

Analysis Of JMTI ITK Lecturer Human Resource Mapping Using The 5C-4C Knowledge Conversion Method To Support Smart Governance At JMTI ITK

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Abstract. Lecturers as a driving element in higher education are an important factor in encouraging higher education progress. The implementation of the Tri Dharma of Higher Education and supporting factors will be assessed using BKD (Lecturer Workload). In its implementation, the assessment is carried out using BKD in the fields of education, research, community service and support in the even semester of the 2021/2022 academic year and the odd-even semester of the 2022/2023 academic year. Mapping is also based on type of study program, education level, employment status and functional position. To ensure the implementation of lecturers' duties, an analysis of the human resources of JMTI ITK was carried out. Processing data into information uses the 5C method which consists of contextualizing, categorizing, calculating, correcting and condensing. Next conversion process to gain knowledge is carried out using the 4C method which consists of comparison, consequence, connection and conversation. The results of this research show equality in the weight of the Education BKD. However, there are one or two lecturers who have research and community service BKD above average. Ten percent of lecturers require special attention to increase workload. Meanwhile, the rest already have a workload of more than 16 credits.

1 Introduction

The Department of Mathematics and Information Technology (JMTI) of the Kalimantan Institute of Technology (ITK) is one of the departments in which there are six study programs, namely Mathematics, Informatics, Information Systems, Statistics, Actuarial and Digital Business. In order to achieve the institute's goals, JMTI has a vision of becoming a center for the development of mathematics, data processing, information technology, and its application to play an active role in empowering the potential of the East Kalimantan region

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by 2035. To realize this vision, it is necessary to carry out a mission, namely contributing to the development of science and technology through higher education tri dharma activities, establishing collaboration with various industrial and government sectors to support independent campuses, and producing graduates who have competencies in the fields of mathematics, data processing, information technology and their applications who can contribute to national development [7].

The quality of human resources, including lecturers, is one of the factors needed to increase the performance and productivity of a higher education institution in achieving the vision through the stated mission. Therefore, human resources are needed who have high competence because their skills or competencies can support increasing lecturer work performance. Academic activities involving lecturers, staff, and students with load composition are based on DIKTI regulations, which are interpreted into the Lecturer Workload (BKD) component. The load composition in question is the Tri Dharma of Higher Education as the main elements, namely education, research, and community service, as well as additional elements, namely support. Lecturers, as one of the knowledge workers in the knowledge conversion process, are the object of research regarding the management of these burdens in carrying out their obligations [1].

JMTI ITK has 61 lecturers from six study programs. From the data obtained, it is still difficult to determine whether lecturers already have a high workload or lecturers still have a low workload, as well as whether there is an even distribution of the workload for each lecturer in the study program or there are certain study programs where the lecturer's workload is still below average. The aim of this research is to identify BKD information and knowledge in the fields of education, research, community service, and lecturer support within the JMTI ITK environment. The BKD calculation begins by identifying data in the fields of education, research, community service, and supporting factors.

Higher education HR management is part of the management of the entire academic community. One of the challenges for higher education managers, especially HR management, is to present a professional lecturer profession where the final output is that the campus is able to produce graduates who are competent in their respective fields. At the same time, the existence of professional lecturers is a necessity to realize the vision and mission of the university.

Based on DIKTI's Lecturer Workload Guidelines, lecturers have the main task of implementing the Tridharma of Higher Education, which consists of education and teaching, research, and community service, which is represented through workload figures, in this case using semester credit units (SKS). The achievement of lecturer workload performance requires regular reporting and evaluation to ensure that lecturer performance is in accordance with the standards set out in statutory regulations.

This research is one way towards smart governance, where all policies as an effort to develop bureaucracy are taken based on the results of the analysis. So this research is suitable if it is included in the smart city research scheme to support bureaucratic development, especially at JMTI ITK. It is hoped that the results of this research can identify the workload conditions of lecturers in the JMTI ITK environment and can carry out related evaluations to determine policies related to mapping lecturer performance in the JMTI ITK environment. Based on this research, it is hoped that it can optimize the performance of lecturers in carrying out the tridharma of higher education and achieving the goal of making the nation's life intelligent.

