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THE IMPACT OF KNOWLEDGE VACUUM TO INNOVATION PROCESS DURING PUBLIC RESEARCH ORGANIZATIONS MERGER

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Abstract

Maintaining innovation process during merger in a merged public research organization is quite a challenge. Knowledge vacuum is a potential rising issue due to merger. This study aims to examine knowledge vacuum as intervening role between organizational factors and individual factor, also how it impacts the innovation process. PLS-SEM is applied by using software SmartPLS 4.0, and 198 innovation actors are involving in questionnaires survey. Surprisingly, the results show that knowledge vacuum positively and significantly influences absorptive and adaptive capability to form distinctive competencies. It shows that missing knowledge flows among high-performer actors, such as innovators, will enhance competencies during chaotic event due to merger. In addition, distinctive competencies have a significant positive influence to innovation process. On the other hand, knowledge vacuum is not having a direct relationship to distinctive competencies. Resource and infrastructure management has a contribution to positively forming knowledge vacuum during merger to create strong absorptive and adaptive capability and curve prominent distinctive competencies, which eventually will positively impact the innovation process.

Keywords: knowledge vacuum, innovation process, managerial support, merged research-based organization, structural equation modelling

1. INTRODUCTION

Merger wave in several industries and organizations often happened. The ultimate goals were usually to gain market and profit, or international reputation. On the other hand, merger also was also causing stagnancy to innovation. A previous study

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explained that a merged organization required an explicitly stated goal of preserving innovation, particularly for research-based organization or agency (Heller-Schuh et al., 2020). A public research organization usually conducted basic and applied researches. Both basic and applied researches were absolutely dependent on absorptive and adaptive capabilites to seek the best alternatives methods to achieve innovation performance through optimal process (Choi & Chandler, 2020; Wensley & Navarro, 2015). Previous researches also showed that product-driven innovation in commercial industries solely relied on innovation capabilities which was not enough comprehensive to capture innovation process (Xiong et al., 2022; Bashir et al., 2023). Therefore, process of innovation was the main parts of public research organization that needed to be noticed during merger. Such managerial decision making, facilities availability, and individual characters were believed to drive process of innovation during organizational change due to merger. Previous researches also found that knowledge vacuum, that arised from dynamic change, influenced negatively the way of innovators adjusting to new environment and maintaining the innovation performance (Choi & Chandler, 2020; Wensley & Navarro, 2015). Thus, to have effective strategies to conduct innovation process during merger in public research organization, it is needed to understand the relationship between particular organizational and individual factors and the role of knowledge vacuum.

According to Xiong et al. (2022), innovation sequences or process was not able to run smoothly without fair distribution of resources and infrastructures that executed by board of management. Bashir et al. (2023) also stated that managerial support with secure commitment to trait each innovators fairly would influence innovative thinking as well as level of innovation performance. Supportive managerial decision also helped innovation actors felt optimistic to perform targeted innovation outputs successfully (Bashir et al., 2023; Li et al., 2022; Zhang et al., 2023). Previous studies also explained that successful managerial decision to support equality of utilizing resource and infrastructure among researchers, could help minimizing individual pesimistic and enhancing adaptive and absorptive skill during organizational mergers (Duan et al., 2022; Heller-Schuh et al., 2020; Piwowar-Sulej, 2022). Absorptive and adaptive capabilities were essential factors to adjust in a new and dynamic environment due to merger (Khan & Tao, 2022; Martínez- Sánchez et al., 2020). But a merged organization, was usually facing chaotic events in knowledge flows which caused by organizational and individual inertia (Aagaard et al., 2016; Choi & Chandler, 2020; Wensley & Navarro, 2015), this obstacle in knowledge flows caused knowledge vacuum. A past study stated that knowledge vacuum influenced how innovators adapt and adopt existing and new knowledge to perform innovation process (Choi & Chandler, 2020). From previously mentioned statements, knowledge vacuum and capabilities of absorptive and adaptive were linking each other. This need further investigation to balance innovation process, and will be the fundamental question of current research. Ability to adopt new knowledge and implement to day-to-day innovation activities had created peculiar competency that supporting organizational innovation targets (Heller-Schuh et al., 2020; Khan & Tao, 2022; van Assche et al., 2021).

Isip (2022) also said that individual who capable to flexibly adjust to dynamic environment would perform better innovation outputs through an advanced and unique competency. Concisely, absorptive and adaptive capabilities indirectly affected process of innovation through distinctive competencies. Until today, it is still debatable the role of distinctive competencies in the innovation process.

Several past studies only showed existing innovation process and financial capability based on commercial R&D and engineering (Heller-Schuh et al., 2020; van Assche et al., 2021), thus there have not been any innovation process model that predicted from distinctive competency and infrastructure management perception. Although study of Isip (2022) introduced the complex innovation process in the policy-driven research, this study result was conducted from historical data without expert judgement and lacked of systematic approach especially when not considering adaptive and absorptive skill as a support to perform innovation process.

The objective of current study was to reveal the relationship among organizational factors (managerial support; resources & infrastructures management), individual factors (adoptive and adaptive capabilities; distinctive competencies), and innovation process in a merged public research organization. Moreover, this study also examined the role of knowledge vacuum as intervening variable between organizational and individual factors, and how knowledge vacuum affected directly or indirectly to innovation process. This current exploratory study was intended to uncover the essentials for factors influencing innovation process in balance.

2. LITERATURE REVIEW

2.1. Managerial Supports to Infrastructure Management

Researches about managerial decision on resource management had been developing since a decade. Managers with critical strategic thinking on organizational goal setting, influenced the framing of opportunities in the organization's resource allocation process (Bai & Liesch, 2022). During merger, organization was possible to suffer from legitimacy deficit due to limited history and reputation. To minimize legitimacy deficit, managers should decide proper types of infrastructures to build with narrow resource allocations. A set of manager's capability enabled optimum coordination and utilization of existing resources to deliver innovation performance successfully (Chapman et al., 2018; Uhm et al., 2018). Research-based organization was putting innovation as core activities. In addition managers with innovative mindset would help maintaining targets of innovation even during uncertainty condition due to merger (Bai & Liesch, 2022; Symeonidou et al., 2022; Xiong et al., 2022). Moreover, distribution of primary resources went well if it was carried by mindful managers who believed in equality in innovation cultures. From previous statements, the following hypothesis has been made:

H1: Managerial support has a positive relationship to resource and infrastructure management.

