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Drivers and Barriers in Conducting Research in Polytechnics: A Content Analysis of Open-Ended Responses

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Abstract

The transformation of obligations in Indonesian polytechnics, particularly in the field of research, remains a challenge in the struggle to pursue research performance, yet there is limited study about lecturers' perceptions of the driving factors and barriers to conducting research in the institution. This study aims to contribute to this gap in the literature in an attempt to understand the existing research culture within polytechnics as well as the driving factors and barriers to conducting research in Indonesian context. The 3-item open-ended question was administered to the fifteen lecturers of a polytechnic institution in Indonesia. We analyzed the open-ended responses using content analysis, i.e., a technique of studying responses to open-ended questions by coding written words into categories and themes, to generate appropriate discussion and recommendation. The categories were loosely grouped into six themes: human resource management policy, research progress, research policy, research funding, research benefits and incentives, and specialized research leadership. The findings were discussed in-dept in this study to underline the appropriate suggestions.

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Keywords: Driving Factors; Barriers; Research Culture, Open-Ended Responses; Content Analysis; Polytechnic

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Introduction

Research performance is a valuable asset for higher education institutions in their efforts to contribute to the advancement of science and the progress of a country, and its productivity has become an important indicator in determining the quality of higher education (Porter & Toutkoushian, 2006; Quimbo & Sulabo, 2014; Kyvik & Lepori, 2010). There is a factual condition that higher education institution's transformational shift toward research and economic revolution has changed its dominating of teaching activities (Sahibzada et al., 2022; Mintrom, 2008). As a result, the body of literature on research productivity and its factors in higher education institutions have been developed so far (Tanjung, 2022; Henry et al., 2020). However, there hasn't been much study-related research productivity in one of the types of higher education institutions, namely, polytechnics.

Polytechnic institutions are a kind of vocational higher education that emphasizes their efforts to produce work-ready graduates that match industry needs (Triyono & Mateeke Moses, 2019; Biscaia et al., 2020). As such, the lecturers have a higher teaching and skill-constructing workload than doing research within their activities, resulting in a lack of research performance. There was another unsupported condition for boosting research productivity in Indonesian polytechnic. Under the previous rules, polytechnic lecturers could not reach the highest academic rank of professor (Warta Kota, 2013), no matter how well they did in their performance in research. Meanwhile, it could be achieved by lecturers who were in universities and institutes with certain performance achievements in research. Until then, the Law on Higher Education (Law No. 12/2012) was enacted in 2012, whereby polytechnics were equalized with universities and institutes in carrying out the academic obligations, making it possible for polytechnic academics to achieve such the highest academic rank (Pongoh et al., 2021). This situation leads to the transformation of polytechnic, particularly in the research performance, from its dominating of teaching activities toward optimum balances between education and research. However, as a like in another developing country, the productivity of research in polytechnics was still considered a challenge in the struggle to pursue better performance (N. D. Nguyen et al., 2021; Carolina Magdalena Lasambouw et al., 2020; Mohd Affandi et al., 2015).

Even though there is a growth of research performance at polytechnics in Indonesia (Carolina Magdalena Lasambouw et al., 2020) where some leading polytechnics have begun to achieve significant developments (Figure 1); however, the productivity of publications, prototypes, and intellectual property rights produced by polytechnics is still generally far behind that of universities and institutes. Thus, it is necessary to conduct a study exploring research culture in the context of polytechnics, including the driving factors and barriers, in order to contribute both empirically and theoretically to the field of research management in polytechnics.