2 Method

The analysis steps in this research are as follows:

1. At the data collection stage, there are two types of data that will be collected: tacit knowledge and explicit knowledge. Tacit knowledge was obtained by conducting a literature study on BKD weighting. Explicit knowledge is obtained by searching for data in the form of SKs and lecturer assignment letters, which can then be identified so that they can be converted into credits.
2. In 5C method process, explicit data processing will be carried out that has been obtained, namely data related to lecturers' duties in the fields of education, research, and community service, as well as supporting factors to be converted into information. The 5C method consists of contextualization, categorized, calculated, corrected, and condensed.
3. At the stage 4C, a comparison of the BKD values for each filled cluster is carried out, as is a comparison of the BKD values according to the JFA. Then, a process of searching for implications between the information and knowledge obtained and the policies that must be taken by the institution's management is carried out. At this stage, the process of searching for relationships between the information and knowledge that have been obtained is also carried out. The connection results obtained were obtained by comparing the BKD with the number of lecturers and the number of students per study program.
4. Description and Exploratory Analysis
5. After obtaining the results in the previous stage, proceed with analyzing the description of the results obtained.
6. Interpret and write it in the report.
7. Write papers and participate in international seminars.

The analysis steps described above can be described in the form of a flow diagram, as shown in the following figure.

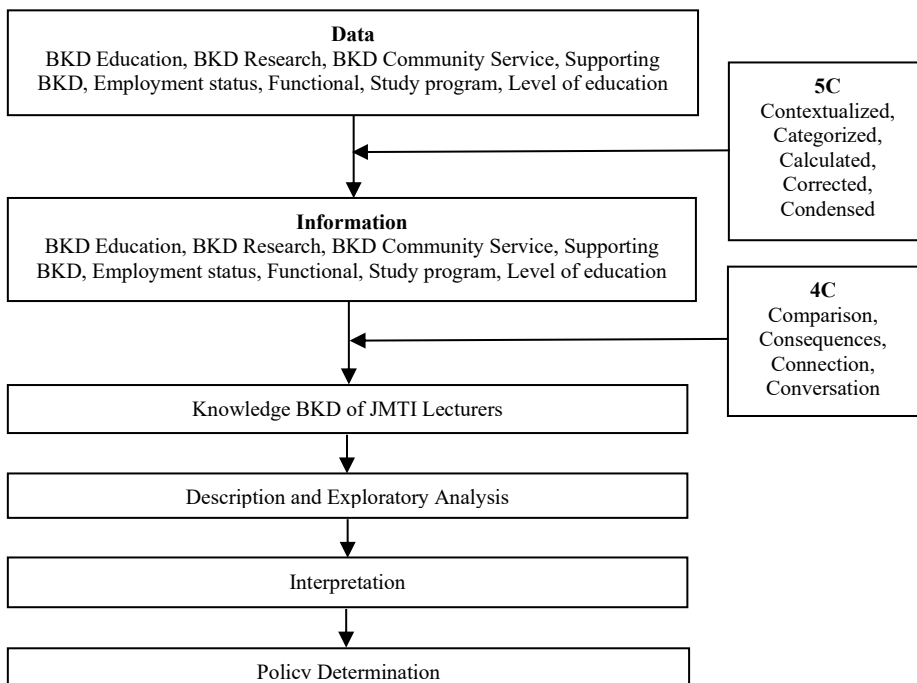
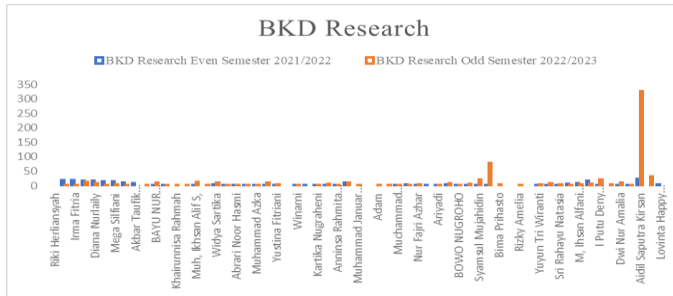


