THE RELATIONSHIP BETWEEN OPEN INNOVATION AND ORGANIZATIONAL PERFORMANCE: EVIDENCE FROM MALAYSIAN PUBLIC SERVICE ORGANIZATIONS

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ABSTRACT

While confronting a multitude of internal and external challenges, public service organizations are consistently subjected to greater expectation and public scrutiny to perform. As such, previous studies have suggested that innovation could play important roles in enhancing the performance of public service organizations, especially by leveraging external resources and capabilities through open innovation. Despite the promise of how advantageous open innovation is, there is conflicting evidence of its impact on organizational performance. Therefore, this study was conducted to investigate the relationship between open innovation and organizational performance in the context of public service organizations. Through a survey questionnaire collected from 112 out of 155 local authorities in Malaysia, quantitative data were analyzed using PLS-SEM in the SmartPLS 4 software to test hypotheses of this study. The results suggest that while open innovation has a significant positive effect on organizational performance, the relationship was not moderated by the type of innovation. The findings of this study provide some new insights into the impact of open innovation on organizational performance, particularly in the public sector. Nevertheless, it is recommended for future research to investigate the specific impacts of different open innovation activities or types on performance in a more diverse context.

***Keywords*:** Open innovation, public innovation, innovation type, public service organization, local authorities, organizational performance

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1. INTRODUCTION

Public service organizations play a pivotal role in establishing and sustaining an ideal environment for the economy to grow, in addition to ensuring a safe environment for society to live in. Owing to their significance, they often receive higher expectations to act with fairness, responsiveness, accountability, and honesty in comparison to private firms, while at the same time also having to endure greater public scrutiny (Manaf et al., 2023). Moreover, they are also under pressure to satisfy demands for improved service, despite reduced allocation of resources (Maqdliyan & Setiawan, 2023), and recently have been tasked with assuming a central role in addressing societal challenges such as unemployment, climate change, poverty, and other concerns pertaining to sustainability (de Vries et al., 2018; Soberón et al., 2020).

As a country's growth and prosperity are dependable on the performance of public service organizations (Abdul Ghani Azmi & Hashim, 2022), there has been increased emphasis on the organizational performance of public service organizations and ways to improve them (Supramaniam & Singaravelloo, 2021). With regards to this, previous studies have suggested that innovation can play a significant role in enhancing organizational performance (Demircioglu, 2020a; Yuan & Gasco-Hernandez, 2021). However, due to perceptions of bureaucratic structure and its non-involvement in the market, public service organizations are often perceived to be lacking in motivation and capacities to pursue innovation (Abdul Ghani Azmi & Hashim, 2022).

On the contrary, past studies have demonstrated that public service organizations are indeed innovative and increasingly aware of its importance (Demircioglu, 2020b). There is an increasing pressure for them to innovate in responding to citizen satisfaction and organizational performance (Barrutia & Echebarria, 2019; Demircioglu, 2020b), and as a result, governments around the world have adopted various approaches to enhance innovation in the public sector. Consequently, several past studies have shown that innovation can enhance the performance of public service organizations through improvement in service quality, service delivery, efficiency, financial, public satisfaction, and perception (Queyroi et al., 2022; Teixeira Filho et al., 2020).

Within the landscape of innovation, there is a growing interest in open innovation (Khan et al., 2022; Sikandar & Abdul Kohar, 2021; Singh et al., 2021). Contrary to conventional, or 'closed' innovation, where organizations generate, develop, and commercialize their own ideas, the open innovation approach requires organizations to open their borders to external partners by leveraging their ideas, resources, and/or channels (Cuevas-Vargas et al., 2022; Odriozola-Fernández & Berbegal-Mirabent, 2022). In addition, depending on the flow of resources, organizations can pursue open innovation through various practices that can be categorized into three core processes, which are inbound, outbound, and coupled open innovation (Bigliardi et al., 2020). A detailed explanation of these categorizations can be found in Section 2.3 Open Innovation.