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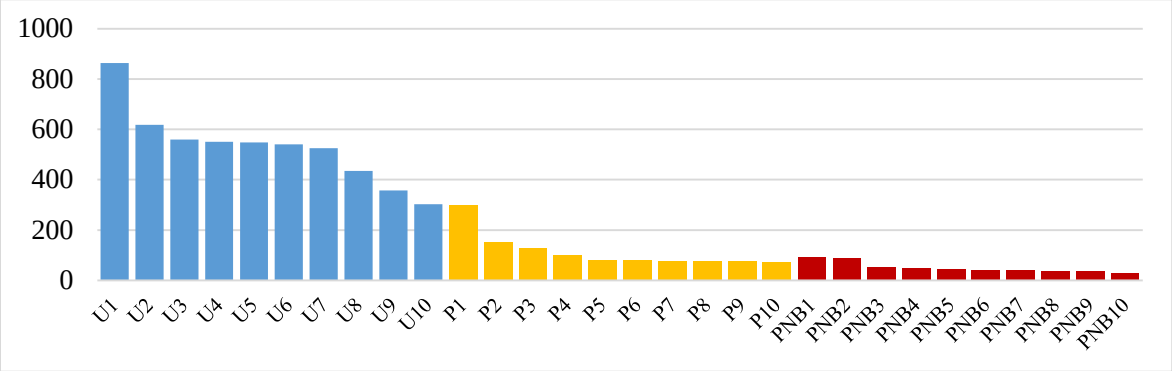

Horizontal Axis: Higher Education Institutions/Vertical Axis: Score of Research Productivity

Note:

U1-U10: Top ten of Indonesian academic college (university and institute) in research productivity

P1-P10: Top ten of Indonesian polytechnic in research productivity

PNB1- PNB10: Top ten of Indonesian new public polytechnic in research productivity

Figure 1. The Score of Research Productivity of Higher Education Institutions Based on *the Indonesian Science and Technology Index (SINTA), January 2022*

Literature Review

Several studies had analyzed the factors affecting the research performance of higher education in an institutional and individual context, both in the quantitative (e.g., Quimbo & Sulabo, 2014), and qualitative paradigm (e.g., Q. Nguyen et al., 2016). Ramesh Babu & Singh (1998) stated that research productivity is seen as a variable that is influenced by the qualification of individual researchers and institutions. Another suggestion, in an attempt to produce a conceptual dimension for research productivity of higher education institution, Quimbo & Sulabo (2014) stated that higher education research productivity is influenced by individual factors (i.e., age, gender, civil status, educational attainment, academic rank, filed of specialization, years in teaching, teaching load, research experience), and institutional factor (i.e., research policy, research funding, research benefit and incentives). Besides, it was stated by another scholar that there is a leadership that also has a significant role in increasing research productivity (Bland et al., 2005). While Henry et al. (2020) pointed out that there were personal, environmental, managerial, and behavioral factors that affected research performance in higher education institution.

Though there is a contention that applied research is more identical to the character of vocational colleges (that we termed as a polytechnic in this study) while fundamental research is identical to academic colleges (Pratt et al., 1999; Bruce Ferguson, 1999; Biscaia et al., 2020), both vocational and academic colleges had equal pressure to get good performance both in applied and fundamental research. There has been an attempt to determine the theoretical dimension of the research performance in polytechnics. Biscaia et al. (2020) developed five major dimensions of research performance in polytechnics that were empirically validated in the context of a developed country—Portugal, namely, service provision, scientific and artistic production, collaborative research, knowledge transfer, and societal impact. In Malaysia, knowledge, attitude, and awareness about research practice were looked at as possible factors that could affect the research performance of polytechnics in a developing country (Mohd Affandi et al., 2015). Meanwhile, in Indonesia,

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a discussion of polytechnic research performance was carried out by Sutjiredjeki et al. (2011) through a conceptual framework of building research management in polytechnics.

Organizational culture plays an important role in organizational performance, not exception for higher education institution such as polytechnics (Shahzad et al., 2012; Serpa & Sá, 2022). In the context of managing research activity, understanding the value and improving research culture in higher education institutions is an important strategy in order to achieve better research performance (Ryazanova & Jaskiene, 2022). For this reason, it is important for higher education management to understand the conditions of the existing research culture and what the driving and inhibiting factors are in achieving optimal research performance based on its capacity and main function.

