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KNOWLEDGE MANAGEMENT INFRASTRUCTURE ON ORGANIZATIONAL PERFORMANCE IN INDONESIAN SCIENCE INSTITUTIONS (LIPI): MEDIATION EFFECTS OF KNOWLEDGE MANAGEMENT PROCESS

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Abstract: As a research institution, the Indonesian Institute of Sciences (LIPI) plays a crucial role in driving innovation and leveraging knowledge to improve people's welfare and the nation's competitiveness. This study analyzes the impact of knowledge management on the performance of science and technology correctional-based organizations at LIPI. This study aims to determine the relationship between knowledge management, including knowledge management infrastructure and processes, and organizational performance. The sample used in this study were employees responsible for the dissemination of science and technology in five service work units at LIPI, with a total of 115 respondents. The analytical method utilized in this study is a quantitative method using SEM PLS. The results of this study demonstrates that: (1) There is a significantly positive relationship between knowledge management infrastructure and knowledge management process; (2) There is a significantly positive effect in the relationship between knowledge management infrastructure and organizational performance; (3) There is a positive and significant relationship between knowledge management process and organizational performance; and (4) The knowledge management process mediates the relationship between knowledge management infrastructure and organizational performance. The results indicated that the science and technology correctional service-based work unit at LIPI have implemented knowledge management practices well in terms of infrastructure and processes. However, there is still room for improvement in certain areas.

Keywords: knowledge management process, knowledge management infrastructure, organizational performance, research institution, sem pls

Abstrak: *Sebagai lembaga penelitian, Lembaga Ilmu Pengetahuan Indonesia (LIPI) sangat vital dalam memberikan inovasi dan pemanfaatan ilmu pengetahuan untuk meningkatkan kesejahteraan masyarakat dan daya saing bangsa. Penelitian ini menganalisis pengaruh knowledge management terhadap kinerja lembaga pemasyarakatan berbasis iptek di LIPI. Penelitian ini bertujuan untuk mengetahui hubungan antara manajemen pengetahuan, termasuk infrastruktur dan proses manajemen pengetahuan, dan kinerja organisasi. Sampel yang digunakan dalam penelitian ini adalah pegawai dengan tugas dan fungsi terkait sosialisasi IPTEK di lima unit kerja pelayanan LIPI dengan jumlah sampel 115 responden. Metode analisis yang digunakan dalam penelitian ini adalah metode kuantitatif dengan SEM PLS. Hasil penelitian ini membuktikan bahwa: (1) Terdapat hubungan positif yang signifikan antara infrastruktur manajemen pengetahuan dan proses manajemen pengetahuan; (2) Terdapat pengaruh positif yang signifikan dalam hubungan antara infrastruktur manajemen pengetahuan dan kinerja organisasi; (3) Terdapat hubungan positif dan signifikan antara proses manajemen pengetahuan dan kinerja organisasi; dan (4) Proses manajemen pengetahuan memediasi hubungan antara infrastruktur manajemen pengetahuan dan kinerja organisasi. Hasil analisis menyatakan bahwa satuan kerja berbasis layanan pemasyarakatan iptek di LIPI telah menerapkan manajemen pengetahuan dari infrastruktur dan proses dengan baik, namun untuk beberapa bagian masih perlu ditingkatkan.*

Kata kunci: *infrastruktur manajemen pengetahuan, kinerja organisasi, lembaga riset, proses manajemen pengetahuan, sem pls*

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INTRODUCTION

Research institutes as innovation pioneers (Endagamage and Dahanayake, 2020) function to provide technology and utilize knowledge to conduct research and produce information in the form of research results and play a significant role in knowledge sharing with the community and stakeholders in order to increase knowledge and the community's economy (Yuriawan et al. 2021). Indonesian Institute of Sciences (LIPI), as a research institution, since 1968, has adopted a strategy by taking an essential role in the science and technology community in various scientific fields that are more varied than other research institutions, namely earth, biological, social, and humanitarian engineering, and scientific services. The potential of human resources, both science and technology human resources and science and technology management, is the largest among other research organizations and work units spread across various regions in Indonesia to support LIPI to produce many research innovation products and disseminate them to the public with a broader scope. The socialization process of LIPI science and technology results is managed and implemented by several service and technical implementation work units, including the Bureau of Cooperation, Law and Public Relations (BKHH), Center for Data and Information Documentation (PDDI), Center for Media and Reproduction (BMR)/LIPI Press, Center for Utilization and Innovation of Science and Technology (PPII) and Center for Education and Training Development (Pusbindiklat).

In the correctional process or dissemination of science and technology and research results, knowledge management is needed so that the flow of knowledge from knowledge owners in research institutions related to their science and technology innovations can be properly conveyed to the public or related stakeholders. In addition, knowledge from service unit employees who act as knowledge communicators also needs to be managed in order to support the organization in formulating strategies, improving processes, and increasing innovation in knowledge sharing or disseminating science and technology and research results to the public as part of organizational performance (Setiawan, 2010).