Through adoption of open innovation, organizations can exploit the resources and capabilities of their external partners, which can then be used to develop new products or services for their current or new market, as well as improve their business processes (K.V & Hungund, 2022; Rumanti et al., 2021). In addition, organizations can effectively harness the full potential of their underutilized internal resources, such as intellectual properties and knowledge resources through external

channels, therefore creating additional value and revenue streams (McGahan et al., 2020). By closely collaborating with external stakeholders, not only various tangible and intangible resources can be pooled together, but public service organizations would also benefit in the form of sharing the risk and responsibility and increasing the buy-in from stakeholders (Yuan & Gasco-Hernandez, 2021). Due to these advantages, this study focused on open innovation, as we believed that it can be beneficial to the public sector, particularly when they are struggling with a reduced resource allocation and are perceived to lack relevant skills to innovate (Vivona et al., 2020), while at the same time, under pressure to meet demands of improved services in a multitude of tasks (Maqdliyan & Setiawan, 2023).

Nevertheless, despite its apparent benefits, there is conflicting evidence on the impact of open innovation on organizational performance. While the positive impact of open innovation has been recorded in some literature, several others have found an inversed U-shaped relationship, a non-significant relationship, or even a negative impact of open innovation towards performance (Rumanti et al., 2021). The mixed findings of past studies also led us to explore a probable intervening factor in the form of a moderator that could alter the link between open innovation and organizational performance. Looking at previous literature on innovation in general, there is evidence that the impact on performance depends on the type of innovation introduced by the firm (Buchheim et al., 2020; Expósito & Sanchis-Llopis, 2019; Queyroi et al., 2022). Nevertheless, there is a research gap in the potential moderating effect of innovation type on open innovation-organizational performance relationship. Therefore, against the backdrop of these research gaps, this study aims to examine the relationship between open innovation and the organizational performance of public service organizations in Malaysia, as well as the moderating impact of innovation types on their relationship.

The contribution of this study is, first, that it addresses the current research gaps on the role of open innovation towards organizational performance. Past empirical studies have mostly focused on inbound open innovation, while outbound and coupled open innovation received less attention and were often studied separately (Oltra et al., 2018; Tajudeen et al., 2019; Wang et al., 2021). Not only that, many of them—especially in the public sector context—centered on a single isolated open innovation activity, such as crowdsourcing, whereas organizations typically deploy a portfolio of different open innovation activities (El Maalouf & Bahemia, 2023). This study, however, considered various inbound, outbound, and coupled open innovation activities simultaneously. In addition, to the best of our knowledge, none of previous studies investigated the moderating effect of innovation types such as service and process innovation on the relationship between open innovation and organizational performance. Through integration of innovation type as moderator and incorporation of a portfolio of diverse open innovation activities, this study will provide a more holistic contribution to the growing body of knowledge in this area.

Secondly, this study contributes to exploring the impact of open innovation within the context of the Malaysian public sector, which, to the best of our knowledge, is lacking. In addition to this, most open innovation studies in the public sector elsewhere have relied on qualitative approaches in their investigation. Therefore, by employing quantitative analysis, this study also aims to establish generalizability and add more robust theoretical and contextual input into our understanding of the subject.

2. LITERATURE REVIEW

2.1 Overview of Public Service Organization

There are several definitions given by previous literature on what constitutes a public service organization. While some of them focus on government ownership and control, other researchers highlight the service itself, i.e., the service must be for public benefit rather than to serve a market (Knies et al., 2024). Based on this definition, privately owned organizations that provide 'public value' services such as education, health, and utilities can be considered as public service organizations. Throughout this study, however, following Vivona et al. (2020), we defined public service organizations as organizations that are "state-owned, under direct political authority, operating in non-market environment, and serving the public interest by producing non-market impacts."

Another key essential point to consider is the distinction between public service organizations and private organizations. The first fundamental distinction is their objective. While private organizations aim for maximizing profits, this is nonexistence in public service organizations (Knies et al., 2024). Unlike private organizations that predominantly influenced by consumer purchasing behavior alongside regulatory standards, public organizations are regulated primarily through oversight bodies due to their non-market-based operations (Jin & Rainey, 2020). In addition to being more bureaucratic and hierarchical (Abdul Ghani Azmi & Hashim, 2022), public service organizations have more institutional constraints that restrict their flexibility and autonomy and are exposed to more intense scrutiny from politicians, interest groups, and the public (Atobishi et al., 2024). These characteristics make goals and performance criteria in public service organizations more complicated, less tangible, diversified, harder to assess, and frequently more contradictory (Rainey et al., 2021; Vivona et al., 2020).