There is a slight empirical study related to the research performance in polytechnics. Previous studies have been carried out mostly in a quantitative method, while few studies have been conducted in a qualitative method, such as quantitative content analysis of the open-ended responses. Besides, its empirical study in polytechnic institutions from a lecturer's perspective has been slim. Thus, this study aims to contribute to this gap in the literature in an attempt to understand the existing research culture within polytechnics as well as the driving factors and barriers to conducting research at institutional and individual levels in the Indonesian context. It helps the management of the polytechnics to improve the institution's research performance by streamlining the policy.

Significance of the Study

The study was conducted at a public polytechnic located in a city in East Kalimantan province—one of Indonesia's most important regions because of its natural resources industry (Tarigan et al., 2017). The transformation of such an institution into a public institution in 2011—after ten years of being a private institution under the local government—was thought as part of the stretching of the region to improve its higher education infrastructure (Moeliodihardjo, Soemardi, Brodjonegoro, & Hatakenaka, 2012; Muttaqin, 2018). This study was a part of a more extensive study to investigate the development progress of polytechnics in the post-transformed era, especially in research performance. As mentioned earlier, research performance has become an essential issue for polytechnic institutions since the stipulation of Law No. 12 of 2012.

Research Methodology

Instrument and Data Collection

To collect primary data, we used three open-ended question surveys, i.e., (Q1) What expressions are appropriate to describe the research culture in your institution so far? (Q2) What are the factors that affect the productivity of research activities in your institution? and (Q3) What are the drivers and barriers to your research productivity?

Because of the limited face-to-face access during the COVID-19 pandemic, the primary data was gathered using an e-questionnaire. It was administered to the participants in a polytechnic object in the period from December 2020 to February 2021. Some secondary data on the research performance of a polytechnic object was also sought as supplementary data for analysis.

Participants

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Purposive sampling was used to select participant candidates from all lecturers in a polytechnic object, taking into account gender representation, year of experience as a lecturer, and field study between engineering and non-engineering. Fifteen candidates met the inclusion criteria as participants in this study were already willing to be recruited. In the report of the study, the real name was anonymized to maintain the confidentiality of participants.

Data analysis

We analysed the three open-ended responses using content analysis, i.e., a technique of studying responses to open-ended questions by coding written words into categories and themes (Hsieh & Shannon, 2005). This technique has been utilised by several researchers, such as Jacob et al., (2014), Chambers & Chiang, (2012), and Gandasari & Dwidienawati, (2020), to extrapolate the meaning of written comments or open-ended responses. As described by Corbin & Strauss (2014), the first step of conceptualizing the qualitative data is coding, which refers to this process as labelling. The analysis was conducted in summative content analysis approach, so the codes are sought by interpreting the underlining context. It is, arguably, the most suitable approach as responses data were in short sentence formats (Hsieh & Shannon, 2005).

Some open-ended responses probably contained more than one code, so there were probably more codes than the number of respondents. The next step was categorizing, which involved organizing and grouping labels to reduce the number of concepts. In this step, codes were categorized to identify common elements among responses. The resulted categories were ranked to show the level of agreement among participants. The emerged categories were then loosely grouped into themes. The sentiment analysis of codes was also conducted to illustrate the sentimental expression of participants, particularly on open-ended responses of Q1: concerning the research culture within institution, and on open-ended responses of Q3: concerning the driving factors and barriers to conducting research.

To make valid conclusions in the content analysis process, the classification procedure must be reliable so that consistency is maintained. The reliability criteria in this study were adopted from the study of Chambers & Chiang (2012): (1) intra-rater reliability: how it was ensured that the same coder produced the same results over and over, and (2) inter-rater reliability: how it was ensured that the coding process on the same text would be coded in the same category by different people. In this study, the open-ended responses were coded twice by first co-author of article, in a two-week interval between the first and second coding. Intra-rater reliability scores were obtained through the percentage of match codes and categories to the total identification; it obtained an average score of 90%. While inter-rate reliability was obtained through the percentage of initial coder (first co-author) to the second coder (second co-author); it obtained a score of 86%.

Results

The demographics of participants, as presented in Table 1, showed that the participants recruited in this study, relatively, had the representation of gender, years of experience as a lecturer, and field of study between engineering and non-engineering.

