

Open Innovation Towards Secondary School Innovation Performance in Kulai District

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Abstract

Open innovation is vital for every countries development which is consist of economy, political and social development. Besides, open innovation enhances these three categories of development as well. Studies related on open innovation in education sector far behind compare to the business world, the industrial sector. This is because, open innovation not fully focused on strategy and its implementation in the education sector. Furthermore, there is not enough empirical evidence of open innovation in education ecosystem. This study is focuses to fill this gap by studying open innovation in secondary schools due to their strong contribution to development of education. Further, this study will analyse the activities of in determining the innovative capabilities of secondary schools in Kulai district. The results, however, were generated based on a sample of 120 school teachers in the Kulai district of Johor region. The results are based on descriptive statistics and inferential statistics using mean values, standard deviation, correlation, and multiple regression analysis. The discussion of results was also carried out considering the focus of the study in mind and context of the study as well. Based on quantitative results outcome indicates that all the variables of the study are significantly related to each other generating a strong Cronbach alpha outcome of the variables. Based on this, further analysis was made and the outcome have help in drawing some conclusions in addition to putting forth some recommendations for the school top management and the government (Ministry of Education) to further re-examine innovation policies to encourage more the activities of innovation, mainly on open ecosystem.

Keywords: *Open innovation, Innovation in school, School innovation performance.*

INTRODUCTION

Innovation and creativity are a way of thinking outside the box and exploring alternatives (Nylund, et al. 2020). Whereas techniques are teachers' skills in the management and implementation of teaching methods in a teaching and learning activity (Onyema & Hanken, 2017). Other commonly used techniques include brainstorming, mind mapping,

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simulation, games and acting techniques. The mastery of new ICT skills and gadgets has greatly helped teachers in teaching and learning process. A great deal of creativity and innovation is possible with the advent of the latest ICT technologies (Chesbrough, 2019). Brainstorming is a collection of ideas that are gathered in a comfortable state in which they produce an idea that is outside of thought or called outside of the box. The ideas generated creates creativity, innovation and further innovation. The success of a student depends on the creativity and innovation of a teacher (Findikoglu & Ilhan, 2016).

To enhance teachers' knowledge on innovation, Wang, Zhang, Zhang et al. (2018) recommends that teachers should always read educational books that can be retrieved from online sources, government or university data sources, take online courses in teaching professionalism and attend online educational seminars or conventions during the stay at home period. In addition, reflective practice and action research should be teachers' practice in nurturing the values of innovation in teaching professionalism (Jennex, et al. 2020). . The teacher's approach as a researcher will provide the opportunity for teachers to plan their own innovations and observe and evaluate their own actions (Figurska & Sokol, 2016).

Problem Statement

There are some significant issues in this topic of study :

According to Houssam Ismail, Rosnah and Norzima (2017), this invention has changed the way of life of today's society and made human life more challenging, fun and competitive. In fact, educational innovation has also made some countries more prominent such as Korea, Finland and some other developed countries. Faced with the competitive challenges, Malaysia also needs to look ahead and make innovations a new educational goal especially among the new generation. Merk et al (2017) states that education today is not just about producing good citizens as well as focusing more on globally; based on skills, knowledge and motivation and and environmental issues.

According to Lawrence, Lim and Haslinda (2019), innovations in global education today are often linked to academic achievement and quality of graduates. Advances in communication and information technology (ICT) have made the world community and an organization more connected to one another in a borderless world. While the smart learning environment emphasizes rapid development and progress as automation technology has been incorporated into the education system in Malaysia, it has provided an opportunity for students to motivate and learn in all fields using mobile learning technology or m-Learning (Ibrahim, 2019). However, based on RMK 2016-2020, the innovation level in education sector in Malaysia is still low and lagging behind economic and industrial sectors such as transportation, fisheries, agriculture (Vanhaverbeke et.al, 2014).

While according to Hashim et al. (2018), Malaysia's competitive performance is also declining in terms of education and technology readiness. Therefore, closed innovation is no longer feasible for education sector in Malaysia. The need to push educational goals towards the globalization of technology and innovation has led Malaysian government to implement several initiatives and reform measures related to open innovation. For example, the implementation of 21st century learning module which promotes school's involvement in creativity and innovation through the use of technological tools such as online learning website. Apart from that, the government also supports the cooperation between educational institutions and industry players to create innovative culture for both learners and workers, through allocation of funds in R&D process (Aminuddin, Haziah & Sharifah Zarina, 2019). As a conclusion, researcher aimed to explore more about open innovation in school ecosystem.