2.2 Organizational Performance of Public Service Organization

Organizational performance in the context of public sector refers to how well an organization could meet its goals and objectives to serve citizens and public interest (Atobishi et al., 2024). By measuring the performance of public service organizations, the impact of their services and initiatives on the well-being of various stakeholders can be evaluated (Siddiquee, 2020). Nevertheless, due to fundamental differences between public service organizations and their private counterparts, measuring the performance of the former cannot be carried out similarly to the latter. For instance, as profit maximization is not an objective for public service organizations, financial indicators such as revenues, profit, or return on asset are irrelevant for the evaluation of their performance (Febriyanti et al., 2024). Compared to private organizations, performance measures of public service organizations are more diverse and must align with their complex goals relating to public value creation, citizen satisfaction, operational efficiencies, and growth (Atobishi et al., 2024; Khaltar & Moon, 2020).

2.3 Open Innovation

The concept of open innovation is based on purposive inflows and outflows of knowledge to accelerate organizations' internal innovation, and expand the markets for external use of innovation (Chesbrough, 2024). Through open innovation, organizations open up their boundaries to work with external partners in their innovation activities such as suppliers, clients, competitors and members of publics (Rumanti et al., 2021). The development of open innovation approach can be attributed to several factors, including mobility of knowledge workers, development of information and communication technologies (ICTs), shortened product life-cycle, dearth of resources, rising competition, and the rising cost of research and development (R&D), among others (El Maalouf & Bahemia, 2023; Narayan & Hungund, 2022; Rumanti et al., 2021). From the perspectives of the public sector, open innovation entails utilizing external resources and knowledge contributed by citizens or other stakeholders for the goal of innovation in solving public concerns, thereby contributing to the creation of public value (Yuan & Gasco-Hernandez, 2021). By collaborating with various stakeholders, public service organizations are able to bring together vast resources for innovation initiatives such as knowledge, skills, expertise, ideas, creativity, and authority, as well as tangible resources such as financial and physical assets (Coulon et al., 2020; Criado & Guevara-Gómez, 2021; Figenschou et al., 2024). This is particularly needed when they are struggling with a diminishing budget and being perceived as lacking relevant skills to pursue innovation (Vivona et al., 2020).

Open innovation can be implemented through three core processes (Bigliardi et al., 2020). Firstly, the inbound open innovation, where organizations incorporate external inputs such as ideas, knowledge, and technologies from external partners internally. This can be achieved by intellectual property (IP) in-licensing, buying patents, crowdsourcing, co-creation with customers, and supplier integration (Chistov et al., 2021; Rumanti et al., 2021). The second one is called outbound open innovation, in which internally developed resources flow towards external partners via out-licensing, selling patents, and spin-off companies, among (Chistov et al., 2021; Rumanti et al., 2021). The third is a hybrid mode between the first two, which is known as coupled open innovation. In coupled open innovation, organizations develop working relationships with external partners in their pursuit of innovation, and this can be done through approaches such as alliances, cooperation, and joint ventures (Chistov et al., 2021; Rumanti et al., 2021).

With regard to relationship with organizational performance, through open innovation, organizations can leverage the external assets to complement their own resources, thereby saving time and cost of innovation, increasing speed of commercialization, and maximizing value of underutilized assets, thus positively contributing to their financial position (Rumanti et al., 2021). In addition, open innovation was also found to be positively affecting non-financial indicators of organizational performance such as market effectiveness, customer satisfaction, image and brand value (Al Nuaimi et al., 2024; Arias-Pérez et al., 2022). Working closely with stakeholders also enables the outcome of services to be enhanced, thereby increasing satisfaction of service users (Lindsay et al., 2021). Not only that, through collaborative innovation efforts, organizations could achieve better compliance with environmental regulations and contribute to sustainability goals (Chistov et al., 2021). Therefore, based on these observations, the following hypothesis is formed:

H1: Open innovation has a positive relationship with organizational performance.