One of the crucial things about knowledge sharing is the existence of a knowledge flow process within the organization, both tacit knowledge (individual knowledge) and explicit knowledge (organizational knowledge) (Setiawan, 2010). Before implementing knowledge management, the flow of knowledge in research institutions tended to only depend on communication between individuals or particular groups (Puryantini et al. 2017). This flow makes it very risky to interrupt the knowledge-sharing process, so it is not conveyed and is well documented and difficult to share. In addition, the work culture factor for sharing knowledge is crucial in the flow of knowledge from individual to organizational knowledge (Setiawan, 2010). This problem is one of the reasons for the importance of managing and documenting knowledge so that it can be used together in research institutions as competitive and innovative assets, one of which is by implementing knowledge management.

LIPI (2020) has implemented knowledge management in socializing the results of its research to ensure the flow of knowledge from the organization can reach the community properly. The implementation is carried out both internally and externally by LIPI. Knowledge management is implemented in the internal work unit of LIPI services, among others, by conducting regular competency improvement webinars, focus group discussions between researchers as knowledge owners and the work unit community, internal sharing sessions among employees related to their knowledge, sharing of data and information on activities as well as guidelines. They are carried out through the cloud so that they can be accessed by all related civitas, business meetings, and technical guidance. External application of LIPI is carried out by building an information system and website related to research results, such as the ISJD e-journal (Indonesian Scientific Journal Database), e-library, and research data repository using RIN (National Scientific Repository), the use of social media as a means of publication. Research results (Facebook, Instagram, Twitter, and Youtube), book publishing, bulletins, book reviews, webinars, focus group discussions, and training for the community from academics, tenants, UMKM, students, and the general public.

The ideal concept is that the implementation of knowledge management will have a positive and significant impact on organizational performance. As a result, the flow of information and knowledge becomes more integrated and not fragmented with the help of technology. This organizational structure supports and underlies knowledge management and

work culture to share knowledge to improve learning and implementation of knowledge for employees to provide innovative and quality science and technology correctional services. These results can be seen from the evaluation of the Ministry of State Apparatus Empowerment and Bureaucratic Reform in 2018 for the Public Service Quality Improvement Program at LIPI, which increased from 3.83 in 2017 to 3.87 in 2019 4.12.

By the end of 2020, 36 LIPI innovations had been achieved from four deputies that various parties had utilized. In addition, from the target of 75 innovation products produced by PPII fostered tenants at Cibinong Science and Technology Park (C-STP) LIPI, 71 innovation products were produced by 49 Technology-Based Startups (PPBT) consisting of 15 startups and 34 UKM.

In terms of fostering the younger generation, LIPI organizes two scientific competitions aimed at the younger generation of Indonesia, namely the Youth Scientific Work Competition (LKIR) and the National Young Inventors Award (NYIA). In 2020, the scientific competition organizing committee accepted 1693 research proposals from all over Indonesia. LIPI also receives visits from service users/community in the context of socializing science and technology, exchanging data and information, utilizing facilities and infrastructure at LIPI research centers, and organizing exhibitions and web seminars or webinars. In 2020, there were 2817 visits and participation in science and technology socialization activities held by LIPI.

However, in its implementation, knowledge management carried out at LIPI still has several obstacles, especially in internal organization implementation. First, the process of transferring knowledge between employees related to the implementation of work in socializing science and technology is often only individual or person-to-person. The time for sharing sessions is still limited and not going well in some parts because there is still resistance to sharing knowledge, and the knowledge acquisition process is not yet complete. Second, well-documented knowledge documentation can be shared anytime implements KM less than optimal. In addition, judging from the perceived value of service quality felt by service users in the Details of the Evaluation of the LIPI RB Implementation Evaluation for 2016-2020, the assessment results are still unstable and have decreased. This finding underlines the need to improve innovation and quality of service performance in work units that provide public services, as well as mechanisms for operational control of their internal performance.

Another condition that encourages the importance of implementing knowledge management at LIPI is the condition of LIPI, which has been integrated into the National Research and Innovation Agency (BRIN). The current transition period certainly has many obstacles related to knowledge management from each previous research institution or body into an integrated whole. This process needs the role of knowledge management so that any organizational knowledge is. Whether the results of research that have been carried out or those that are still in process. It can be well documented and provide easy access to searches so that there is no overlapping and repeated research can occur in the research process, burden the budget

On the other hand, Yuriawan (2021) stated that the problem of the process of socializing the results of research and innovation is still an obstacle for the world of research and development in Indonesia to date, so research seems to have stopped at this stage of invention and publication in scientific journals or in scientific forums that can only be carried out. Only accessible to specific groups. This problem causes research results from research institutions to seem exclusive and not reach the wider community. The implementation of knowledge management, especially the knowledge management system, of course, requires a significant investment, so from some of the obstacles faced, it is necessary to measure it so that it can be seen how far the significance level of the implementation of knowledge management has on organizational performance at LIPI, in this case on performance in socializing science and technology. This implementation is critical to ensure that the implementation of knowledge management supports the organization's goals and provides significant impacts and benefits that lead to better results so that it can be considered in its sustainability plan.

This research has interesting novelties to study. This study analyzes how knowledge management is implemented on organizational performance based on the dissemination of science and technology research results of LIPI as a research institution and analyzes the elements of knowledge management influence, both in terms of infrastructure and processes on the

performance of science and technology correctional-based organizations, namely in carrying out work to popularize knowledge and technology owned by LIPI so that it is known and becomes part of the community where it becomes part of the organization's performance in the service sector. This research is included in the strategic decision hierarchy in research institutions because the implementation of knowledge management needs special attention at both the manager and leadership levels so that it can be used as organizational knowledge capital, and the results can have implications for managerial decisions.