Underpinning Model / Theories

Model of School Effectiveness and Improvement

This effective school model is suitable for this study because this model covers student achievement, school improvement and the effectiveness of a school. Meanwhile, open innovation is also a process for school improvement to improve school performance. In detail it emphasizes school performance in depth. This is because, it involves a process that leads towards the progress of the school. Furthermore, it involves the involvement of third parties in school activities where in this study there are collaboration activities and outsourcing activities involving private parties and parties outside the school.

This effective school model is designed for a school to act independently in implementing the improvement process through a control system (Hajar et al, 2019). This emphasizes knowledge acquisition activities that enable a school to act independently for improvement. At the same time, this model creates the importance of a conducive school culture through collaboration among all process variables. This conducive school culture involves the role of the government in bringing the infrastructure and services needed by a school towards innovation. At the same time, collaborative activities also require collaboration among process variables. Finally, this model emphasizes the importance aspect of receiving support from outside parties for school activities. This explains the role of external parties such as government support, private sector support and external parties in outsourcing activities. With this, it is relevant to use this effective school model in this study.

According to Parlar and Cansoy (2017), qualities of teachers can be identified from eight dimensions: reliability, durability, durability, serviceability, aesthetics, performance, basic features of the product or service and quality. expected (perceived quality). Whereas according to MS ISO 9000 quality is the entire characteristic of an entity (product and service) that meets the requirements of the stated and implied customer (Kawamura, 2016). From these two qualities of quality, it can be said that quality teachers are excellent teachers who are able to meet the needs of their students through teaching and learning and can carry out their task by motivating themselves to become productive teachers. Teachers have their own role in stimulating students' interest in a given subject. Teacher quality in a holistic context refers to the knowledge, skills and personality of the teacher as all these aspects have certain advantages to enhance student competence (Garland, 2019).

A quality teacher provides support and motivation in the form of cognitive, emotional and social support to his students (Zamani et al, 2018). This clearly demonstrates that good teachers are not only presenters of content but also convey emotions and spread social awareness about the areas of specialization they represent. The effectiveness of the individual teaching process also depends on the relationship between the knowledge and the pedagogical skills of the teacher (Anil, 2017). The imbalance between these two aspects will cause the teaching to be ineffective and cause misconceptions or misunderstandings. Extensive knowledge of the subjects taught make a teacher expert accompanied by the skills to convey the content of the teaching so that it is of interest to the student (Ahmadi, 2018). On the other hand, the study of Keller, Neumann and Fischer (2016) described teachers as the largest determinants of student achievement in a complex subject. Positive 'teacher-student relationships' in the school allow for the comfort of a student to take further initiative in a given topic.

This is supported by Aminuddin et al. (2019) found that teachers are the earliest individuals to whom students will refer to their doubts or misunderstandings about a school matter. Students have confidence in the teachers they know possess a wide range of skills and knowledge in any subject (Sanders & Wong, 2020). Effective teachers also exhibit positive behaviors in their learning (Keller, 2016) such as appreciating each student's answers or ideas and providing constructive comments. Innovation can help

teachers to become more knowledgeable and increase their quality of teachings at the same time.