2.4 Type of Innovation

Past studies (e.g., Bekkers et al., 2011; de Vries et al., 2018; van der Wal, 2017) have made various attempts to categorize innovations according to their characteristics (Buchheim et al., 2020). Nevertheless, this study adopted the categorization made by the Oslo Manual, which separated innovation into two major categories, which are product (or service) innovation and process innovation (OECD/Eurostat, 2018). The former is defined as "a new, or improved good or service that differ significantly from the firm's previous goods or services and that has been introduced in the market," while the latter is defined as "a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use in the firm" (OECD/Eurostat, 2018).

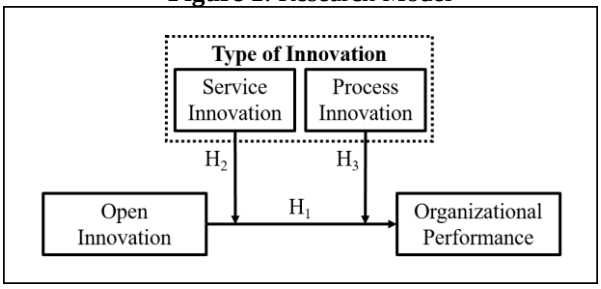
With regards to product (or service) innovation, in reflecting the output of our subject, i.e., public service organizations, the term 'service innovation' is used. Service innovation has an external focus, and within the public sector, it concerns the development of new public service amenities and service provision to public users (Cinar et al., 2022; de Vries et al., 2016, 2018; van der Wal, 2017). It is often citizen-oriented and may involve automation, outsourcing, or collaboration. For instance, a patient-specific care service for the elderly that incorporates telehealth solutions and a mobile team of healthcare workers (van der Wal, 2017). Unlike service innovation, process innovation meanwhile has an internal focus with goals such as to enhance the quality, efficiency, and effectiveness of business processes (Bekkers et al., 2011; Damanpour et al., 2009; van der Wal, 2017). The processes may include core processes in the production of goods and services; logistics, delivery, and distribution of goods and services; and other supporting processes such as marketing and procurement (MOSTI, 2018). The creation of one-stop centers for public services (e.g., Urban Transformation Center) and digital tax assessment are some examples of process innovation output in the public sector.

Different types of innovations are found to impact organizational performance differently (Buchheim et al., 2020; Queyroi et al., 2022). For example, as service innovation has an external focus, it is found to positively affect performance in the context of clients' satisfaction, increased responsiveness, and improved social responsibility (Arundel et al., 2015; Queyroi et al., 2022; Sousa et al., 2015). In addition, service innovation also benefits organizations in reducing cost, generating economies of scale, and optimizing service operation and quality (Arundel et al., 2015; Queyroi et al., 2022; Torugsa & Arundel, 2016a). Meanwhile, as process innovation aims to improve business processes, past literatures have found that it increases efficiency and process quality, reduces cost, and improves overall organizational performance (Arundel et al., 2015; Queyroi et al., 2022; Sousa et al., 2015; Torugsa & Arundel, 2016b). As mentioned in the first section, there are mixed results from past empirical studies that investigated the impact of open innovation on organizational performance. This inconclusiveness may potentially be explained by the type of innovation that open innovation is used for, as both types impact performance differently. Therefore, this study developed the following hypotheses: -

H2: Higher level of service innovation implementation will strengthen the relationship between open innovation and organizational performance.
H3: Higher level of process innovation implementation will strengthen the relationship between open innovation and organizational performance.

Based on the objective of this study, and the previously discussed hypotheses, the research model below is developed.

Figure 1: Research Model



Source: Authors

3. RESEARCH METHODOLOGY

3.1 Research Instrument

Based on the objective of this study, a structured survey questionnaire was developed for the purpose of primary data collection. Measures for each variable were adapted from past studies and established survey instruments. However, the questions were modified from the original items in terms of lengths, choice of word, and language (from English to Malay) to ensure that they are easy-to-understand and suit the local context, especially from the perspectives of local authorities in Malaysia. All these modifications were done with careful attention in preserving its original meaning.

As the data were collected from a single source at one point in time, several procedural remedies were implemented in the questionnaire design to address the concern about common method bias. For example, following Podsakoff et al. (2003, 2012), the survey adopted a different scale format for its variables and reduced the ambiguity by providing examples and descriptions of unfamiliar terms. In addition to procedural strategies, this study also incorporated a marker variable into the research instrument to be used for statistical remedy of common method bias (Miller & Simmering, 2023; Podsakoff et al., 2012).