In previous research, Knowledge Management (KM) has been shown to increase the utilization of knowledge and as an asset that is an essential factor in the success of an organization's digital transformation and as a driving factor for renewal in workflows (Alvarenga et al. 2020). In addition, several other studies have shown that the implementation of knowledge management in organizations can have a positive and significant impact on improving organizational performance (Farid and Aryani, 2016; Imran et al. 2017; Qasrawi et al. 2017; Sunardi, 2017; Afqarina and Dihan, 2019; Iqbal et al. 2019; Meher and Mishra, 2019; Payal et al. 2019; Susanty et al. 2019; Balasubramanian et al. 2020; Obeso et al. 2020; Sahibzada et al. 2020; Rezaei et al. 2021). Knowledge management can also facilitate employee learning (Shaddiqa et al. 2013). Employees can interact and have a dialogue to allow for the process of creating, capturing, and exchanging new knowledge that is useful for the organization in improving performance.

From this interaction, there will be a knowledge management process where knowledge is created, captured, acquired, and converted to become more beneficial for the organization. Then the knowledge is applied in the process of completing work to support the achievement of maximum performance results. Studies found that the knowledge creation capability of an organization fully mediates the relationship between intra-organizational knowledge sharing potential and the amount of innovation in an organization as a share of performance outcomes. The innovation process can be modeled as the result of knowledge processes in organizations considering the close relationship between innovation and knowledge (Smith et al. 2005; Andreeva and Kianto, 2011; Susanto et al. 2021; Wicaksana and Hanifah, 2022).

The knowledge process can be critical in achieving long-term innovation through external knowledge acquisition and internal knowledge sharing to increase company innovation (Alvarenga et al. 2020). This knowledge management process needs the support of technology, organizational structure, and works culture as an enabler or infrastructure of knowledge management to run well (Gold et al. 2001). In addition, the knowledge management process can mediate between the factors in the knowledge management infrastructure (namely collaboration, learning culture, and IT support) with creativity and organizational learning that improve organizational performance because organizational performance depends on the extent to which knowledge process capabilities improve organizational learning (Lee et al. 2012; Payal et al. 2019). The objective of this study is to analyze implementation and effect of knowledge management in LIPI as a research based institution's organizational performance.

METHODS

This study is conducted at the Indonesian Institute of Sciences (LIPI), which includes five service work units, namely the Bureau of Cooperation, Law and Public Relations (BKHH), Center for Data and Information Documentation (PDDI), Center for Media and Reports (BMR)/LIPI. Press, PPII and Pusbindiklat LIPI. The time starts in January – April 2022. This study uses a quantitative approach with primary and secondary data types. The primary data obtained were through interviews and questionnaires, while secondary data was obtained from the LIPI website and research from previous scientific journals. The number of samples taken is 115 people, whose population is LIPI employees consisting of staff in the duties and functions of the science and technology correctional at the Bureau of Cooperation, Law and Public Relations (BKHH), Center for Data and Information Documentation (PDDI), LIPI Press, PPII, Pusbindiklat LIPI. The sampling technique used is non-probably sampling with an incidental/convenience sampling approach. The convenience sampling technique is used because, in this technique, sampling is done based on gathering information from members of the population that is easily obtained and can provide that information (Creswell, 2005).

The first analysis used in this research is descriptive analysis, which is used to identify the implementation of knowledge management in five LIPI work units. Descriptive analysis was carried out using an in-depth interview method with analytical procedures to test the validity of the data and data triangulation. Then the next test was to use the PLS-SEM method to analyze the influence of knowledge management on science and technology correctional performance based on three pillars of performance in the public sector: innovation, quality, and operations (Ghozali, 2008; Ghozali and Latan, 2015). The scale used refers to concepts from various theories and was developed by researchers. The research variables to be studied are listed in the table on Table 1.

Based on the conceptual model in Figure 1. explains that the knowledge management infrastructure aspect has a role as a supporting facilitator, both in terms of the technology used, a supportive organizational structure, and an organizational culture that has a shared attitude to share and manage knowledge, in the implementation of the knowledge management process in the organization and assist employees in achieving maximum performance. The knowledge management process also assists employees in completing work to achieve good performance in innovation, quality, and from an operational perspective directly or by mediating knowledge management infrastructure on organizational performance.

Hypotheses

H1 : KM Infrastructure has a significant effect on KM Process

H2 : KM Infrastructure has a significant effect on Organizational Performance

H3 : KM Process has a significant effect on Organizational Performance

H4 : KM Process mediates the relationship between KM Infrastructure and Organizational Performance