Conceptual Framework of the Study

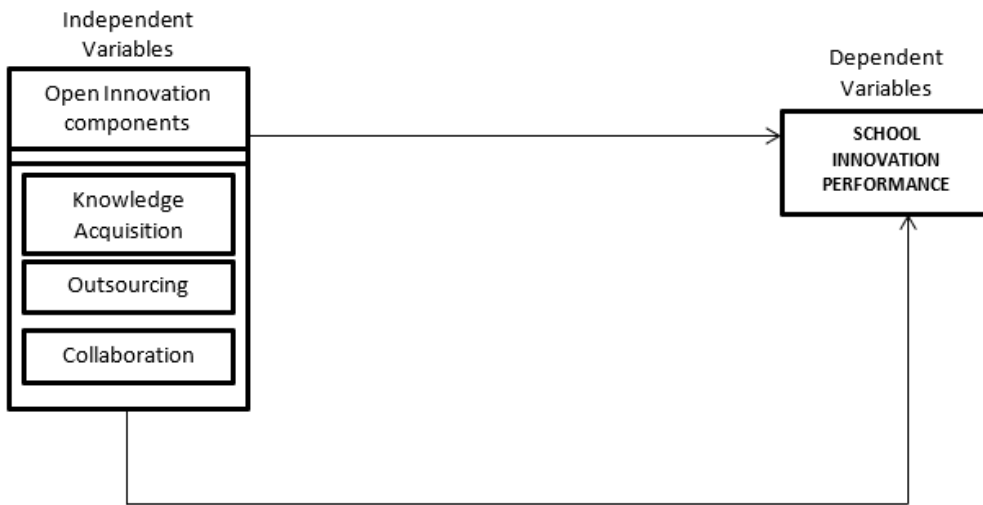


Figure 1: Conceptual Framework Open Innovation in School Environment

Above is showed as proposed framework of this study. There are two types of variables in the proposed framework. Firstly, open innovation components known as independent variables while school innovation performance known as dependent variable. Further, independent variables consist of open innovation activities. Such as, knowledge acquisition, outsourcing and collaboration. Here, the aim is to study the relationship whether significant or vice versa according to independent and dependent variables.

RESEARCH METHODOLOGY

The unit of study is Principle and Assistant teachers of Secondary school in Kulai district. In this research, every questionnaire was used to analyse the relationship between Open innovation components towards school innovation performance. Here, Government support plays as a core role moderator. Furthermore, Open innovation components were categorised as Knowledge acquisition, collaboration activities and outsourcing. The relationship between school innovation performance and knowledge acquisition, outsourcing and collaboration activities were the main objectives in this research. The information extracted from questionnaire were utilized to study the effect between open innovation components and school innovation performance.

In the questionnaire, five-point of Likert scale was constructed to get the valid responses. The questionnaire consist of Part A (5 constructs), Part B (7 constructs), Part C (7 constructs), Part D (9 constructs), Part E (7 constructs), and Part f (9 constructs). Total of 120 questionnaires were circulated. 120 questionnaires with through feedback were received that indicate an overall response rate of 100%. Further the data collected from secondary school in Kulai district. The statistical tool such as multiple regression analysis has been used to interpret the data. In addition, SPSS 26 used to interpret the research data as well.

RESEARCH FINDINGS

Introduction

This chapter deals with study results findings based on the survey carried out. Specifically, it discuss highlights of the outcomes of this study along with their interpretations based on the study research questions and research aims. The main aim of this research is to explore role and impact which is factor influencing school innovation performance of school, based on open innovation activities in secondary schools in Kulai district. The results were generated by Statistical Package for Social Science software (SPSS) in the first instance to generate the descriptive and regression analysis. The mean values have been calculated for descriptive statistics, correlation and regression analysis was performed as per study objectives as below:

Objectives of The Study

- a) To study the relationship between knowledge acquisition and school innovation performance in secondary schools in Kulai district, Johore state.
- b) To examine the relationship between the role of outsourcing and school innovation performance in secondary schools in Kulai district, Johore state.
- c) To examine the relationship between collaboration and school innovation performance in secondary schools in Kulai district, Johore state.

Validity and Reliability Test

In any survey undertaking, the validity and reliability of its construct is the foremost requirement. While, reliability provides evidence that the survey instrument is suitable for further collection of data in relation to a study, this can be calculated using Cronbach alpha reliability statistics (Sekaran and Bougie, 2003; Hair Jr et al.). The results however show that all the variables and sub-variables of the study indicate a good and reliable threshold to be above 0.60 level adjudged to consider before progressing with the analysis (Sekaran and Bougie, 2003). Also, the internal consistency of the instrument used in the study was tested using the items factor loadings with a minimum threshold of > 0.5 , whereby Cronbach's Alpha Coefficient, the average variance extracted and square root correlation of latent variables.