Organizations that had been merged might gain a number of resources and infrastructure, but might possible to experience priorities that will enable

organizations to develop certain capabilites or core competencies with limited time and budget (Haucap et al., 2019; Heller-Schuh et al., 2020; Kang & Liu, 2021). Disorientation of resource allocation management could harm research and development performance, especially innovation (Kafouros et al., 2020). Merger conditions also arised personel and resource mobilization issues which resulted knowledge mismatch or loss and eventually impacted organization competencies and performance (Choi & Chandler, 2020; Wensley & Navarro, 2015). According to Choi & Chandler (2020), chaotic condition that caused by merger had influenced the way of managing the resource and infrastructure allocation and choosing strategy to maintain or achieve innovation targets. In most cases, unsettled resource and infrastructure management could harm knowledge and communication internal networks which eventually resulted knowledge vacuum. Knowledge vacuum was defined as an absent of particular information and knowledge in a merger organization (Choi & Chandler, 2020; Wensley & Navarro, 2015). Availabilities of resource and infrastructure had a strong impact to flows and qualities of knowledge. Thus, previous arguments provide the basis for the following hypothesis:

H2: Resource and infrastructure management has a negative relationship to knowledge vacuum.

2.2. Knowledge Vacuum impacts Innovation Process through Distinctive Competencies

The concept of knowledge vacuum was identified as a result of structural change failure due to lack of appropriate learning and organizational inertia such as: a pro-innovation bias without careful planning, employee resistance, lack of training and resource (Choi & Chandler, 2020). Meanwhile, a distinctive competency was believed as an activity capable of creating value in an organization and necessary for that organization to gain a competitive edge. The term was coined with the goal of determining an organization's fundamental strategy capabilities (Fernandez et al., 2018). A distinct capability was defined as an activity capable of creating value in an organization and necessary for that organization to gain a competitive edge. During a successful innovation, the pulling forces may temporarily impede the process, but organizations will eventually catch up with the changes (Bennato et al., 2021; Fernandez et al., 2018). In the preceding scenario, the organizational dynamic did not function in the direction of balancing distinct components to heal the negative effects of others, but instead incurred a positive feedback loop that magnified the negative effects of the factors. A knowledge vacuum, or a lack of critical knowledge and expertise within an organization, could have a negative impact on the development and preservation of unique competencies. Distinctive competencies often need specialized skills, experience, and knowledge. Without these resources, the organization will struggle to build and retain distinct competencies. A lack of awareness might lead to missed chances (Choi & Chandler, 2020; Khan & Tao, 2022; Manning et al., 2021; Wensley & Navarro, 2015). Recognizing and capitalizing on unique opportunities frequently resulted in distinctive competencies. Without the requisite knowledge, the organization might fail to

recognize or act on these opportunities, stifling the development of different talents. Decision-making becomes less informed in the absence of essential knowledge (Fernandez et al., 2018). A knowledge vacuum resulted to the loss of these fundamental competencies, reducing the organization's ability to effectively supply what it provides. From previous statements, the next hypothesis will be defined as written below:

H3: Knowledge vacuum has a negative relationship to distinctive competencies.

Absorptive aptitude, or the ability of the company to learn and integrate external knowledge, can assist the merged firm in capitalizing on the distinct strengths and skills of each merging entity. This may result to a greater knowledge of the unique skillsets that each individual brings to the table. Meanwhile, adaptive capacity enables the organization to successfully integrate and apply this knowledge. It enables the merged organization to change its internal processes, frameworks, and strategies to line with each entity's individual competencies. Mergers frequently provide complementing skills and talents (Hulke & Revilla Diez, 2020; van Assche et al., 2021). Absorptive capability aids in the identification of these complimentary competencies, whereas adaptive capability enables the company to combine and exploit them for mutual advantage (Bouguerra et al., 2022; Khan & Tao, 2022; Martínez-Sánchez et al., 2020). As the organization adapts and executes new information and methods connected to its different strengths, it may track the results and use the feedback to improve further. When an organization's culture encourages change and innovation, it becomes simpler to nurture and build specific abilities that are aligned with the organization's strategic goals (Khan & Tao, 2022). The merged organization has a greater ability to innovate, react to competitive changes, and stay ahead of competitors, resulting in a distinct competitive position (Hulke & Revilla Diez, 2020). Finally, based on above mentioned researches, the next hypothesis is concluded as follows:

H4: Absorptive and adaptive capability has a positive relationship to distinctive competencies.

Absorptive and adaptive capability had been identifed in the scope of knowledge-based view (KBV). This explained that absoprtive and adaptive capability in organization could help developing capacities to obtain, comprehend, combine, and deploy useful knowledge for achieving organizational competitiveness including performing excellent innovation performance (Salehi & Veitch, 2020). In addition, learning process in the absorptive and adaptive capability was influenced by environment characters including knowledge dynamism, complexity of environment, and competitive intensity. During merger, knowledge dynamism could be dominated by uncertain resource and information mobility that caused vacuum of knowledge (Choi & Chandler, 2020; Wensley & Navarro, 2015). Stressfull condition and vacant of important knowledge or information, would decrease capacity of learning that form absorptive and adaptive capability (Manning et al., 2021). Therefore, the next hypothesis will be stated as follows:

H5: Knowledge vacuum has a negative relationship to absorptive and adaptive capability.

Understanding and fostering these distinct capabilities was critical for long-term innovation viability and success. During merger, distinctive competency could be used as a resource pooling or gathering various resources and assets (Fernandez et al., 2018; Palacios-Marqués et al., 2019). As two organizations merged, they frequently brought a varied combination of resources and assets together. Distinctive competencies at the core of the merging organizations' complementary capabilities might complement each other (Agolla & Van Lill, 2017; Haucap et al., 2019; Singh et al., 2021). Mergers frequently involved the blending of distinct organizational cultures (Fernandez et al., 2018). Intellectual property leverage could be achieved when distinctive competency involved proprietary technology or implemented policy brief. Thus, the merged organization could capitalized on intellectual property benefits by integrating them into new services, process, or products to create innovation competitiveness. Distinctive competency that involved cross- functional collaboration within the merged organization could enhance innovative outputs and help mitigating particular risks associated with uncertainty of a merger (Fernandez et al., 2018; Haneda & Ito, 2018; Mukherjee, 2022). Therefore, from the previous statement will conclude the next hypothesis as mentioned below:

H6: Distinctive competencies has a positive relationship to innovation process.