Table 1. Research variables and indicators

Variable	Indicator	Source	Scale
KM Infrastructure	Technology	(Gold et al. 2001; Imran et al. 2017; Sunardi, 2017; Iqbal et al. 2019; Payal et al. 2019; Endagamage dan Dahanayake, 2020; Rezaei et al. 2021)	Likert Scale (1-5)
	Structure	(Gold et al. 2001; Iqbal et al. 2019; Meher dan Mishra, 2019; Payal et al. 2019; Rezaei et al. 2021)	Likert Scale (1-5)
	Culture	(Gold et al. 2001; Imran et al. 2017; Iqbal et al. 2019; Meher dan Mishra, 2019; Payal et al. 2019; Rezaei et al. 2021; Setyawan, 2021)	Likert Scale (1-5)
KM Process	KM Acquisition	(Gold et al. 2001; Imran et al. 2017; Afqarina dan Dihan, 2019; Payal et al. 2019)	Likert Scale (1-5)
	KM Conversion	(Gold et al. 2001; Afqarina dan Dihan, 2019; Payal et al. 2019)	Likert Scale (1-5)
	KM Application	(Gold et al. 2001; Imran et al. 2017; Afqarina dan Dihan 2019; Payal et al. 2019; Balasubramanian et al. 2020)	Likert Scale (1-5)
	KM Protection	(Gold et al. 2001; Afqarina dan Dihan, 2019; Payal et al. 2019)	Likert Scale (1-5)
Organizational Performance	Innovation Performance	(Cong dan Pandya, 2003; Balasubramanian et al. 2020)	Likert Scale (1-5)
	Quality Performance	(Cong dan Pandya, 2003; Balasubramanian et al. 2020)	Likert Scale (1-5)
	Operational Performance	(Cong dan Pandya, 2003; Balasubramanian et al. 2020)	Likert Scale (1-5)

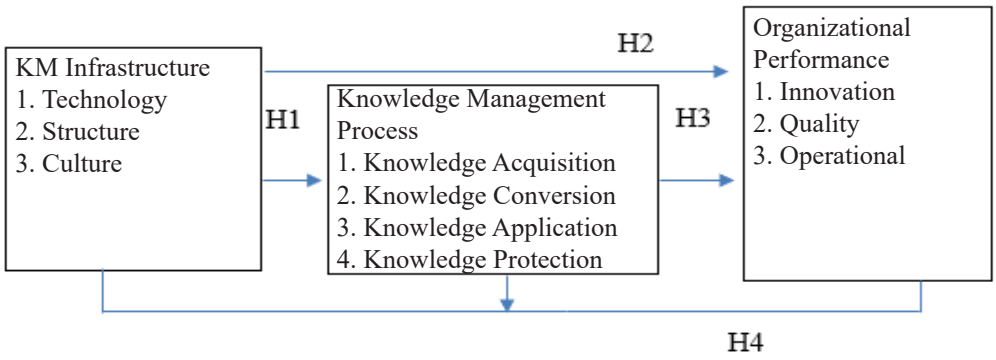

Figure 1. Conceptual model

RESULTS

In this study, respondents consisted of employees in the Bureau of Cooperation, Law and Public Relations (BKHH), Center for Data and Information Documentation (PDDI), Center for Media and Reproduction (BMR)/LIPI Press, Center for Utilization and Innovation of Science and Technology (PPII) and Education and Training Development Center (Pusbindiklat) which has duties and functions related to the socialization of science and technology such as media or inter-institutional relations, scientific community development, public information/ exhibitions, multimedia, publishing journals and repositories, publishing books, libraries, developing Knowledge Management Systems (Corporate website, Intra, ISJD, RIN, e-journal, e-library), technology transfer, technology incubation, Intellectual Property Rights (IPR), education and training/courses. The results of processing from the characteristics of the respondents can be seen in Table 2. Respondents in this study were dominated by 60 women (52%) and 55 men (48%). From the remaining data, there is some information that this data is dominated by individuals who know knowledge management and organizational culture.

Descriptive Analysis

The results of this descriptive analysis support the results of the questionnaires obtained from employees, carried out with an in-depth interview process about knowledge management to several resource persons who have led five service work units in the 2019-2021 timeframe. The first thing to do to analyze descriptive data is to look at the mean value and then add the interview results to obtain additional data, which is quite adequate regarding the variables studied. First, for the knowledge management infrastructure variable, the mean of each dimension is obtained, namely Technology (4.27) with criteria for strongly agreeing, Structure (3.97) with agreeing criteria, and Culture (4.13) with agreeing on criteria. So for the knowledge management infrastructure, the overall average is (4.13) with the criteria agreed.

The interviews show little resistance to implementing knowledge management in the five science and technology correctional service work units at LIPI. This finding happened because the application of knowledge management has been greatly improved in the last three years. However, there are perceived obstacles to applying knowledge management in the five service work units. Therefore, in the knowledge-sharing process, the management requires every employee to speak in front of his co-workers regarding work progress, ideas, or knowledge to increase employee confidence and cognitive abilities.

On the other hand, obstacles are also caused by the knowledge gap between employees within the work unit. Different educational backgrounds and experiences in one work unit and the ability to understand and use technology in some employees who are still lacking become obstacles in implementing knowledge management, especially in pandemic conditions. Many employees easily adapt to organizational changes and business processes because they have adequate educational backgrounds. However, some employees still need to try harder to keep up with the development of knowledge and technology used in daily work activities, such as using zoom for online applications or KMS use. Management policies related to these obstacles are usually carried out with regular assistance or mentoring systems. However, if it turns out that the employee still cannot keep up with the development of the knowledge and technology used, the management will adjust his work assignments in other appropriate fields.