In this study, open innovation is operationalized as the implementation of various open innovation practices in which the local authority takes part (Oltra et al., 2018). Following the approach taken by Oltra et al. (2018), this study has identified 15 open innovation practices from an extensive collection of past literature on open innovation. Therefore, for the construct of open

innovation, the respondents were asked to indicate the frequency of implementation of each open innovation practice in their organization using a five-point Likert scale, ranging from 1 = Never to 5 = Always.

Following the Oslo Manual, service innovation is operationalized as the implementation of new, or significantly improved service, while process innovation is operationalized as the implementation of new, or significantly improved processes in the production of service; delivery of service; and other ancillary operations (OECD/Eurostat, 2018). As organizations may implement both types of innovation, for these two moderating variables, the measurement was made in continuous form and not in categorical form. Nevertheless, they are both conceptualized as collectively exhaustive. The measurement items by the National Survey of Innovation (MOSTI, 2018) were adapted using a five-point Likert scale, indicating the frequency of implementation from 1 = Never to 5 = Always.

Meanwhile, organizational performance is operationalized as a perceptive measure by the representative of the organization in evaluating the achievement of his/her organization in the past 12 months. The measurement items for this construct were adapted from past studies, namely Gieske et al. (2019) and Queyroi et al. (2020), and external assessment of Malaysian local authorities called *Sistem Penarafan Bintang Pihak Berkuasa Tempatan* (*SPB-PBT*), or Star-Rating (Local Government Department, 2025). The measurement of this construct was done using 11 items consisting of financial, non-financial, and social indicators, and were measured using a six-point Likert scale ranging from 1 = Strongly Disagree to 6 = Strongly Agree.

3.2 Sampling and Data Collection

This study identified local authorities in Malaysia as its target population due to their importance in providing numerous public services and their relative financial independence compared to other public service organizations. Altogether, there are 155 local authorities in the whole country, categorized into four (4) different categories based on their revenues and the number of population within their areas (Local Government Department, 2023). Using Krejcie and Morgan (1970) as the basis for sample size determination, the total sample needed for this study is calculated at 113 organizations. Next, we employed proportionate stratified random sampling techniques using categories of local authority as stratification variables to determine the sample needed for each category. This was done to ensure the representativeness of the sample in reflecting the target population (Zikmund et al., 2009).

To ensure that the representative of the sample organization is able to adequately represent their organization in providing appropriate and accurate responses, we asked the organization to identify their own representative, who is either a member of the top management team or an executive responsible for their innovation activities. Once identified, we contacted the representative of each sample organization via telephone to introduce our intentions. In preserving confidentiality, all respondents were informed that their responses would remain anonymous and would only be used for the purposes of this study. Upon receiving approval for data collection, the survey was then sent to the representative in the form of an online survey.

From the 113 samples needed, the researchers managed to collect data from 112 organizations, achieving a 99.1% response rate, as one organization did not return the questionnaire. The entire data collection process took approximately 21 weeks, as it was done in several stages based on the location of the organizations. Once collected, the data were checked for missing values, outliers, and straight-lining responses, and none of them showed any. Table 1 below shows the distribution of the sample based on the categories of local authorities.

Table 1: Distribution of sample by categories of local authority

Type	Population		Sample Needed		Sample Collected	
	N	%	N	%	N	%*
City council / city hall	19	12.3	14	12.4	14	12.4
Municipal council	40	25.8	29	25.7	29	25.7
District council	92	59.3	67	59.3	66	58.4
Modified local authority	4	2.6	3	2.6	3	2.6
Total	155	100.0	113	100.0	112	99.1

Notes: *percentage calculated based on total sample needed

3.3 Data Analysis

In this study, Partial Least Square Structural Equation Modeling (PLS-SEM) using the SmartPLS 4 software was used for the data analysis. This selection of analysis was made as PLS-SEM uses latent variables for hypothesis testing and is able to handle complex structures while at the same time making minimal demands on sample size and data distribution (Hair et al., 2022; Lee & Hooi, 2023). In analyzing the data, we followed two-stage procedures suggested by Hair et al. (2022). In the first stage, which is the measurement model evaluation, the research model was tested using a reflective measurement model to determine its reliability and validity. Upon confirmation of the instrument's reliability and validity, structural model estimation was conducted for hypothesis testing. The result for this two-stage procedure can be found in Section 4 Result and Discussion.