Absorptive and adaptive capabilities were critical in an organization's innovation process. These two competencies were linked and might possess a favorable impact on an organization's innovation activities (Bouguerra et al., 2022; Khan & Tao, 2022). Scanning the external world, recognizing relevant knowledge and information, and incorporating this knowledge into the organization's existing knowledge base were all part of the process in absoprtive and adaptive skills (Hulke & Revilla Diez, 2020; Salehi & Veitch, 2020). The combination of adaptive and absorptive capacities fostered a culture of constant learning and responsiveness (Bouguerra et al., 2022; Fernandez et al., 2018; Khan & Tao, 2022). Organizations with high absorptive and adaptive capacities were more nimble and better ready to respond to changing market conditions, consumer wants, and emerging technology (Arias-Pérez et al., 2021; Stipp et

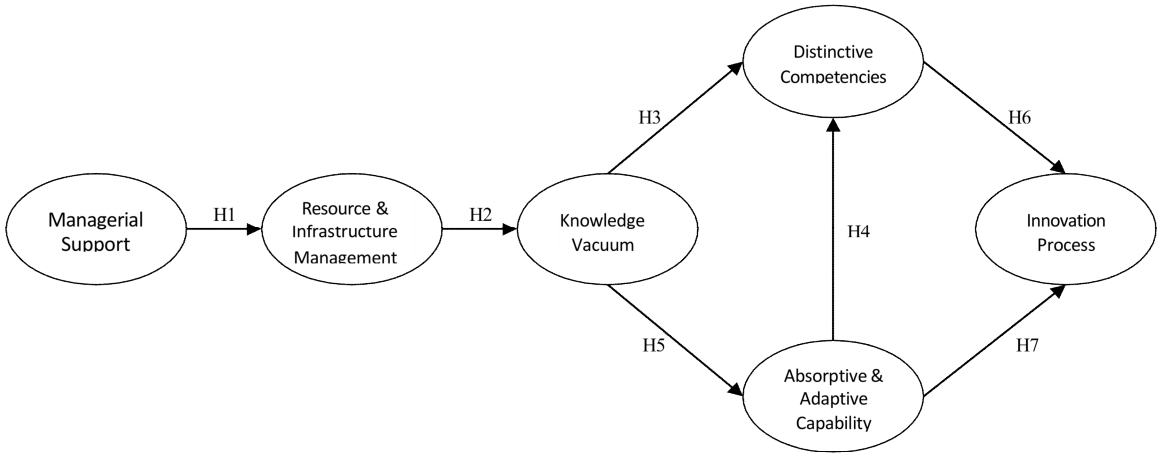

Figure 1. Proposed Conceptual Model

al., 2018). Through a constant cycle of innovation, the positive relationship between adaptive-absorptive capacities and innovation process could lead to sustainable competitive advantage over time (Bouguerra et al., 2022; Martínez-Sánchez et al., 2020). As previous researches mentioned, the last hypothesis is concluded as follows:

H7: Absorptive and adaptive capability has a positive relationship to innovation process.

3. METHODOLOGY

3.1. Data Collection and Sample

This study used empirical data to test and analyze the conceptual model shown in Figure 1. The empirical data were gathered from researchers and engineers in National Research and Innovation Agency (BRIN); who came from various former agencies such as *Badan Pengkajian dan Penerapan Teknologi (BPPT), Lembaga Penerbangan dan Antariksa Nasional (LAPAN), Badan Tenaga Nuklir Nasional (BATAN), Lembaga Ilmu Pengetahuan Indonesia (LIPI).* Also several research and development agencies of ministries which merged into the BRIN. Researchers and engineers were the core actors of innovation or the science and technology human resources in BRIN. There were 198 valid questionnaires to be analyzed. Data gathering was conducted between June 2023-August 2023. Respondents were divided into technological (such as basic and applied technology) and non-technological (such as social and humanities) experts. Moreover, continuity of research and development was a prominent indicator of good innovation process in a merged institution (Cheah & Ho, 2021; Heller-Schuh et al., 2020; Selviaridis, 2021). Therefore, continuity aspect was also being analyzed. Table 1 explained the result of respondent descriptive statistics.

3.2. Common Method Bias (CMB), Measures, and Scales

In this study, CMB was examined by using variance inflation factor (VIF) to define collinearity of construct. If VIF value was less than 3.3, it explained that the model was free from CMB (Hair Jr et al., 2016). According to Table 2., it depicted that all VIF values were less than 3.3, suggesting that there was no evidence of CMB in the data. Current study utilized 4-point Likert scale questionnaires to collect data. The scales were ranged from 1 (strongly disagree) to 4 (strongly agree). Validity of

Table 1. Descriptive statistics of respondent

Characteristics	Classification	Frequency	Percent
Sex	Female	87	43.9%
	Male	111	56.1%
Type of research	Technological-based research	101	51%
	Non-technological-based research	97	49%
Research and development continuity	continue after merger	30	15.5%
	not continue after merger	168	84.5%
Level of job	Assistant	82	41.4%
	Junior	58	29.2%
	Senior	35	17.6%
	Principal	23	11.8%

the scale item had been passed through rigorous process to assure that the questions were understandable and precise. A pretest was carried out by involving several researchers and engineers to correct sentences and enhance readability. All items were adjusted to the context of a merging research-based organization. Variable construct of absorptive and adaptive capabilities was measured by using 5 items adopted from Khan and Tao (2022). The distinctive competencies scale was adjusted from Fernandez et al. (2018), meanwhile the construct of innovation process was inherited from Berkhout et al. (2006) (6 items) since only construct from Berkhout et al. (2006) best fit to this research rather than using recent other constructs. A couple of past researches (Bashir et al., 2023; Engelsberger et al., 2023) was used and adjusted to form 7 items of questions to measure managerial support variable. Since study of knowledge vacuum had been studied relatively little, valid scale to measure knowledge vacuum has yet to be developed. A study of knowledge vacuum by Choi & Chandler (2020) was chosen as a reference and adjusted to this research. There are 4 items to quantify the knowledge vacuum construct. Finally, resource and infrastructure management variable was built from Tseng et al. (2021) and defined into 3 items. Brief description and measurement items of each construct were shown in Appendix 1.

3.3. Data Analysis

Current study applied Partial Least Squares-Structural Equation Modelling (PLS-SEM) method for analyzing data. The SEM was well-known for its suitability to estimate complex models with multivariate structure. Moreover, PLS-SEM was one of adequate methods to explain the variance in main target constructs (Hair Jr et al., 2016). Another beneficial reason was PLS-SEM fitted to measure small sample size studies and to explore conceptual models. SmartPLS 4.0 software was used in the analysis step. There were 2 phases of analysis which consisted of measurement and structural model assessments.

4. RESULTS

4.1. Measurement Model Assessment

4.1.1. Reliability

Standardized factor loadings (SFL) and T-Value were used as the main indicators to show model reliability. A suggested significant value of factor loadings was at 0.70 or more. Meanwhile, T-Value was preferable to be more than 1.96 (Khan et al., 2019). As shown in Table 2., the results suggest that all SFL were strongly significant and all t-statistics values were more than 1.96 (p = 0.05). Therefore, the reliability of individual item for all 6 constructs was acceptable.