Table 2. Respondent characteristic

Characteristics	Total	Percentage
Field of Work (Social Science and Technology)		
1 field of work	78	68
More than 1 field of work	37	32
Gender		
Male	55	48
Female	60	52
Age		
25 -35 years	41	36
36-45 years	50	43
> 45 years	24	21
Length of work		
< 5 years	9	8
5-10 years	26	23
11-15 years	43	37
16 – 20 years	17	15
21 – 25 years	6	5
> 25 years	14	12
Educational Level		
High School	4	4
Bachelor Degree (S1)	63	58
Master Degree (S2)	47	38
PNS Job Grade		
Class 2	1	1
Class 3	103	89
Class 4	11	10
Position		
General	14	12
Functional	101	88
Location		
Central	67	58
Regional	48	42

Second, for the knowledge management process variable, the mean for each dimension is obtained; namely, Knowledge acquisition has a mean (4.01) with Agree criteria, (Knowledge conversion) has a mean (3.94) with Agree to criteria, Knowledge application (3.91) with Agree criteria, and Knowledge protection (4.02) with the agree criteria.

For the knowledge management process, the results of interviews conducted for knowledge protection through a knowledge management system, the implementation is quite good. However, in its implementation, socialization is still constrained by socialization that has not been maximally reached and understood by the organization's employees. The guidelines are still more focused on being understood by the responsible team. LIPI is also quite good in its implementation for knowledge acquisition but needs improvement by providing a technology database platform ready to be transferred to technology. The data obtained from knowledge conversion shows that the process of converting competitive knowledge into action plans has been going well but still needs improvement. The knowledge possessed by employees and obtained from outside the organizational unit is then applied in work plans; for example, knowledge related to public information services obtained from benchmarking several Ministries and institutions is contained in plans for improving public information services in the organization. However, in its implementation, not all competitive knowledge can be applied to plans and actions because it must consider many things related to conformity with organizational goals and their budget. Furthermore, for knowledge application in its implementation, thinking and work culture in government institutions are still strong in the hierarchical process. Leaders are expected to be ready to be given input. However, sometimes for its realization, decision-making still depends on superior policies and is bureaucratic. This finding makes the concept of thinking from employees not all accustomed to being more innovative and taking the initiative in making decisions related to work.

Third, for organizational performance, Innovation performance has a mean (4.05) with agreed criteria, Quality performance has a mean (3.92) with agreed criteria, and Operational performance has a mean (4.05) with agreed criteria. In the indicators of innovation, quality, and operation. LIPI has made innovations in the form of systems that encourage technology and the dissemination of science and technology with good quality and operationalization. Implementation in the field is still quite lacking and needs some improvements.

Structural Equation Modeling Analysis

From the results of the Structural Equation Modeling analysis, the model obtained can be seen in Figure 2.

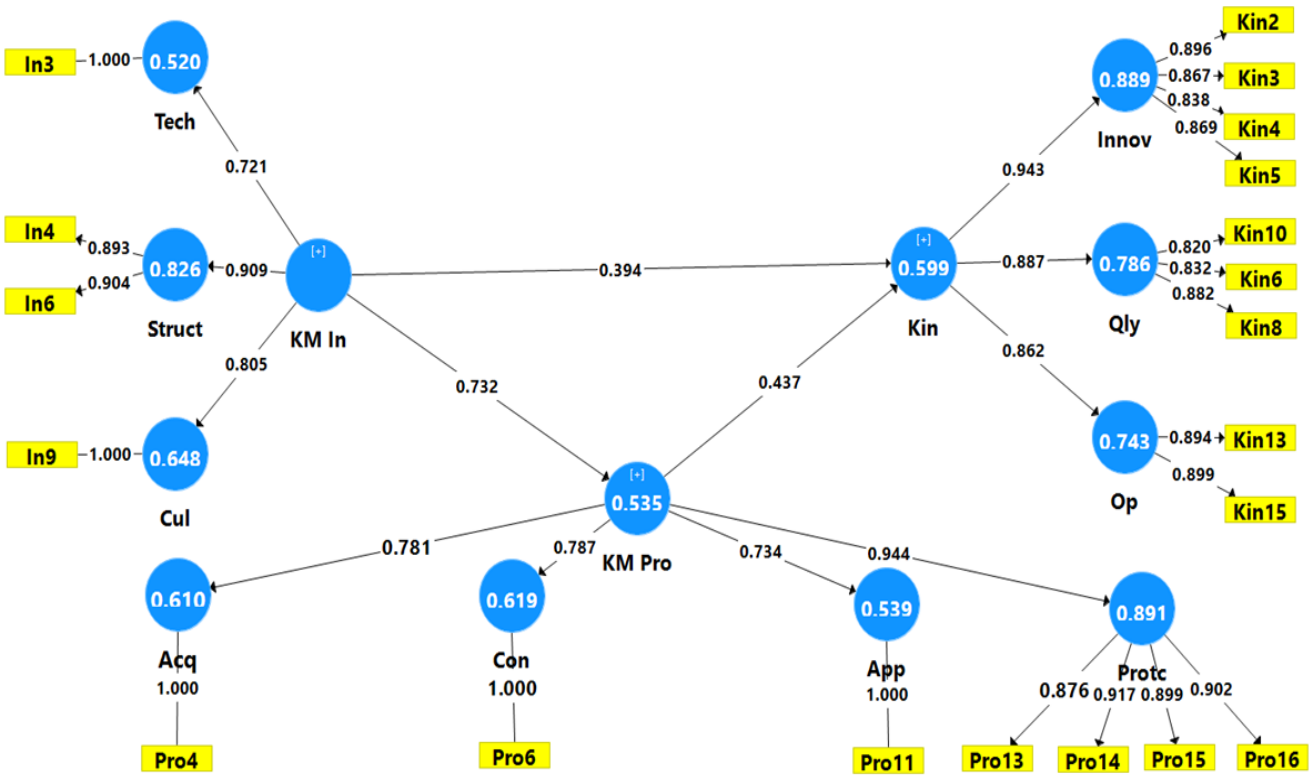

Figure 2. Model fit loading factor

Measurement model evaluation analysis (outer model)