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Table 1.
The demographic of participants

Characteristic	N	(%)
Number of participants	15	100
Gender		
male	10	44.24
female	5	44.76
Year experiences as a lecture		
1- 5 years	6	37.45
6 – 10 years	5	34.04
> 10 years	4	28.51
Field of study		
Engineering	9	48.94
Non engineering	6	51.06

From the first open-ended question (Q1): "What expressions are appropriate to describe your institution's research culture so far?", all participants responded to the said question, resulted in twenty-three codes, as presented in Table 2. All codes were categorized into eight common elements regarding research culture in a polytechnic object. Then, these categories were loosely grouped into five themes, i.e., research benefits and incentives (39.13%), human resource management policy (26.08%), research progress (21.74%), and research policy (13.04%).

Table 2.
Q1: What expressions are appropriate to describe the research culture in your institution so far?

Ranked	Categories	Code counts	Percentage	Theme groups
1	Less motivation and goal of research activity	5	21.74	Research benefits and incentives
2	Developing progress	4	17.40	Research progress
3	Less institutional support and benefits	3	13.04	Research benefits and incentives
4	Less collaboration	3	13.04	Human resource management policy
5	Low research ability	3	13.04	Human resource management policy
6	Ineffective institutional research roadmap	3	13.04	Research policy
7	Adequate institutional support and benefits	1	4.34	Research benefits and incentives
8	Good motto	1	4.34	Research progress
		23	100	

The sentiment analysis of codes in these open-ended responses, as presented in Table 3, shows that there are six (26%) codes in positive sentiment expressed by four participants in viewing research culture within polytechnic object. While twelve participants expressed seventeen (74%) codes in negative sentiment.

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Table 3.
The sentiments analysis of codes in the open-ended responses of Q1.

Negative sentiment / Codes (-)	frequency	Positive sentiment / Codes (+)	frequency
Just complying mandatory workload	3	Developing	3
Need more funding	2	Having good motto	1
Roadmap is not effective	2	Well facilitated by institution	1
Individualistic	1	New lecturers are more productive	1
Fragmented	1		
Research is challenging activity	1		
The lectures are hampered by research	1		
Directionless	1		
Research as secondary activity	1		
Need improvement	1		
Need motivation	1		
Need added value	1		
Need collaboration	1		
	17 (74%)		6 (26%)

From the second open-ended question (Q2): "What are the factors that affect the productivity of research activities in your institution?", as presented in Table 4, all responses resulted in thirty-five codes. All codes were categorized into eight common elements concerning the factors that affect the productivity of research in a polytechnic object based on participant's perspective. These categories were loosely grouped into four themes, i.e., human resource management policy (34.29%), research policy (25.71%), research funding (20%), research benefits and incentives (14.28%), and specialized research leadership (5.71%).

Table 4.
Q2: What are the factors that affect the productivity of research activities in your institution?

Ranked	Categories	Code counts	Percentage	Theme groups
1	Policy and guidance	9	25.71	Research policy
2	Funding	7	20.00	Research funding
3	Personal capacity in research and publication	5	14.29	Human resource management policy
4	Workload	4	11.43	Human resource management policy
5	Motivation and goal of research activity	3	8.57	Research benefits and incentives
6	Scientific collaboration and academic atmosphere	3	8.57	Human resource management policy
7	Leadership	2	5.71	Specialized research leadership
8	Reward and incentive system	2	5.71	Research benefits and incentives
		35	100	

From the third open-ended question (Q3): "What are the drives and barriers to the productivity of your research?", all responses resulted in thirty-one codes, as presented in Table 5. All the codes were categorized into eight common elements regarding research culture in a polytechnic object. These categories were loosely grouped into six themes, i.e., research funding (32.26%), human resource management policy (29.03%), research benefits

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and incentives (19.35%), research policy (12.90%), and specialized research leadership (6.45%).

Table 5.
Q3: What are the drives and barriers to the productivity of your research?