4.1.2. Convergent & Discriminant Validity

Cronbach's alpha (α) and composite reliability (CR) was tested to evaluate construct validity for each construct. Reliable variables were indicated by values of α and CR exceeding 0.70 for significance. All constructs in Table 2 showed that each values of α and CR were more than 0.70. Thus, all constructs in the model were reliable. In addition, from Table 2., all average variance extracted (AVE) values of

each variables outstipped 0.50 which suggested by Hair Jr et al. (2016). This results proved that the model had adequate convergent validity. Discriminant validity related to the proposed model in this study was assessed using Fornell- Larcker criterion, heterotrait-monotrait ratio of correlation (HTMT), and cross-loading analysis. Fornell-Larcker criterion was assured by defining whether the square root of AVE of each constructs was more than the correlations with other constructs in the model. Table 3 represented the square root of AVE in the diagonal form met the strong criteria of Fornell- Larcker. The result of HTMT ratio that shown in Table 4, indicated that all HTMT indices were lower than HTMT suggested critical value of 0.85 or 0.90. Furthermore, according to Table 5, the individual items of each construct variables were valued higher than other constructs and the cross-loading difference was also higher than preffered criteria of 0.1 (Hair Jr et al., 2016). From several indicators above mentioned, the results showed that the model in current study had qualified discriminant validity.

Table 2. Measurement Model Result (p = 0.05)

Construct	Indicators	SFL	t-value	VIF	α	CR	AVE	
Managerial Supports (MS)					0.878	0.891	0.583	-
	MS1	0.789	23.772	2.142				
	MS2	0.828	24.206	2.505				
	MS3	0.789	20.612	2.141				
	MS4	0.789	20.760	2.337				
	MS5	0.861	38.388	2.974				
	MS6	0.628	11.798	1.699				
	MS7	0.627	8.113	1.422				
Resource and Infrastructure Management (RIM)					0.901	0.905	0.834	0.606
	RIM1	0.907	39.385	2.767				
	RIM2	0.908	49.614	2.743				
	RIM3	0.925	71.923	2.968				
Knowledge Vacuum (KV)					0.859	0.867	0.705	0.291
	KV1	0.759	12.851	1.640				
	KV2	0.853	25.434	2.225				
	KV3	0.899	57.193	2.695				
	KV4	0.842	24.132	2.156				
Distinctive Competencies (DC)					0.770	0.786	0.530	0.357
	DC1	0.773	18.701	1.632				
	DC2	0.528	6.025	1.210				
	DC3	0.727	15.618	1.672				
	DC4	0.831	24.741	2.416				
	DC5	0.742	13.451	1.920				
Absorptive-Adaptive Capacity (AA)					0.839	0.851	0.608	0.209
	AA1	0.829	27.709	1.950				
	AA2	0.731	13.613	1.595				
	AA3	0.786	12.832	1.796				
	AA4	0.812	23.388	1.898				
	AA5	0.734	12.482	1.657				
Innovation Process (IP)					0.804	0.829	0.509	0.164
	IP1	0.850	23.640	2.403				
	IP2	0.811	19.744	2.221				
	IP3	0.743	11.462	1.789				
	IP4	0.555	6.194	1.728				
	IP5	0.646	6.991	1.824				
	IP6	0.631	7.701	1.287				

Table 3. Fornell-Larcker Criterion

	AA	DC	IP	KV	MS	RIM
AA	*0.780*					
DC	0.598	*0.728*				
IP	0.136	0.387	*0.714*			
KV	0.457	0.259	-0.117	*0.840*		
MS	0.477	0.317	0.084	0.580	*0.764*	
RIM	0.457	0.284	0.071	0.539	0.778	*0.913*

Table 4. Heterotrait-Monotrait Ratio (HTMT)

	AA	DC	IP	KV	MS	RIM
AA						
DC	0.732					
IP	0.189	0.488				
KV	0.530	0.312	0.154			
MS	0.557	0.391	0.135	0.668		
RIM	0.526	0.336	0.101	0.610	0.867	

Table 5. Loadings and Cross-Loadings

	AA	DC	IP	KV	MS	RIM
AA1	*0.829*	0.563	0.126	0.423	0.381	0.404
AA2	*0.731*	0.324	0.049	0.423	0.470	0.463
AA3	*0.786*	0.475	0.173	0.298	0.374	0.217
AA4	*0.812*	0.474	0.053	0.414	0.375	0.369
AA5	*0.734*	0.466	0.127	0.198	0.262	0.333
DC1	0.387	*0.773*	0.358	0.142	0.183	0.163
DC2	0.305	*0.528*	0.287	0.112	0.188	0.154
DC3	0.427	*0.727*	0.280	0.211	0.179	0.118
DC4	0.498	*0.831*	0.313	0.229	0.271	0.246
DC5	0.530	*0.742*	0.180	0.232	0.320	0.334
IP1	0.095	0.341	*0.850*	-0.046	0.006	0.021
IP2	0.162	0.304	*0.811*	-0.042	0.128	0.150
IP3	0.033	0.281	*0.743*	-0.192	0.065	0.064
IP4	0.164	0.209	*0.555*	-0.050	0.003	-0.007
IP5	0.020	0.194	*0.646*	-0.086	0.093	0.043
IP6	0.127	0.293	*0.631*	-0.083	0.069	0.020
KV1	0.293	0.124	-0.142	*0.759*	0.507	0.489
KV2	0.427	0.241	-0.070	*0.853*	0.432	0.384
KV3	0.392	0.266	-0.120	*0.899*	0.528	0.515
KV4	0.417	0.230	-0.063	*0.842*	0.484	0.424
MS1	0.429	0.252	0.027	0.521	*0.789*	0.654
MS2	0.351	0.189	0.112	0.444	*0.828*	0.618
MS3	0.388	0.294	0.170	0.459	*0.789*	0.611
MS4	0.367	0.214	0.022	0.407	*0.789*	0.644
MS5	0.387	0.263	0.042	0.492	*0.861*	0.670
MS6	0.308	0.289	0.065	0.321	*0.628*	0.424
MS7	0.304	0.218	0.008	0.438	*0.627*	0.490
RIM1	0.358	0.217	0.106	0.436	0.695	*0.907*
RIM2	0.460	0.274	0.077	0.470	0.693	*0.908*
RIM3	0.431	0.283	0.018	0.564	0.742	*0.925*

4.2. Structural Model Assessment

4.2.1. Multi-Collinearity Statistics and Explanatory Assessment

Multi-collinearity test was used to assess which research structures interacted with each other, by calculating the value of VIF. When VIF was not greater than 5, it indicated there was no multi-collinearity (Khan et al., 2019). According to Table 2, the results proved that the model in this study had no multi-collinearity (all VIF values < 5). Next, PLS-SEM examined the path between the research concepts proposed in the model through R^2 (determination coefficient). The R^2 described the level of bias in potential endogenous construct variable; which consisted of strong (at 0.67), medium (at 0.33), and weak (at 0.19) level (Hair Jr et al., 2016). On the other hand, a previous study suggested that R2 value more than 0.10 was still acceptable and available for continuing to research concept analysis (Nicolas et al., 2020). From Table 2, it recognized that all R^2 values were more than 0.10 and path coefficients were allowed to be used for evaluating the effects of research concepts.