The questionnaire distributed to related respondents is tested first on 30 respondents with similar characteristics to the research respondents to test the validity. Furthermore, the answers from the 30 sample respondents were tested to see their validity and reliability using the SPSS version 25 application. This analysis is to see the evaluation of measurements by testing convergent validity, discriminant validity, and composite reliability. At first, there were 40 items in the processing, but there were 20 items that dropped because they did not meet the standards when the factor loading value was below 0.7. Then there were 20 items valid, which can be seen in Table 3.

To test the discriminant validity, the researcher used the Fornell lacker. From Table 4, it can be concluded that the discriminant validity test has met the rule of thumb. Furthermore, convergent validity has a standard for testing convergent validity and reliability. If AVE is above 0.5 then it is considered valid. Therefore, in Table 5, it can be concluded that the data is valid. Meanwhile, if cronbach's alpha and composite reliability has criteria above 0.7, it can be said to be reliable. In conclusion, all data are reliable.

Structural Model Evaluation (inner model)

In the inner model, conclusions can be drawn from the value of r square and hypothesis testing. First, the inner model that the value of r square of knowledge management infrastructure is 0.531, meaning that the knowledge management infrastructure variable is in the moderate category and can explain the diversity of knowledge management process variables by 53.1 percent and organizational performance by 0.591. organizational performance is in the moderate category and can explain the diversity of knowledge management process variables by 59.1 percent.

From Table 6, it can be seen that all path coefficients have a value > 0.1. This finding means that all paths' hypothesis testing requirements have been met. In addition, from the path coefficient, it can be seen that the original sample in all paths is positive, meaning that the effect of exogenous variables on endogenous variables is positive. Furthermore, the value of t-statistics can be seen in table that the value of t-statistics for all paths is more than 1.96, which means that all paths have met the requirements for testing the hypothesis. Likewise, other conditions for hypothesis testing have been met for the p-value on all paths whose magnitude is > 0.05.

Table 3. Item factor loading

Variable	Indicator	Item	Loading Factor	Remarks
Knowledge Management Infrastructure	Technology	In3	1	Valid
	Structure	In4	0.89	Valid
		In6	0.9	Valid
	Culture	In9	1.000	Valid
Knowledge Management Process	Knowledge Acquisition	Pro4	1	Valid
	Knowledge Conversion	Pro6	1	Valid
	Knowledge Application	Pro11	1	Valid
	Knowledge Protection	Pro13	0.88	Valid
		Pro14	0.92	Valid
		Pro15	0.9	Valid
		Pro16	0.9	Valid
Organizational Performance	Innovation	Kin2	0.9	Valid
		Kin3	0.87	Valid
		Kin4	0.84	Valid
		Kin5	0.87	Valid
	Quality	Kin6	0.83	Valid
		Kin8	0.88	Valid
		Kin10	0.82	Valid
	Operational	Kin13	0.89	Valid
		Kin15	0.9	Valid

Table 4. Fornell Lacker Table

Variables	Knowledge Management Infrastructure (KMIn)	Knowledge Management Process (KMPro)	Organizational Performance (Kin)
Knowledge Management Infrastructure (KMIn)	0.790		
Knowledge Management Process (KMPro)	0.731	0.814	
Organizational Performance (Kin)	0.714	0.725	0.785

Table 5. convergent validity and composite reliability

	Cronbach's Alpha	Composite Reliability	(AVE)	Remarks
Knowledge management infrastructure (KMIn)	0.798	0.869	0.625	Reliable
Technology (Tech)	1.000	1.000	1.000	Reliable
Sctructure (Struct)	0.761	0.893	0.807	Reliable
Culture (Cul)	1.000	1.000	1.000	Reliable
Knowledge Management Process (KMPro)	0.914	0.932	0.663	Reliable
Knowledge Acquisition (Acq)	1.000	1.000	1.000	Reliable
Knowledge Conversion (Con)	1.000	1.000	1.000	Reliable
Knowledge Application (App)	1.000	1.000	1.000	Reliable
Knowledge Protection (Protc)	0.920	0.944	0.808	Reliable
Performance (Kin)	0.922	0.935	0.617	Reliable
Innovation (Innov)	0.890	0.924	0.753	Reliable
Quality (Qly)	0.799	0.882	0.714	Reliable
Operational (Op)	0.755	0.891	0.803	Reliable

Table 6. Path analysis

Path	Path Coefficient	T-statistic	P-value	Remarks
Direct Effect				
Knowledge management infrastructure (KMIn) → Knowledge management process (KMPro)	0.731	134.294	0.000	Significant
Knowledge management infrastructure (KMIn) → organizational performance (Kin)	0.394	33.245	0.000	Significant
Knowledge management process (KMPro) → organizational performance (Kin)	0.437	39.784	0.000	Significant
Knowledge management infrastructure (KMIn) → Knowledge management process (KMPro) → organizational performance (Kin)	0.320	36.455	0.000	Significant