Cronbach's Alpha Coefficient for Construct

As shown in Table 4.1, as Cronbach's Alpha value for each construct in the study was analysed to show the reliability of each of the construct employed in the study. According to Sekaran and Bougie (2003), they advocates that the use of Cronbach alpha can be seen to be adequate to use in measuring inter item internal consistency. The general rule, as discussed in most literatures are that the value of the alpha coefficient should be within 0.6 to 0.9 and above. Based on this research, the Cronbach alpha value for all the items in this study construct are greater than 0.6, with none of the items prone to be deleted. The entire Cronbach alpha for the entire four constructs in the study were within the range of 0.748 to 0.862 which implies that their internal consistency and reliability of all the study items is high.

Table 4.1: Cronbach's alpha coefficient for study construct

Scale Item	Items	Cronbach's Alpha Value for Actual Study
Knowledge Acquisition	7	0.862
Outsourcing	7	0.782
Collaboration	9	0.783
School Innovation Performance	9	0.834
Overall Item		0.748

To avoid being biased or committing errors in analysing the data generated, an assessment of normality test for the variables used in the study was equally conducted. At first, this helps in the selection and identification of the kind of analysis and method that will be appropriate for this study data (Tolmie et al., 2011). While the test help in identifying whether or not the data obtained are normally distributed or not from the study population. However, Razali and Wah (2011) suggest that among the several notable types of test carried out for normality data, Shapiro – Wilk test proves more powerful and thus will be employed in this research. The output of the normality test for all the constructs in this study was generated as illustrated in Table 4.2 showing the Skewness and kurtosis. Accordingly, if the value for Skewness of the data variables conducted falls within (-2.0 to +2.0), then the normality of the data collected can be said not to have been violated. For this study, and in all the variables measured, the Skewness fall within the criteria and thus, fulfilling the requirement of normality as presented in Figure 4.1 and 4.2 respectively.

Table 4.2: Normality test using descriptive statistics

	Descriptive Statistics								
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
B-Know	120	3	5	4.04	.493	-.146	.221	.102	.438
C-Outs	120	3	5	4.08	.362	-.502	.221	2.233	.438
D-Collab	120	3	5	4.06	.322	-.865	.221	4.161	.438
F-Perf	120	3	5	4.16	.343	.249	.221	1.146	.438
Valid N (listwise)	120								

Additionally, both the normality and homoscedasticity as replicated in the histogram indicates that all assumption of the multiple regression analysis performed in this study has been met and can be seen from the dotted line and zeros aligning with the regression line. This generally shows that the factors as identified in the study have strong relationships with school innovation performance implementation of the open innovation activities.