4.2.2. Model Fit and Hypothesis Testing

PLS-SEM used such as standardized root mean square residual (SRMR) to approximate model fit indices. SRMR was defined as goodness of fit measure that can be used to prevent model misspecification and should be valued at 0.08 or less (Nicolas et al., 2020). The SRMR value of current model was at 0.075, and confirmed a strong overall model fit. From Table 6 and Figure 2, the hypothesis testing showed that not all paths of relationships had significant value. There were several hypothesis that remarked as significant (T-Value > 1.96), such as : H1, H2, H4, H5, H6. However, H5 had a positif relationship which different from the proposed hypothesis . There were two insignificant paths : H3 and H7. All the tested hypothesis were using confidence level at 95% ($p < 0.05$).

Results from Table 6 was supported by Table 7 to explain indirect relationship between variables. Managerial support had an indirect relationship to innovation process through resource/infrastructure management, knowledge vacuum, absorptive and adaptive capability, and distinctive competencies. On the other hand, resource/infrastructure management could not have an indirect

Table 6. Results of Path Analysis

Effects on endogenous variable	Direct Effects	T-Value	Remarks
Effects on RIM			
H1. Managerial Supports	0.778	16.942	Supported
Effects on KV			
H2. Resource & Infrastructure Management	0.539	9.394	Supported
Effects on DC			
H3. Knowledge Vacuum	-0.017	0.223	Not supported
H4. Absorptive & Adaptive Capabilities	0.605	9.439	Supported
Effects on AA			
H5. Knowledge Vacuum	0.457	6.664	Supported
Effects on IP			
H6. Distinctive Competencies	0.476	5.036	Supported
H7. Absorptive & Adaptive Capabilites	-0.149	1.315	Not supported

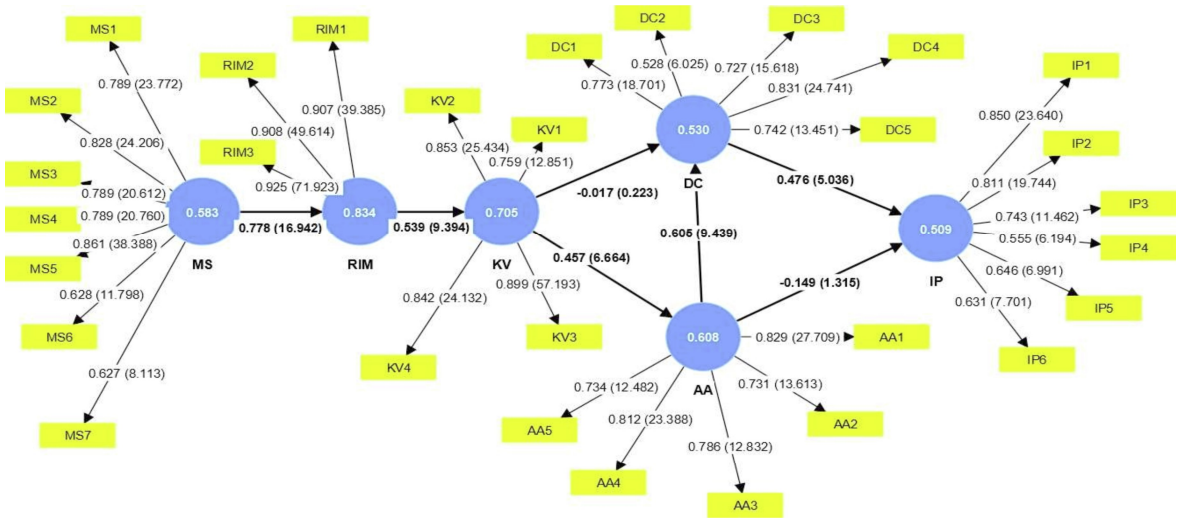

Figure 2. Structural Model Result

effect to innovation process through the path of knowledge vacuum and distinctive competencies. In addition, knowledge vacuum had no direct positive significant relationship to distinctive competencies. Adaptive and absorptive capabilities could affect innovation process through distinctive competencies, but these capabilities did not have a direct impact to innovation process.

4.2.3. Importance-Performance Map Analysis (IPMA)

This research implied IPMA to elaborate the outputs of PLS path modelling by considering the level of performance for each individual variable. IPMA depicted importance dimension on the x-axis from path's total effect, and performance

Table 7. Specific Indirect Effects

Indirect Relationship	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
KV -> AA -> IP	-0.068	-0.074	0.056	1.218*	0.223
RIM -> KV -> AA -> DC	0.149	0.153	0.032	4.598+	0.000
MS -> RIM -> KV -> AA -> DC	0.116	0.120	0.027	4.278+	0.000
KV -> AA -> DC -> IP	0.132	0.141	0.038	3.422+	0.001
RIM -> KV -> DC -> IP	-0.004	-0.006	0.021	0.205*	0.837
RIM -> KV -> DC	-0.009	-0.010	0.042	0.220*	0.826
RIM -> KV -> AA	0.246	0.250	0.047	5.256+	0.000
KV -> DC -> IP	-0.008	-0.011	0.039	0.208*	0.835
MS -> RIM -> KV -> AA -> IP	-0.029	-0.031	0.024	1.178*	0.239
MS -> RIM -> KV -> AA	0.192	0.196	0.040	4.752+	0.000
MS -> RIM -> KV -> DC	-0.007	-0.008	0.033	0.218*	0.827
AA -> DC -> IP	0.288	0.306	0.069	4.170+	0.000
KV -> AA -> DC	0.276	0.283	0.051	5.450+	0.000
RIM -> KV -> AA -> DC -> IP	0.071	0.077	0.023	3.090+	0.002
RIM -> KV -> AA -> IP	-0.037	-0.040	0.031	1.197*	0.231
MS -> RIM -> KV	0.420	0.425	0.057	7.414+	0.000
MS -> RIM -> KV -> AA -> DC -> IP	0.055	0.060	0.019	2.974+	0.003
MS -> RIM -> KV -> DC -> IP	-0.003	-0.005	0.017	0.204*	0.839

*) not significant ($p > 0.05$); +) significant ($p < 0.05$)

dimension on the y-axis from averages values of variable score. From strategical point of view, IPMA helped to underline and differentiate main determinant which affect innovation process (Ali, 2021). By identifying IPMA from Figure 3, distinctive competencies had the highest performance value in affecting innovation process. In addition, distinctive competencies defined as the highest importance in explaining innovation process and followed by absorptive and adaptive capabilities, knowledge vacuum, resources and infrastructures management, and finally managerial support. This findings showed that a unit increase in the performance of distinctive competencies was expected to gain the level of process innovation by the 0.48-value of the total effect.