As the data were collected from a single source at a single time, they were first tested for common method variance (CMV). This test was done through a single-common-method-factor approach using marker variables (Lin et al., 2015). Using this approach, the baseline model was compared with the method factor model, which consists of a marker variable adapted from Miller and Simmering (2022). From the result, the significant path in the baseline model remained significant even with the presence of marker variables in the method factor model. Therefore, following Lin et al. (2015), we concluded that CMV was not a concern in the data.

4. RESULTS AND DISCUSSION

Table 2 below depicts the demographic details of the respondents, including the position of respondents, type of local authorities, and the total number of employees. As shown in Table 2 below, exactly half of the representative of respondents was from top management, either the governor/president/secretary themselves (N = 4, 3.6%), or another member of the top management team (N = 52, 46.4%). The distribution of respondents based on the type of local

authorities was similar to the sample needed (refer to Table 1 above), thus showing the representativeness of the population. Meanwhile, in terms of number of employees, almost half of respondents indicated that their organizations employed between 100 and 499 employees (N = 55, 49.1%).

Table 2: Demographics Profile of Respondents

Demographic Characteristics	Frequencies (N)	Percentage (%)	Cumulative Percentage (%)
Position			
1. Governor/President/Secretary	4	3.6	3.6
2. Other member of top management team	52	46.4	50.0
3. Executive	54	48.2	98.2
4. Not specify	2	1.8	100.0
Total	112	100.0	-
Type of Local Authorities			
1. City councils	14	12.5	12.5
2. Municipal council	29	25.9	38.4
3. District council	66	58.9	97.3
4. Modified local authorities	3	2.7	100.0
Total	112	100.0	-
Number of Employees			
1. Less than 100	32	28.6	28.6
2. 100 – 499	55	49.1	77.7
3. 500 – 999	10	8.9	86.6
4. 1000 – 1499	8	7.1	93.8
5. 1500 – 1999	4	3.6	97.3
6. 2000 or more	3	2.7	100.0
Total	112	100.0	-

4.1 Evaluation of Measurement Model

Following the procedure suggested by Hair et al. (2022), we tested the measurement model for validity and reliability of the instruments. First, we assessed the model for loadings, composite reliability (CR), and average variance extracted (AVE). The value of loadings should be ≥0.4, and items with loadings lower than threshold should be removed from the construct (Hair et al., 2022). As a result, only one item, OOI2, which assessed the organization's frequency on open data implementation, was removed. As shown in Table 3, all other items met the minimum threshold and were therefore retained. Meanwhile, the value of CR must be higher than 0.70 to establish internal consistency reliability (Bougie & Sekaran, 2019; Hair et al., 2011, 2019). The result in Table 3 showed that all constructs met this requirement.

With regards to the AVE, although the rules of thumb indicate that its value should be above 0.50 (Hair et al., 2011), the indicator itself is a more conservative evaluation of the validity of the measurement model, and it suffices to conclude whether the validity of the construct is adequate (or otherwise) based on CR alone (Fornell & Larcker, 1981). If the CR ≥0.60, an AVE value lesser than 0.50 is still adequate to establish convergent validity (Fornell & Larcker, 1981; Lam, 2012; Muhamad Safiih & Nor Azreen, 2016; Pervan et al., 2018). Therefore, based on the result

in Table 3, we concluded that the convergent validity of the measurement model is established.

The measurement model also was tested for discriminant validity, which examines the uniqueness of a construct (Hair et al., 2022). As suggested by Henseler et al. (2015) and updated by Franke and Sarstedt (2019), discriminant validity was tested using the HTMT criterion, and the value should be lower than 0.90 (Garson, 2016). As shown in **Table *4*** below, the values of HTMT were all lower than 0.90; therefore, it can be concluded that all constructs were distinct.