Ranked	Categories	Code counts	Percentage	Theme groups
1	Funding	10	32.26	Research funding
2	Policy and guidance	4	12.90	Research policy
3	Workload	4	12.90	Human resource management policy
4	Career motivation	4	12.90	Research benefits and incentives
5	Personal capacity in research, grant competition, and publication	3	9.68	Human resource management policy
6	Leadership and management	2	6.45	Specialized research leadership
7	Reward and incentive	2	6.45	Research benefits and incentives
8	Collaboration	2	6.45	Human resource management policy
		31	100	

The sentiment analysis of codes in these open-ended responses, as presented in Table 6, shows that there are eleven (33.3%) codes identified as driving factors in conducting research, expressed by seven participants. While twenty-one (66.7%) codes were identified as barriers, expressed by twelve participants.

Table 6.
The sentiments analysis of codes in the open-ended responses of Q3.

Codes (-)/Barriers	frequency	Codes (+)/Driving factors	frequency
Limited Funding	7	Policy	2
Workload	5	Career advancement	2
Collaboration	2	Good response from community	1
Low research ability	1	Roadmap of research	1
Limited grant obtained	1	Adequate facility	1
Academic performance	1	Reward and incentive	1
Curriculum alignment	1	Leader support	1
Management and bureaucracy	1	Grant obtained	1
Publication capability	1		1
Policy	1		
	21 (66.7%)		11 (33.3%)

Figure 2 shows how the number of registered lecturers and how many researchers has grown over the last five years. One of the participants stated: *"…Indeed, new lecturers have been more productive in carrying out research recently…"* It indicates that the increasing number of researches was due to the new joined-lecturer who were likely more motivated toward research productivity, rather than caused by increased involvement of the existing lecturers.

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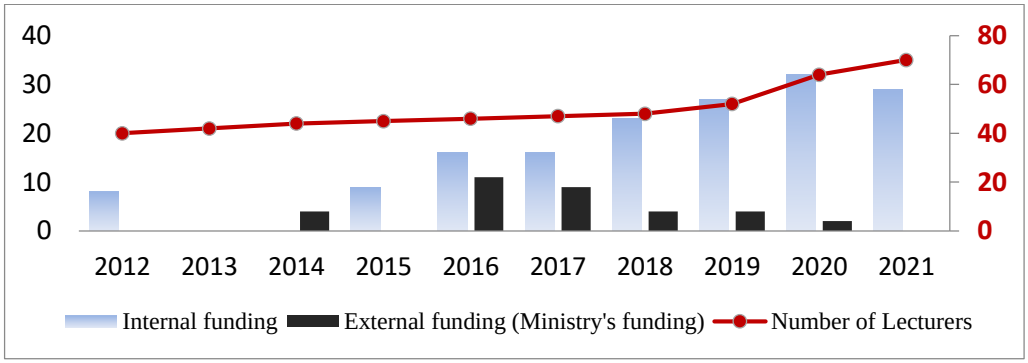

Figure 2. Number of Lecturers and Research Funding Attainment
(Source: Center of research and community service of polytechnic object)

Discussions

The findings are discussed under six emerging themes in this study, i.e., human resource management policy, research progress, research policy, research funding, research benefits and incentives, and specialized research leadership.

Human Resource Management Policy

The theme of "human resource management policy" related to providing capacity-building programs concerning personal capacity for research and publication, normalizing teaching and administrative workloads, and fostering collaboration between lecturers within and across institutions. According to the findings, one of the major barriers for lecturers conducting research was an excessive teaching load. Normalizing the lectures' workload within the institution by new lecturer recruitment or eliminating some courses is a rational option. A similar finding was also made by Q. Nguyen et al. (2016) where the teaching load that was too high makes research productivity decrease. Besides normalizing the teaching load, the possibility offered solution is to pursue the integration between research and teaching in lecturers' academic activities (Brew, 2010), such that these two mandatory works, i.e., education and research, are not much more dichotomized.