Effect of knowledge management infrastructure on knowledge management process

Table 6 shows that the path coefficient value of the knowledge management infrastructure to the knowledge management process is 0.731 and a positive value, meaning that the knowledge management infrastructure variable has a positive effect of 73.1% on the knowledge management process. Furthermore, the t-statistics and p-values of the knowledge management infrastructure on the knowledge management process of 134,294 and 0.000, respectively, can be declared to have met the requirements of the hypothesis test where the t-statistics must be > 1.96 and the p-value must be < 0.05. It can be interpreted that the statement of hypothesis 1 can be accepted; namely, the knowledge management infrastructure significantly affects the knowledge management process. This result is per the statement from research (Iqbal et al. 2019) which argues that knowledge management infrastructure or enabler has a positive and significant effect on the knowledge management process.

The successful implementation of knowledge management at LIPI cannot be separated from the support of the supporting factors of knowledge management itself, namely the use of technology, support from organizational structures, and work culture within the organization. This finding can be seen from the many uses of various technologies with various platforms as KM support media both in the initial process related to the creation, collaboration, and absorption of knowledge from tacit to explicit and from explicit to explicit, knowledge management and storage to the distribution of organizational science and technology so that it can reach to the community and stakeholders, especially during the pandemic in the last three years. In addition, management support in the form of policy foundations, strategies, and how to build a work culture that supports the implementation of knowledge management also plays a vital role in the implementation of knowledge management. This support forms a new work culture with a better work ethic and is active in sharing knowledge for employees in the work environment, including work units with science and technology correctional tasks and functions

Effect of knowledge management infrastructure (KMIn) on organizational performance (Kin)

Knowledge management infrastructure (KMIn) significantly influences organizational performance (Kin). This finding can be seen in the t-statistical value> 1.96, which is 33,245. In addition, the p-value on the path is less than 0.05 which can be said to have met the requirements for testing the hypothesis. The positive path coefficient of 0.394 means that implementing a good knowledge management infrastructure can improve organizational performance. This finding is in line with research from (Farid and Aryani, 2016; Imran et al. 2017; Susanty et al. 2019) which states that employee knowledge related to technology has a positive and significant influence on organizational performance. In addition to technology, the support of other facilities also dramatically influences the smooth process of completing tasks and work functions (Imran et al. 2017; Payal et al. 2019), including the structure and work culture of the organization. In this study, the organizational structure has a positive and significant effect on improving performance and is in line with the research results (Rezaei et al. 2021). The work culture or culture in this study also has a positive and significant influence so that the results are in line with research from (Imran et al. 2017; Meher and Mishra, 2019; Rezaei et al. 2021) but contradict the results of research from (Setyawan, 2021) which states that organizational culture does not affect organizational performance.

At LIPI, knowledge management infrastructure is directly proportional to the support of facilities in the form of technology, policies, organizational structures, workflows, and even the atmosphere in the work environment related to the knowledge management process in the organization. Technological support is needed, especially in a pandemic where many restrictions apply. The communication process and the implementation of employee tasks depend a lot and become easier to do using technology. In addition, policies from management also become the basis for decision-making, organizing more innovative science and correctional technology activities, and establishing work patterns and conditions that support employee performance.

Effect of knowledge management process (KMPro) on organizational performance (Kin)

The path coefficient value in table 6 for this path is 0.437 and positive, meaning that in this study, the knowledge management process positively influences organizational performance. The t-statistic in this path is 39.784, and the p-value is 0.000, where the value meets the criteria for the t-statistic value > 1.96 and p-value <0.05. This finding means that the knowledge management process positively and significantly impacts organizational performance regarding innovation, quality, and operations. This finding follows research (Balasubramanian et al. 2020) which states that implementing knowledge management significantly impacts innovation performance, quality performance, and operational performance in public organizations.

This research is also in line with the knowledge acquisition process from individuals and other parties at LIPI to help increase the capacity of employees to complete work. Tacit knowledge that comes from individuals, employees of the science and technology correctional unit, and researchers are converted into explicit knowledge that is useful for the organization. This process encourages employees to continuously learn and improve organizational learning processes that affect organizational performance. This finding is in line with the results of research from (Sunardi, 2017), which states that organizational learning positively affects organizational performance.

Furthermore, the knowledge conversion stage is carried out so that the acquired knowledge can be put to good use by converting it using knowledge packaging methods, languages, or editorials that are easy to understand and apply, for example, packaged in exciting events, with more straightforward language and editorial or in the form of attractive presentations and presentations. Easy to understand and apply. The next stage is the application of knowledge, where at this stage, the knowledge that has been obtained can be applied in the process of completing work or can be a solution to the problems related to internal and external problems in society that require science and technology innovation. This stage shows that the knowledge management process, in addition to helping in terms of improving knowledge and learning systems and improving organizational operations, also improves the cognitive abilities and methods of personnel which is in line with the results of research by (Sahibzada et al. 2020).

Knowledge-based employee cognitive and ability improvement will be directly proportional to the increase in human and intellectual capital quality, which can be a driving force in improving organizational performance. This finding follows the results of research from (Rezaei et al. 2021), which states that knowledge management affects organizational performance, both directly and through the mediating variable of human capital. These results also align with research from (Iqbal et al. 2019) which states that the knowledge management process affects organizational performance directly and indirectly through intellectual capital. Knowledge protection is helpful as a barrier so that organizational knowledge owned and shared is not misused. This process can be done with the security protection of the application, product license, and other applicable laws.