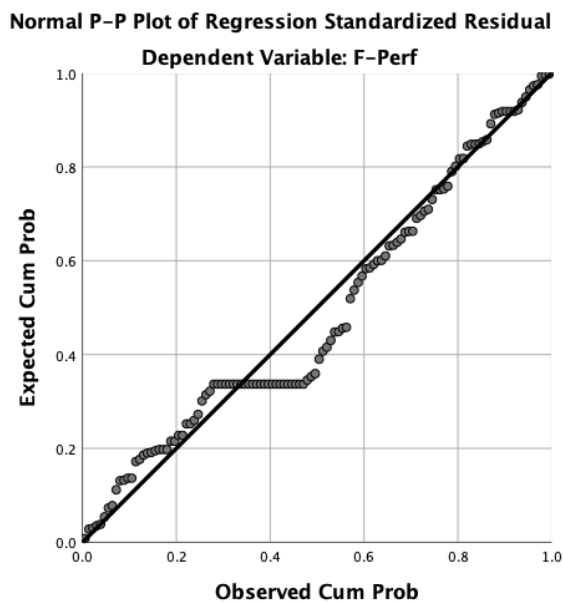


Figure 4.1: Shows the Normal P-P Plots

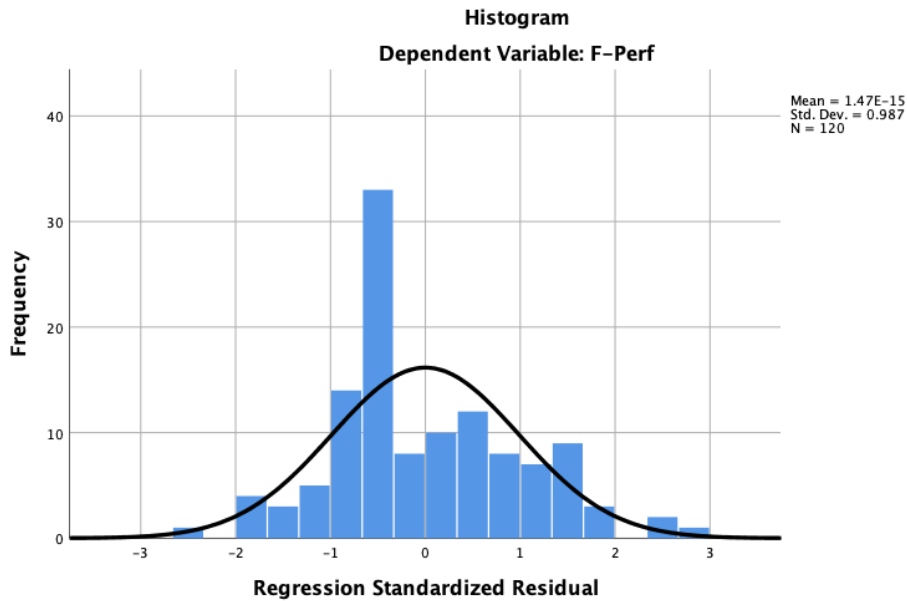


Figure 4.2: Histogram for standardized relationship

Demographic Information

Based on a total of hundred and twenty (120) teachers’ responses that were collected from the participants working in primary school in Kulai, Johor. This study survey instrument consists of four sections with the first section focused of collecting the data pertaining to the demographic information details of the respondents. The respondents were asked multiple items such as their gender and job function/ status in the school. The respondents who fully participated in this survey and thus analysed. This descriptive analysis was performed in other to identify the peculiar characteristics of the teacher’s state of nature in relation the importance they bear on the innovation performance. The results of the demographic analysis are presented in detail below.

Analysis on Gender of Respondents

The frequency analysis of the respondent gender in Table 4.3 explains that the highest percentage (67.5%) response of respondents is female teacher, while, the lowest percentage (32.5.0%) response among the respondents indicates that they were male.

Table 4.3: Analysis of gender of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	81	67.5	67.5	67.5
	Male	39	32.5	32.5	100.0
	Total	120	100.0	100.0	

Analysis on Job Function/Status

Lastly, in terms of respondent’s job function/status in the firm, the data presented in Table 4.4, shows that most of the respondent’s job function/status are related to assistant teacher (86.7%), 13.3% respondents belonging to principal role. The study reveals that most of the teachers, function centred directly on the performance of different tasks and routine responsibilities in the school.

Table 4.4: Analysis of teacher's job function / status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Assistant Teacher	104	86.7	86.7	86.7
	Principle	16	13.3	13.3	100.0
	Total	120	100.0	100.0	

Correlation and Multiple Regression Analysis

To answer the RQ1, RQ2 and RQ3, the researcher first carried out a correlation analysis between the study constructs. Thereafter, the results of correlations and regression analysis was employed to determine the relationship and impact between the variables used in this study to answer the research question and objective. The correlation analysis employed aimed to determine the extent of the relationships between the overall study variables as identified in the research framework. The output thus, indicates that innovation activities, creativity, and identified factors all have positive and statistically significant relationship at $p < 0.01$. As presented in Table 4.5, the correlation results indicate a positive relationship between the collaboration and innovation performance. Thus, a significant impact can be said to be realized on innovation performance. On the other hand, knowledge acquisition and outsourcing indicate a weaker relationship towards innovation performance, however, it is still positively related.

Table 4.5: Inter-correlations between the constructs

		Correlations			
		B-Know	C-Outs	D-Collab	F-Perf
B-Know	Pearson Correlation	1	.426**	.427**	.358**
	Sig. (2-tailed)		.000	.000	.000
	N	120	120	120	120
C-Outs	Pearson Correlation	.426**	1	.677**	.380**
	Sig. (2-tailed)	.000		.000	.000
	N	120	120	120	120
D-Collab	Pearson Correlation	.427**	.677**	1	.454**
	Sig. (2-tailed)	.000	.000		.000
	N	120	120	120	120
F-Perf	Pearson Correlation	.358**	.380**	.454**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	120	120	120	120