Table 3: Measurement model

Constructs	Items	Loadings	CR	AVE
Open Innovation (OI)	IOI1	0.676	0.912	0.430
	IOI2	0.520		
	IOI3	0.685		
	IOI4	0.646		
	IOI5	0.677		
	IOI6	0.705		
	IOI7	0.739		
	OOI1	0.591		
	OOI3	0.605		
	OOI4	0.563		
	COI1	0.601		
	COI2	0.787		
	COI3	0.577		
	COI4	0.744		
Service Innovation (SI)	SI1	0.908	0.926	0.863
	SI2	0.949		
Process Innovation (PI)	PD1	0.759	0.915	0.644
	PD2	0.916		
	PO1	0.641		
	PO2	0.811		
	PP1	0.793		
	PP2	0.866		
Organizational Performance (OP)	FP1	0.834	0.961	0.693
	FP2	0.816		
	FP3	0.820		
	NF1	0.899		
	NF2	0.896		
	NF3	0.888		
	NF4	0.860		
	NF5	0.865		
	SE1	0.778		
	SE2	0.696		
	SE3	0.783		

Notes: Item OOI2 was removed due to low loadings (<0.4)

Table 4: Discriminant Validity

	OI	SI	PI	OP
OI				
SI	0.667			
PI	0.579	0.842		
OP	0.281	0.135	0.151	

4.2 Structural Model Estimation

Before conducting structural model estimation, the model was tested for collinearity. The values of the variance inflation factor (VIF) in this research model were found to be less than the maximum threshold of 5.0 (Hair et al., 2022), therefore confirming that collinearity was not a critical issue. In generating the path coefficients of each relationship in the research model, bootstrapping procedures were conducted at the 0.05 significance level, a one-tailed test, and 10,000 subsamples. The result of the bootstrapping procedure is presented in Table 5 below.

Table 5: Structural Model Estimation

Relationship	β	SD	t-value	p-value	PCI LL	PCI UL	R^2	f^2
OI → OP	0.289	0.104	2.778	0.003	0.026	0.403	0.105	0.059
SI x OI → OP	0.113	0.151	0.751	0.226	-0.151	0.339	-	0.006
PI x OI → OP	-0.028	0.155	0.182	0.428	-0.251	0.244	-	0.000

Notes: β = Path coefficient; SD = Standard deviation; PCI LL = Confidence interval percentile corrected lower limit; PCI UL = Confidence interval percentile corrected upper limit; R^2 = Coefficient of determination; f^2 = Effect size

Based on the result above, it was found that OI has a positive and significant influence on OP (β = 0.289; t = 2.778; p = 0.003). The relationship between these two constructs was also found to show a non-zero confidence interval, with both its lower limit and upper limit indicating positive values (PCI LL = 0.026; PCI UL = 0.403). The empirical results also showed that OI only explains 10.5% of the variance in the OP (R^2 = 0.105). In addition, the measurement of effect size was also conducted to determine whether there is a substantive effect on the endogenous constructs when an exogenous is removed from the structural model (Hair et al., 2019). Following Cohen (1988), the f^2 values of 0.02, 0.15, and 0.35 can be interpreted as having small, medium, and large effects, while values below 0.02 mean that there is no effect. Therefore, as shown in the result above, OI can be interpreted as having a small effect on OP. Based on these results, the first hypothesis, H1, is accepted.

With regards to the moderating effect of SI and PI on the relationship between OI and OP, both moderators were found to be not significant. The former showed a t-value of 0.751, and the latter showed a t-value of 0.182, both lower than the minimum threshold of 1.65 (Hair et al., 2022). In addition, the confidence intervals for both relationships were also found to have zero values, confirming the non-significance relationship. As such, this study concluded that both hypotheses H2 and H3 are rejected.

4.3 Discussion and implication

This study aimed to provide empirical evidence on the influence of open innovation on organizational performance as well as the moderating effect of innovation type on their relationship. Based on the results, this study confirms that open innovation is a significant factor in influencing organizational performance positively, even for public service organizations. This finding echoes past studies in the context of private organizations (e.g., Arias-Pérez et al., 2022; Narayan & Hungund, 2022; Rumanti et al., 2022) that recognize the contribution of open innovation adoption in making a positive impact towards performance. By leveraging the resources and capability of their external partners, public service organizations can overcome their internal challenges of limited know-how, equipment, tools, or even financial resources to address public or their own operational issues, therefore contributing towards performance. Opening up their borders to external partners also helps organizations bring additional value from their underutilized resources. For instance, within the context of the public sector, this could be new innovative services resulted from crowdsourcing and civic hackathon activities, where the public can contribute their ideas and knowledge to solve long-standing social problems. Not only can they solve public issues, but through engagement, they could also get the buy-in from their stakeholders, thus increasing public satisfaction and contributing to overall performance.