5. DISCUSSION AND CONCLUSION

The research on innovation and organizational merger is still progressing. The contribution of current study is adding empirical evidence about innovation process in research-and- development-based organization which recently merged. This study has research objective of understanding how individual factors (such as AA, DC, and KV) and organizational factors (such as MS and RIM) affect the process of innovation in a merged organization. By adding the analysis of knowledge vacuum in the proposed research model, this study has contributed to fill the theoretical gaps in innovation studies. Furthermore, the results of this study confirm that innovation process during merger is supported by distinctive competencies that indirectly affected by managerial supported and resources and infrastructures management. In addition, unique finding of this research shows that knowledge vacuum is intended to be made in current case of organizational merger, and surprisingly this knowledge vacuum has a direct positive influence to absorptive and adaptive capabilities. This finding is

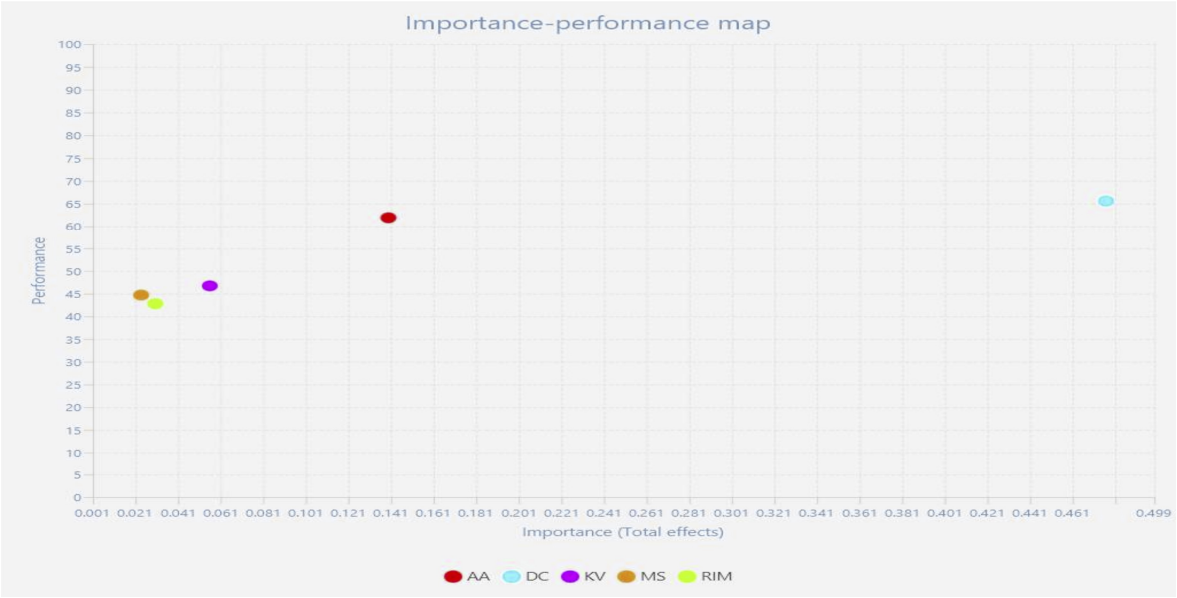

Figure 3. Importance-Performance Map Analysis for Navigating Innovation Process During Merger

completely different from previous researches which explained that knowledge inertia or vacuum had a negative influence to innovation performance (Wensley & Navarro, 2015). According to past studies, knowledge vacuum affected innovation circumstances negatively. Knowledge vacuum mostly posed as a moderating variable which caused by a pro-innovation bias condition (Choi & Chandler, 2020; Wensley & Navarro, 2015). In this research, knowledge vacuum was identified as a booster to enhance absorptive and adaptive capabilities. In details, management is using unsettled condition and rigid yearly innovation outputs to form a positive knowledge vacuum that impact to the innovation actor's capabilities of adapting and adopting in the case of National Research and Innovation Agency (BRIN). An innovation actor can be considered as a high achiever individual, and will do the best to fulfill innovation targets either in settle or unsettled condition. Moreover, innovation actors are entitled as civil servant innovators, could be have only one choice which is to stay in BRIN and have to achieve mandatory yearly outputs. Distinctive competencies are confirmed as a crucial factor to reinforce innovation process in a merged public research organization. Along with goals of gaining worldwide image, distinctive competencies through writing national and international scientific articles and also having logical-critical thinking are quite necessary since these two indicators have loading factor of 0.831 and 0.773 consecutively. These facts are supported by previous researches which showed that distinctive competencies improved product and service innovation process in several commercial companies (Fernandez et al., 2018). Several contributions have been made by this study to contribute to the literature. First, this study enrich innovation process insight by using the first phenomena of merger public research organization in Indonesia. Result analysis of the research model involves knowledge vacuum and shows that knowledge vacuum can influence positively to absorptive and adaptive capabilities. Second, this study implies further support that managerial support and resource/infrastructure management may intended to shape knowledge vacuum in order to build strong absorptive and adaptive capabilites to form prominent distinctive competencies. Third, this study confirms that knowledge vacuum can be treated as intervening variable rather than moderating variable, which opposes the result of a previous research of Ririh et al. (2023).

This research highlights new direction in maintaining innovation process during merger public research organization. Secure managerial support should be made in-terms of making proper resources and infrastructures management decision. Furthermore, the existing of knowledge vacuum is tolerable and beneficial if management support can direct dynamic environment during merger. The knowledge vacuum can be seen as antecedent of well navigation of innovation process. To support strong distinctive competencies, several training programs that enhance absorptive and adaptive capabilities should be done especially for progam that provide facilities to update relevant research knowledge and technologies. Other similar programs also need to focus on helping innovation actors to adjust themselves to new environment during transition with less anxiety, so that innovation process is running well. There are several limitations of this study. First, this study was conducted in National Research

and Innovation Agency-as the first public research organizations that merging. Therefore, future studies should conduct comparative research to similar phenomena in other countries. Second, this study is using scaled-questionnaires survey which need to be deep explored by adding focus group discussions and dynamic systems. Third, further study may adopt longitudinal timeline and involve external stakeholders.

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References

Aagaard, K., Hansen, H.F., & Rasmussen, J.G. (2016). Mergers between governmental research

institutes and Universities in the Danish HE sector. European Journal of Higher Education, 6 (1), 41–55.

Agolla, J.E., & Van Lill, J.B. (2017). Insights into Kenya's public sector innovation: The case of managers. International Journal of Innovation Science, 9 (3), 225–243.

Ali, M. (2021). Imitation or innovation: To what extent do exploitative learning and exploratory learning foster imitation strategy and innovation strategy for sustained competitive advantage? Technological Forecasting and Social Change, 165, 120527.

Arias-Pérez, J., Velez-Ocampo, J., & Cepeda-Cardona, J. (2021). Strategic orientation toward digitalization to improve innovation capability: why knowledge acquisition and exploitation through external embeddedness matter. Journal of Knowledge Management, 25(5), 1319–1335.

Bai, T., & Liesch, P. (2022). Organizational goals and resource allocation to overseas foreign direct investment. Journal of World Business, 57 (3), 101308.

