciplines. This is because teaching-related activities open the learners to critical thinking skills, dynamic thought processes and an entrepreneurial mindset necessary to encounter the challenges of an increasingly globalised economy with dynamic market forces (Arza and Carattoli, 2017).

## CONCLUSION

This study provides empirical evidence that brought to light key emerging trends with respect to age, gender, seniority, nationality and institutional systems in commercially-oriented academic-industry entrepreneurial collaborations activities. 1) academics engagement in these activities is conducted co-currently with their traditional academic roles of teaching, research and administrative; 2) senior-ranked academicians are more likely to engage in various entrepreneurial activities due to their years of experience and networks built; 3) academicians from institutions with robust learning systems, access to financial resources and collaboration networks are more likely to engage in them compared to their peers; 4) individual characteristics and motivations (financial and non-financial) are key drivers of academic engagement.

## **RESEARCH IMPLICATIONS**

The findings highlight issues of concern for researchers, practitioner audiences and policymakers theoretically and policy-managerial implications.

### ***Theoretical implications***

The theoretical implications fill essential gaps. First, it categorises the various types of commercially-oriented academic-industry collaboration activities. Second, it illustrates the consequences of each kind of commercially-oriented academic-industry collaboration. Lastly, it measures the performance of commercially-oriented academic-industry collaboration against the performance variables in developing nations like Malaysia.

### ***Policy and Managerial implications***

This study has policy and managerial implications based on the empirical evidence collected to highlight the outcomes of commercially-oriented academic-industry collaborations, related policy formulation, necessary support structures and trust-building process commercially-oriented academic-industry collaborations.

According to the findings of Lawson et al. (2019), researchers who hold senior positions and possess PhD qualifications tend to exhibit a greater cultural affinity with industrial partners. As a result, they encounter fewer barriers in terms of their orientation towards commercial activities, making them more inclined to engage in academic-industry collaborations with a commercial focus compared to their counterparts who do not hold PhD qualifications.

As a result of their extensive experience and established networks, senior-ranked academicians are more inclined to participate in a diverse range of entrepreneurial activities. Yet, young researchers have to build up

their reputations by publishing papers and networks before engaging in various entrepreneurial activities.

Firstly, policy makers take time to proactively understand how commercially-oriented academic-industry collaborations work in order to develop robust Human Resource Management (HRM) policies that take into account the unique demographic characteristics of the end users. Lawson et al. (2019) found that academicians with senior academicians with PhD are culturally closer to industrial partners thus experience lower orientation barriers thus more readily engage in collaborations with third parties than those starting out their academic careers.

Secondly, policymakers must proactively understand the different categorises of commercially-oriented academic-industry collaborations and be able to meet the specific issues addressed in Memorandums of Understanding (MoU) (Manning, 2018). For example, their partnerships must be able to handle the 17 goals of Sustainable Development Goals (SDGs) societal impact while maintaining set academic-industry standards (Arruti and Panos-Castro, 2020).

Thirdly, previous studies (Perkmann et al., 2019; Tennent et al., 2016) highlight the utmost need of the establishment of vibrant and functioning support structures to support academicians involving commercially-oriented academic-industry collaborations. These include; financial resources, non-financial resources, data and access to networks.

Lastly, universities involved in commercially-oriented academic-industry collaborations need to develop mentoring programmes to train their staff involved in these collaborations. During the collaboration life cycle, the participants create social networks, better insights into the needs of involved stakeholders and access to better financial and non-financial resources. This will ultimately result in better optimalization of the bottom-line and overall performance.



### Limitations

The study has certain limitations. Firstly, data collection relied on a self-administered survey questionnaire. However, no follow-up interviews were undertaken yet this would have helped us probe the academicians further to understand why they hold particular views. Secondly, the study utilised a limited data sample from all foreign branch campuses and private universities in Malaysia, which makes the findings nation-specific, limiting generalisation of findings to other types of institutions from other countries.

### Future research

Firstly, this paper has a single country focus yet the phenomenon of private universities is commonplace in both developed and developing nations. This places limitations on possibilities for theory development.

Therefore, future research into this area might be conducted in a multi-nation context for greater insights. Secondly, the use of quantitative methods of data collection places limits on information gathered from respondents. We recommend that future studies utilise more robust qualitative data collection methods such as one on one interviews in order for respondents to express their views on constructs under study better. Thirdly, this study acknowledges the distinctions between public and private universities, recognizing that entrepreneurship is heavily influenced by contextual factors. Differences can be observed in various aspects of these institutions, including their mission or purpose, ownership, sources of revenue, government controls, and management norms (Lawson et al., 2019). We recommend more studies in this area in the context of private universities. This is because entrepreneurial practices by these institutions have been largely ignored. Lastly, this study is cross-sectional yet it is common knowledge that opinions held by people usually evolve. To this end, we recommend that future studies utilise a longitudinal approach.

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