Collaboration, an essential factor in the productivity and quality of research activity (Porac et al., 2004), was considered lack by the participant. Bozeman & Corley (2004) pointed out that collaboration provides several benefits, including access to the sharing of expertise, facilities and equipment, funding, and getting prestige or visibility, pooling knowledge for overcoming the complex problem, also fun and pleasure in friendship. In this regard, a good way to get lecturers pursuing collaboration is to offer them a good reason to do so, such as an attractive incentive and reward. Another way is to facilitate academics to carry out academic mobility toward advanced university and industry. It can boost lecturers' creativity while also expanding their professional and social networks, knowledge improvement, cultural awareness, and prestige (Horta et al., 2020; Sage, 2020). This works for both academic-academic and academic-industry collaboration, with the goal of making research and capacity technology that help each other for mutual exchange of beneficial knowledge and resources.

Participants' expressions about how hard it is to get an external research grant are in line with another ability: publishing research. Thus, it is necessary to intervene with capacity-

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building programs to enhance capability for winning grants and publication. As stated in the key findings of recommended practice in a developed country like the United States (Hanover research, 2014), institutions wishing to acquire research productivity must allocate significant faculty training and support resources. Likewise, Bland et al. (2005) asserted that continuing education and measurable capacity building program are needed to get acceleration in research productivity.

Research Progress

Theme of "research progress" related to how progress development of research within polytechnic-object is seen and felt by participants. The finding shows that there has been a development infrastructure provided for research activities in the last five years, at least until 2020. The unestablished culture of research in polytechnics as a vocational college compared with academic colleges was the issue that many lectures were aware of. One of participant said "*The research atmosphere in vocational colleges is not as good as academic college…"* This condition was reasonable considering that prior to 2012, polytechnics did not much focus on research activities. Rather than academically oriented, polytechnics tended to focus on vocational education, emphasizing their efforts to produce work-ready graduates, until then the Law on Higher Education (Law No. 12/2012) was enacted.

As drawn on management theory, there were strong correlation between changes in beliefs, attitudes and values in bringing toward a change in the organizational culture, especially in some cases about an established culture of research (Pratt et al., 1999). In light of that, the decentralized management structure, as empirically practiced by such institutions, may enable the institution to direct its resources in the most efficient manner to achieve accelerated progress in change.

Research Policy

Theme of "research policy" related to creating a conducive environment for research, and guiding research capacity toward measurable improvement. The findings revealed that the quality of policy in managing research was viewed as one of under-expectation performance by the participant. Negative sentiment regarding the consistency of the research roadmap was expressed by several lecturers. One of them said, "There is no assigned research related to priority issues. It impressed "up to you" or "without direction." A participant who had worked for more than ten years stated, "My research theme is still not consistent in one theme. It tends to change every year depending on available inspiration..." Whereas, based on experience both in the context of developed (e.g., Uncles, (2000), and developing countries (e.g., N. D. Nguyen et al. (2021), without a doubt, it can be concluded that the quality of policies, particularly in guiding program building and capacity, has a positive effect on research productivity in a higher education institution. Thus, the institution should facilitate involvement and acceptance in the developing research culture, including strategic planning, by creating a supportive environment and conducive atmosphere for voicing ideas, including criticism of existing practices.

Research Funding

Theme of "research funding" related to raising and managing funds for high-quality research and innovation. Insufficient funding was the most mentioned barrier to conducting research.

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This insufficiency possibly is due to two things: the limited capacity of the institutional budget and the institutional policies that had not given high priority to research activities. Excessive workload and limited funding are two issues that have been frequently mentioned in several responses. Although they had been repeatedly conveyed by several scholars (e.g., Hidayat, 2008), they were still issues that had not been fully addressed by several Higher Education Institutions in Indonesia in fostering research productivity (Vina Oktaviana, 2020). Empirically, Álvarez-Bornstein & Bordons, (2021) revealed that an adequate funding strongly correlates with publication quality. He said that well-funded research is more capable of publishing in prestigious journals. Thus, better tailoring policy in budget provision should be implemented based on the capacity of institutional resources.