Bashir, M., Alfalih, A., & Pradhan, S. (2023). Managerial ties, business model innovation & SME performance: Moderating role of environmental turbulence. Journal of Innovation & Knowledge, 8 (1), 100329.

Bennato, A.R., Davies, S., Mariuzzo, F., & Ormosi, P. (2021). Mergers and innovation: Evidence from the hard disk drive market. International Journal of Industrial Organization, 77, 102755.

Berkhout, A. J., Hartmann, D., Van Der Duin, P., & Ortt, R. (2006). Innovating the innovation process. International Journal of Technology Management, 34 (3–4), 390–404.

Bouguerra, A., Mellahi, K., Glaister, K., Sadeghi, A., Temouri, Y., & Tatoglu, E. (2022). Absorptive capacity and organizational performance in an emerging market context: Evidence from the banking industry in Turkey. Journal of Business Research, 139, 1575–1587.

Chapman, G., Lucena, A., & Afcha, S. (2018). R&D subsidies & external collaborative breadth: Differential gains and the role of collaboration experience. Research Policy, 47 (3), 623–636.

Cheah, S.L.Y., & Ho, Y.P. (2021). Commercialization performance of outbound open innovation projects in public research organizations: The roles of innovation potential and organizational

УТИЦАЈ ВАКУУМА ЗНАЊА НА ИНОВАЦИОНИ ПРОЦЕС ТОКОМ СПАЈАЊА ОРГАНИЗАЦИЈА ЗА ЈАВНО ИСТРАЖИВАЊЕ

Kirana Rukmayuninda Ririh, Elisa Anggraeni, Machfud, Nurul Taufiqu Rochman

Извод

Одржавање иновационог процеса током спајања у спојену јавну истраживачку организацију је приличан изазов. Вакуум знања је потенцијално растући проблем због спајања. Ова студија има за циљ да испита вакуум знања као интервентну улогу између организационих фактора и индивидуалног фактора, а такође и како утиче на процес иновације. PLS-SEM је примењен коришћењем софтвера SmartPLS 4.0, а 198 иновационих актера је учествовало у анкетирању. Изненађујуће, резултати показују да вакуум знања позитивно и значајно утиче на способност апсорпције и прилагођавања да се формирају дистинктивне компетенције. То показује да ће недостајући токови знања међу актерима високих перформанси, као што су иноватори, побољшати компетенције током хаотичног догађаја због спајања. Поред тога, карактеристичне компетенције имају значајан позитиван утицај на иновациони процес. Са друге стране, вакуум знања нема директну везу са карактеристичним компетенцијама. Управљање ресурсима и инфраструктуром доприноси позитивном формирању вакума знања током спајања како би се створила снажна апсорпциона и адаптивна способност и криве истакнутих дистинктивних компетенција, које ће на крају позитивно утицати на процес иновације.

Кључне речи: вакуум знања, иновациони процес, менаџерска подршка, удружена организација заснована на истраживању, моделовање структурне једначине

capabilities. Industrial Marketing Management, 94, 229–241.

Choi, T., & Chandler, S. M. (2020). Knowledge vacuum: An organizational learning dynamic of how e-government innovations fail. Government Information Quarterly, 37 (1), 101416.

Duan, Y., Deng, Z., Liu, H., Yang, M., Liu, M., & Wang, X. (2022). Exploring the mediating effect of managerial ability on knowledge diversity and innovation performance in reverse cross-border M&As: Evidence from Chinese manufacturing corporations. International Journal of Production Economics, 247, 108434.

Engelsberger, A., Bartram, T., Cavanagh, J., Halvorsen, B., & Bogers, M. (2023). The role of collaborative human resource management in supporting open innovation: A multi-level model. Human Resource Management Review, 33 (2), 100942.

Fernandez, A.I., Lara, P.R., Ugalde, M.C., & Sisodia, G.S. (2018). Distinctive competencies and competency-based management in regulated sectors: A methodological proposal applied to the pharmaceutical retail sector in Spain. Journal of Retailing and Consumer Services, 42, 29–36.

Hair Jr, J.F., Hult, G.T.M., Ringle, C., & Sarstedt, M. (2016). A primer on partial least squares structural equation modeling (PLS-SEM). SAGE Publications.

Haneda, S., & Ito, K. (2018). Organizational and human resource management and innovation: Which

management practices are linked to product and/or process innovation? Research Policy, 47 (1), 194–208.

Haucap, J., Rasch, A., & Stiebale, J. (2019). How mergers affect innovation: Theory and evidence.

International Journal of Industrial Organization, 63, 283–325.

Heller-Schuh, B., Lepori, B., & Neuländtner, M. (2020). Mergers and acquisitions in the public research sector. Toward a comprehensive typology. Research Evaluation, 29 (4), 366–376.

Hulke, C., & Revilla Diez, J. (2020). Building adaptive capacity to external risks through collective action – Social learning mechanisms of smallholders in rural Vietnam. International Journal of Disaster Risk Reduction, 51, 101829.

Isip, M.I.G. (2022). Adaptive capability of micro agribusiness firms: Qualitative evidence from the Philippines. Research in Globalization, 5, 100087.

Kafouros, M., Love, J.H., Ganotakis, P., & Konara, P. (2020). Experience in R&D collaborations, innovative performance and the moderating effect of different dimensions of absorptive capacity. Technological Forecasting and Social Change, 150, 119757.

Kang, Y., & Liu, R. (2021). Does the merger of universities promote their scientific research performance? Evidence from China. Research Policy, 50 (1), 104098.

Khan, A., & Tao, M. (2022). Knowledge absorption capacity's efficacy to enhance innovation performance through big data analytics and digital platform capability. Journal of Innovation and Knowledge, 7 (3), 100201.

Khan, G.F., Sarstedt, M., Shiau, W.L., Hair, J.F., Ringle, C.M., & Fritze, M.P. (2019). Methodological research on partial least squares structural equation modeling (PLS-SEM): An analysis based on social network approaches. Internet Research, 29 (3), 407–429.

Li, Y., Mbanyele, W., & Sun, J. (2022). Managerial R&D hands-on experience, state ownership, and corporate innovation. China Economic Review, 72, 101766.

Manning, L., Morris, W., & Birchmore, I. (2021). Organisational forgetting: The food safety risk associated with unintentional knowledge loss. Trends in Food Science and Technology, 118 (Part A), 242–251.

Martínez-Sánchez, A., Vicente-Oliva, S., & Pérez-Pérez, M. (2020). The relationship between R&D, the absorptive capacity of knowledge, human resource flexibility and innovation: Mediator effects on industrial firms. Journal of Business Research, 118, 431–440.

Mukherjee, A. (2022). Merger and process innovation. Economics Letters, 213, 110366.

Nicolas, C., Kim, J., & Chi, S. (2020). Quantifying the dynamic effects of smart city development enablers using structural equation modeling. Sustainable Cities and Society, 53, 101916.