Effect of knowledge management infrastructure (KMIn) on organizational performance (Kin) through knowledge management process (KMPro)

Table 6 shows that the path coefficient value is 0.3201 and is positive, so it can be interpreted that the knowledge management infrastructure research indirectly has a significant positive effect on performance through the knowledge management process. For example, the t-statistic in this path is 36.455, and the p-value is 0.000, where the value meets the criteria for the t-statistic value > 1.96 and p-value <0.05. This finding can be interpreted that the statement of hypothesis 4 is acceptable; namely, the knowledge management

process mediates the relationship between knowledge management infrastructure and organizational performance. This finding is in line with the results of research from Payal et al. (2019) which states that the knowledge management process mediates the relationship between knowledge management enabler or infrastructure and organizational performance.

At LIPI, the knowledge management infrastructure consisting of components of technology, organizational structure, and organizational culture are factors that support the implementation of the knowledge management process. Technology becomes a medium for communication, collaboration, and knowledge sharing, as well as a place to store knowledge for internal and external organizations, making it easier to re-access when needed. The organizational structure becomes the basis for policies and legal umbrellas and drives the process of implementing knowledge management in organizations. Based on the result, organizational culture functions as a control mechanism that shapes the attitudes and behavior of employees to implement knowledge management, such as awareness to share knowledge, document knowledge, and other processes that support knowledge management.

Managerial Implications

LIPI should improve implementation in facilitating creating and transferring of knowledge, primarily related to expert databases, databases related to technology, or research results that are ready to be disseminated or transferred of technology, and maximize service channels and integrated complaint channels by building an updated database on an integrated website, assigning assignments to manage and updating the latest expert data, making appeals to each and socializing the use of the service channel and complaint channel to users of the organization's science and technology services, as well as documenting complaints, criticisms, and suggestions as an evaluation of organizational performance

Assessment of service performance at LIPI needs to be added to the knowledge-sharing process because currently, there is still a gap in knowledge regarding either the use of technology or work tasks and functions between evenly distributed knowledge transfer activities among employees and the opportunity to utilize the knowledge learned. No measurements have been taken regarding the impact on society after science and technology correctional. This can be done by planning a strategy for improving and increasing tacit knowledge sharing and explicit knowledge sharing among employees both within one work unit and cross-structural related to technology or work tasks and functions such as making a routine schedule for sharing sessions between employees and making division of tasks in the form of tandem jobs and job rolling for the same work unit, while for measurements related to the impact of science and technology conventionalization can be done by collaborating with related parties such as local governments, schools, and other stakeholders as users of science and technology services

It is better if LIPI needs to make improvements in protecting organizational knowledge, especially in the process of knowledge documentation and its management, as well as arrangements related to punishment for misuse of knowledge within the organization. The knowledge management documentation process can be carried out by planning a strategy for utilizing digital file storage in the Intra-employee application, Google Drive or using Network Attached Storage (NAS) for storing knowledge documents related to organizational tasks and functions and knowledge documents for sharing such as documenting any existing knowledge data, upload or save any knowledge documentation into storage folders, manage storage files so that they are organized and can be easily accessed by interested employees. Arrangements related to punishment for misuse of knowledge within the organization are carried out by taking inventory of existing policies related to the protection of organizational knowledge both inside and outside the organization, planning strategies for protecting knowledge from within the organization, for example certain access restrictions, incentive adjustments, rules regarding employee behavior, or planning tasks and job authority

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The results of the description analysis state that the science and technology correctional service-based work unit at LIPI has implemented knowledge management from infrastructure and processes well, but for some parts still need to be improved. The results of the PLS-SEM analysis state that the knowledge management

infrastructure has a positive and significant effect on the knowledge management process and organizational performance. Infrastructure support such as technology, management policies, and organizational culture are very helpful in implementing knowledge management and making it easier for employees to carry out their duties and work functions. The knowledge management process has a positive and significant effect on organizational performance. This finding means that good knowledge management can increase employee knowledge and learning to perform better and promote organizational knowledge in the form of science and technology products and innovations. Knowledge management infrastructure indirectly has a positive and significant impact on organizational performance through the knowledge management process in its position as an enabler or supporting facility.

Although currently, LIPI has transformed into the National Research and Innovation Agency (BRIN). Based on the Presidential Regulation of the Republic of Indonesia Number 78 of 2021 concerning the National Research and Innovation Agency (BRIN), in the concept and duties of its function as a research institution, one of them is to produce products. Research and innovations that can be utilized by the community and improve the nation's sustainable competitiveness. In addition, to BRIN's current organizational structure, the work units with the task and function of science and technology corrections are still more significant and diverse. The results of this managerial research and implementation are relevant as input, learning, and evaluation of organizational management in improving organizational performance. Based on science and technology, correctional institutions in research institutions implement knowledge management.

Recommendations

For current research institutions, it is better to maintain good aspects of knowledge management such as the use of technology and consider improving other aspects such as facilitating organizational structure and protecting knowledge within the organization.

Further research is also suggested to explore other variables related to knowledge management and organizational performance, such as employee competence or organizational learning in research organizations.

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