Contrary to our hypotheses on the moderating effect of service innovation and process innovation, both types of innovation were found not altering the relationship between open innovation and organizational performance. As we conceptualized the innovation types into two categories that are collectively exhaustive, looking at these two findings collectively, it indicates that open innovation influences organization performance similarly regardless of the innovation types. In other words, by adopting an open innovation approach, organizations can enhance their overall performance irrespective of whether they prioritize one innovation type over another or not. However, this result may have limitations in the context of this study, which is public service organizations, where performance indicators are multi-dimensional and not solely focused on tangible financial measures such as profit and return on asset. For public service organizations, the impact of open innovation on their performance could be in the form of increased satisfaction, enhanced service quality and responsiveness, cost and resource efficiencies, and improved social responsibility, among others, consistent with findings of other past studies on the impact of innovation in the public sector (e.g., Arundel et al., 2015; Queyroi et al., 2020).

In terms of theoretical implications, this study provides more comprehensive evidence on the body of knowledge of open innovation. Firstly, organizations are not restricted to implementing only one activity, nor one type of open innovation, but a mixture of various activities of inbound, outbound, and coupled open innovation. Therefore, by incorporating a range of inbound, outbound, and coupled open innovation activities, the findings of this study provide more authentic evidence by mirroring the actual implementation of open innovation in organizations. Secondly, this study provides statistical evidence on the relationship between open innovation and organizational performance in the context of public service organizations. Although past literature has recognized the influence of open innovations within the public sector, the findings were mostly relied on qualitative methods, particularly case studies, where generalizability is lacking. Therefore, based on the findings of this study, we validate and provide more robust evidence that the positive impact of open innovation is beyond profit-oriented business organizations to include non-market participants like public service organizations.

Thirdly, although we initially hypothesized that the impact of open innovation would be affected by the type of innovation, the findings of this study have proven otherwise. It showed that the positive impact of open innovation is not restricted to certain innovation types. Nevertheless, this discovery adds more depth into our understanding on the subject, as to the best of our knowledge, this study is the first to analyze the moderating impact of innovation type on the relationship between open innovation and organizational performance.

In terms of practical implications, this study highlights the role of open innovation in enhancing the performance of public service organizations. Based on the findings of this study, officers and public managers should consider implementing open innovation in their public service organization, irrespective of innovation type. By engaging in open innovation initiatives, they could leverage the resources and capabilities of their external stakeholders to innovate and address public concerns and operational issues, thus contributing to their overall organizational performance. The findings of this study also call for policymakers to pay more attention to developing relevant initiatives that encourage the adoption of open innovation in public service organizations. Training and development programs, networking sessions, and other relevant capability development programs related to the implementation of open innovation should be encouraged within the public sector.

5. CONCLUSION

Overall, this study has shed some light on the impact of open innovation towards organizational performance. The findings of this study suggest that open innovation has a significant positive impact on Malaysian public service organizations, irrespective of innovation type. Although this study has established some significant contribution in the body of knowledge as well as practical implication, it is not without any limitation. Firstly, the results of this study need to be interpreted with care, given that the data was collected from a single cross section within the local authorities in Malaysia. Second, as local authorities in Malaysia have more financial independence compared to other public service organizations, the result of this study may only be applicable within the context of local authorities in Malaysia.

Addressing these limitations, we suggest that future research should consider collecting data from multiple sources, such as objective data from internal stakeholders for open innovation activities and external and non-perceptual measures for organization performance. Secondly, future studies should also consider including other types of public service organizations in their sample to verify the impact of open innovation in the public sector. As this study was also conducted by incorporating all open innovation activities into a single construct, a differentiated impact of a single type of open innovation or a single open innovation activity cannot be made. It would be interesting to investigate which type of open innovation or open innovation activity has the most impact on performance so that it would be more practically useful to public managers to develop an open innovation strategy in their organization.

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