Palacios-Marqués, D., García, M.G., Sánchez, M.M., & Mari, M.P.A. (2019). Social entrepreneurship and organizational performance: A study of the mediating role of distinctive competencies in marketing. Journal of Business Research, 101, 426–432.

Piwowar-Sulej, K. (2022). Environmental strategies and human resource development consistency: Research in the manufacturing industry. Journal of Cleaner Production, 330, 129538.

Ririh, K.R., Anggraeni, E., Machfud, M., & Rochman, N.T. (2023). Distinctive Competencies and Process of Innovation During Organizationals Merger: The Moderating Effect of Knowledge Vacuum.

STI Policy and Management Journal, 8 (1), 43-57.

Salehi, V., & Veitch, B. (2020). Measuring and analyzing adaptive capacity at management levels of resilient systems. Journal of Loss Prevention in the Process Industries, 63, 104001.

Selviaridis, K. (2021). Effects of public procurement of R&D on the innovation process: evidence from the UK small business research initiative. Journal of Public Procurement, 21 (3), 229–259.

Singh, S., Dhir, S., Gupta, A., Das, V.M., & Sharma, A. (2021). Antecedents of innovation implementation: a review of literature with meta-analysis. Foresight, 23 (3), 273–298.

Stipp, D.M., Pimenta, M.L., & Jugend, D. (2018). Innovation and cross-functional teams: Analysis of innovative initiatives in a Brazilian public organization. Team Performance Management, 24(1– 2), 84–105.

Symeonidou, N., Leiponen, A., Autio, E., & Bruneel, J. (2022). The origins of capabilities: Resource allocation strategies, capability development, and the performance of new firms. Journal of Business Venturing, 37 (4), 106208.

Tseng, M.L., Bui, T.D., & Lim, M.K. (2021). Resource utilization model for sustainable solid waste management in Vietnam: A crisis response hierarchical structure. Resources, Conservation and Recycling, 171, 105632.

Uhm, C.H., Sung, C.S., & Park, J. Y. (2018). Understanding the accelerator from resources-based perspective. Asia Pacific Journal of Innovation and Entrepreneurship, 12 (3), 258-278.

van Assche, K., Valentinov, V., & Verschraegen, G. (2021). Adaptive governance learning from what organizations do and managing the role they play. Kybernetes. 51 (5), 1738-1758.

Wensley, A.K.P., & Navarro, J.G.C. (2015). Overcoming knowledge loss through the utilization of an unlearning context. Journal of Business Research, 68 (7), 1563–1569.

Xiong, X., Yang, G. liang, Zhou, D. qun, & Wang, Z. long. (2022). How to allocate multi-period research resources? Centralized resource allocation for public universities in China using a parallel DEA-based approach. Socio-Economic Planning Sciences, 82 (PB), 101317.

Zhang, W., Zhang, W., & Daim, T.U. (2023). The voluntary green behavior in green technology innovation: The dual effects of green human resource management system and leader green traits. Journal of Business Research, 165, 114049.

APPENDIX 1.

Variable	Definition	Items	Questions
Absorptive and adaptive capabilities	Capability to utilize available resources and to adjust to dynamic environment to conduct innovation process smoothly	AA1	During this organizational merger, I always update relevant knowledge and information that I need to support research and development in the innovation process that I conduct
		AA2	During this organizational merger, I always utilize facilities and infrastructures optimally to support my innovation activities
		AA3	During this organizational merger, I usually define strategic steps before and after conducting innovation activities to achieve innovation usefulness
		AA4	In this organizational merger, I easily can adjust myself to this new environment to maintain innovation process running well
		AA5	During this organizational merger, I always learn new knowledge and technology to support my research and development activities
Distinctive Competencies	Ultimate or unique abilities of innovation actors that support the development of research-and-development-based organizational performance itself	DC1	I can produce scientific article(s) that has/have national and/or international reputation, during this organizational merger
		DC2	I am able to create prototype(s) and/or policy brief(s) from research development activities, during this organizational merger
		DC3	I am able to obtain and conduct external joint researches both nationally and/or globally, during this organizational merger
		DC4	I am able to think logically and critically in the process of innovation I involved, during this organizational merger
		DC5	I keep on updating social and technological knowledges, during this organizational merger
Innovation Process	A sequence of process in innovation that start from forming conceptual ideas until converting into valuable outputs that have intellectual properties	IP1	I am competent to identify problem issues and generate fundamental concepts to produce prominent innovation
		IP2	I am capable of defining detailed steps of innovation and executing them to generate innovation output(s)
		IP3	I am able to convert conceptual model into product prototype(s) and/or policy brief(s)
		IP4	I am an open-minded person to willingly accept suggestions and critics related to the innovation I made
		IP5	I improve policy brief(s) and/or prototype(s) based on feedback(s)
		IP6	I disseminate and/or commercialize my innovation output(s)
Knowledge Vacuum	Distraction of organizational learning capabilities due to structural and behavioral inertia in a merged organization	KV1	I feel business process and/or personnel losses during this organizational merger
		KV2	I feel less motivated to perform innovation in this merger situation
		KV3	I think there is a knowledge loss or emptiness due to business process and/or personnel change during this organizational merger
		KV4	I think there is a possibility that can cause inconvenient environment to learn new and advanced knowledge during this organizational merger
Managerial Support	Support from managerial board to decide strategic actions for each entities that involved in innovation process to enhance innovation stimulus optimally	MS1	Currently, I think board of management has given support to innovation actors to enhance innovation knowledge (such as workshops)
		MS2	Currently, I think board of management has created well-structured learning cultures and knowledge management systems, and also can be accessed by all innovation actors
		MS3	Currently, I think board of management has created well-structured learning cultures and equal opportunities to all innovation actors to upgrade knowledges
		MS4	Currently, in my opinion, the board of management has decided impartial policies through a careful deliberation and thus it makes me believe that existing and prospected policies will support my innovation process activities
		MS5	In my mind, the board of management has committed to well regulated budgets-facilities-and policies of innovation to maintain innovation process runs smoothly for short-medium-long term innovation goals
		MS6	I believe that currently board of management already provide a platform for external collaboration
		MS7	In my opinion, currently the board of management has provided good and fairly-distributed facilities and infrastructures (such as laboratory, meeting rooms, computers, etc.) to support innovation process activities
Resource & Infrastructure Management	Managerial commitment to be responsible for entire innovation process, specifically to distribute equally resources and infrastructures, with proper priority and non-problematic to conduct and achieve targeted innovation outputs	RIM1	The board of management has been allocated resources and infrastructures fairly and consistently, based on (mutual) agreements
		RIM2	The board of management has been committing to fulfill the mutual commitment and established regulation in terms of distributing and utilizing resources and infrastructures
		RIM3	Currently, the board of management has been arranged the resources and infrastructures in a good and fair way to support innovation process