** . Correlation is significant at the 0.01 level (2-tailed).

Additionally, the regression analysis was performed to validate the correlation analysis outcome since it is not sufficient to test a hypothesis. Subjecting the relationship to regression analysis identified the model fitness their association. The result of the study showed that the identified factors overall beta coefficient indicates the factors are having a positive relationship to innovation performance, except for outsourcing activities ($\beta = 0.778$, $P > 0.05$). Furthermore, the result also showed the overall model fitness as represented by the F statistics. The F statistics, in this case was significant at $p < 0.01$, and suggest a good model fit was being achieved. Also, the independent variable (identified factors) shows an R-value of (0.493) that is accounting for about 49% of the variance for innovation performance, while other variables outside these studies accounted for other of them. This result showed a further confirmation in support of the factors to have a linear relationship between identified factors and innovation performance for the school.

Table 4.6: Model summary of Linear Regression of Factors

Variables Entered/Removed ^a			
Model	Variables Entered	Variables Removed	Method
1	D-Collab, B-Know, C-Outs ^b		Enter

a. Dependent Variable: F-Perf

b. All requested variables entered.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.493 ^a	.243	.224	.302

a. Predictors: (Constant), D-Collab, B-Know, C-Outs

+

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.409	3	1.136	12.423	.000 ^b
	Residual	10.609	116	.091		
	Total	14.018	119			

a. Dependent Variable: F-Perf

b. Predictors: (Constant), D-Collab, B-Know, C-Outs

□

The second part of the RQ was to determine the impact between the identified factors. Answering this multiple regression analysis carried out. As multiple regression analysis usually aims at investigating the relationship between more than two independent variables or factors. In this study, factor analysis carried out earlier identified a total of four (4) factors groupings from study. To achieve measurement consistency in addition to the nature of this analysis, further check was performed to subject the factor variables to further test to achieve the assumption of normality, multi-collinearity, and equality of variance of the dependent variables. These tests are very key and an underlying principle for multivariate analysis (Hair et al., 1998). With all these performed, the outcome from multiple regression analysis was thus, represented in Table 4.7 and to provide answers to RQ and to answer the Hypothesis H1 to H3. The outcome of the multiple regression analysis to test the level of association between each of the identified factor's groupings and innovation performance are the main hypothesis for the study. The summary of the results in Table 4.8 shows the model summary of the factor groupings from. Based on this, the multiple regression output has indicated and provides evidence to support the hypothesis, one (factor 1) $p < 0.05$ (0.43) and three (factor 3) $p < 0.05$ (0.006). While hypothesis two (factor 2) not supported and rejected (H2).

Table 4.7: Multiple regression analysis & their impact on identified factors groupings

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Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
		B	Std. Error			
1	(Constant)	1.932	.371		5.200	.000
	B-Know	.130	.064	.187	2.045	.043
	C-Outs	.083	.106	.087	.778	.438
	D-Collab	.336	.120	.315	2.809	.006

a. Dependent Variable: F-Perf

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CONCLUSION

This study investigated how open innovation influence innovation management from employee's point of view. The study findings have revealed lots of interesting pattern towards understanding the pertinent role of open innovation and government support in enhancing innovation performance school. In this chapter, highlights of the study results were presented. The results, however, were generated based on a sample of 120 school teachers in the Kulai district of Johor region. The results are based on descriptive statistics and inferential statistics using mean values, standard deviation, correlation, and multiple regression analysis. The discussion of results was also carried out considering the objectives of the study in mind and the context of the study as well. The quantitative results outcome indicates that all the variables of the study are significantly related to each other generating a strong Cronbach alpha outcome of the variables. Based on this, further analysis was made and the outcome have help in drawing some conclusions in addition to putting forth some recommendations for the school top management and the government (Ministry of Education) to further re-examine innovation policies to encourage more the activities of innovation, mainly on open ecosystem. In summary, the study outcomes further summarised in Table 5.1 below.

Table 5.1: Summary of the Study Results and Findings

Code	Hypothesis	Statements	Results
RQ1	H ₁ (+)	There is a positive and significant relationship between knowledge acquisition and school innovation performance	Supported
RQ2	H ₂ (-)	There is a positive and significant relationship between outsourcing activities and school innovation performance	Non-Supported
RQ3	H ₃ (+)	There is a positive and significant relationship between collaboration activities and school innovation performance	Supported

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