Research Benefits and Incentives

The theme of "research benefits and incentives" related to giving value added by means of rewards and incentives based on research output or outcome. Motivation of participants to conduct research was still mostly to fulfilling the mandatory work (i.e., teaching, research, and community service). As empirically academic engagement in higher education institutions are crucial credit points in applying for academic promotion (Smith et al., 2014). Thus, there was an apparent need for tailoring more resources to improve lecturers' motivation to conduct research and for providing a strong commitment from the leader to enhance the reward system policy.

It is undeniable that financial benefits is an important element in one's activities for the sake of economic-pragmatic motives besides the idealism of the need for self-development (Lach & Schankerman, 2008; Zutlevics, 2016). It was found even in the context of developed country that the more considered incentives by academic faculties, the more increased publication motivated by financial incentive (Andersen & Pallesen, 2008). Meanwhile, in the context of a developing countries, there was more direct-impact where sufficient incentives had a significant effect on research productivity in higher education institution (Q. Nguyen et al., 2016). Thus, the commitment of top management to allocating a certain amount of additional funds for research and financial incentives in this study serves as a concrete policy that has more direct-impact.

Specialized Research Leadership

The theme of "specialized research leadership" related to support and a powerful guidance of research activity from top leader within institution. The leadership issue was mentioned at least three times by participants in different sentences. One of the participants said, "Rather than demanding lecture to conduct research, commitment from the leadership in allocating more funding and organizing research capacity building programs for lecturers would be more impactful." The policy of providing incentives was also considered as a part of the leadership's commitment implementation to improve the quality of research due to the budgetary power attached, outside the policy of increasing lecturers' capacity. This policy can indirectly increase a positive image for the leadership and address participant's skepticism over the quality of commitment and leadership in managing research.

In higher education institutions, transformational leadership, knowledge, and research are critical to innovation in education management and leadership (Howell et al., 2022). One of the tasks that must be completed by higher education leaders is the

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development of strategic research programs for institutions, which is best accomplished by utilizing the resources and creativity of existing lecturers and staff. Natural research groups should do their function with an autonomy and hold unimpeded meetings during strategic planning to share ideas while working on strategic plans for the next period. Advice from more senior scholars is required. As revealed in the previous study (such as: Bland et al., 2005; Nguyen et al., 2021), the said best practice leadership played a significant role in enhancing the research productivity of higher education institutions.

Conclusion

This study was motivated by the desire to get information concerning the existing research culture, including the driving factors and barriers to conducting research within vocational higher education institutions: polytechnics, from the lecturer's perspective. The summative content analysis approach was used to analyze the open-ended responses in which the codes were sought and categorized into six themes: human resource management policy, research progress, research policy, research funding, research benefits and incentives, and specialized research leadership. The sentiment analysis of codes, which illustrates the expression of participants concerning the research culture, shows that the majority of expressions depicted a negative rating of research culture. The most common barriers experienced by participants to conducting research were limited funding and workload, while the most driving factors were policy and career advancement.

Two-fold suggestions are proposed in this study. First, institutions must be able to ensure the proportionality of the workload of all lecturers. Income generated from excess teaching workload can be diverted into financial incentives for research performance. However, it is necessary to identify a precise formula of how it can be done. Second, to improve the research culture, the tailoring of resources must be held effectively based on current motivations and abilities. If lecturers already have high motivation but low abilities, then the capacity-building program should be strengthened. On the other hand, if motivation is still low, it would be more beneficial to offer lecturers incentives and to develop collaboration both within the institution and within the wider academic community. The existing resources should be optimized through measurable programs for fostering research performance.

This study has several limitations. Since this study involved a small number of participants in a polytechnic object, it does not necessarily result in a suitable recommendation for all polytechnic institutions. Some findings can perhaps be used as starting points in future studies to catch up with the research performance of polytechnics. This study was carried out in a qualitative method where the findings were subjectively interpreted by the authors and were influenced by their capacity to generate appropriate judgments. In this respect, all of the authors have had first-hand experience with both research activities and resource management within the research organization. The quantitative research can be carried out to provide objective interpretation and to make more generalized results, guiding polytechnics toward effective policy in their catching up.

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Human Participants

The authors confirm that research involving human participants, human material or personal data complies with all legal and ethical requirements and other applicable guidelines.

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