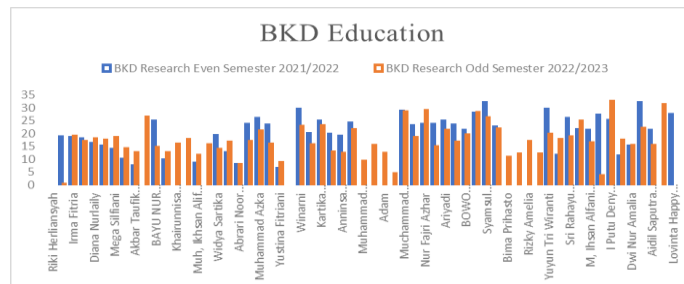
Fig. 1. Research Flow Chart

The following is a description of the data used in this research.

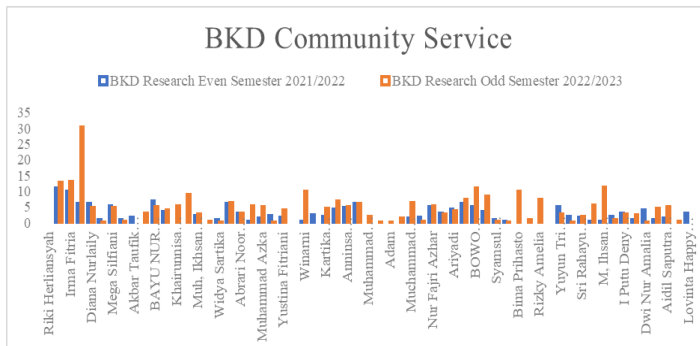
2.1 Explicit Data on the Lecturer Workload



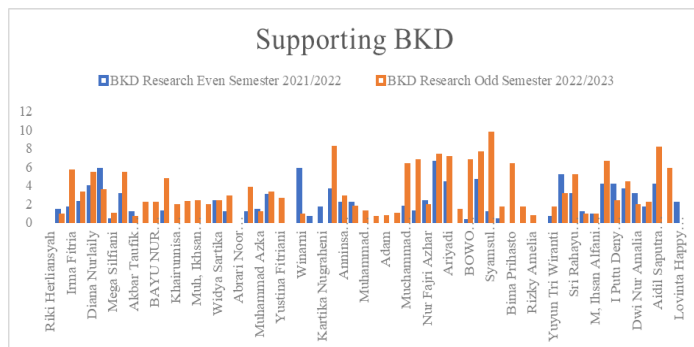
(a) Comparison of Research BKD



(b) Comparison of Education BKD



(c) Comparison of Community Services BKD



(d) Comparison of Supporting BKD

Fig. 2. (a), (b), (c), (d) Explicit Data on the Lecturer Workload

2.2 Explicit Data Mapping JMTI Lecturers

Table 1. Number of JMTI ITK Lecturers

Study Program	Number of Lecturer
Mathematics Study Program	10
Statistics Study Program	10
Information Systems Study Program	13
Informatics Study Program	14
Actuarial Study Program	6
Digital Business Study Program	8

Table 2. Education Level of JMTI ITK Lecturers

Education Level	Number of Lecturer
S2	53
Master in Study Period	7
S3	1

Table 3. JMTI ITK Lecturer Employment Status

Employment Status	Number of Lecturer
ASN	47
Non ASN	14

Table 4. JMTI ITK Lecturer Functional Position

Functional	Number of Lecturers
Non	13
Asiten Ahli	26
Lektor 200	15
Lektor 300	7

3 Result and Discussion

In this section, it is explained the results of research and at the same time is given the comprehensive discussion.

3.1 Data Collection Stage

At the data collection stage, there are two data that will be collected, namely tacit knowledge and explicit knowledge. Tacit knowledge was obtained by conducting a literature study on BKD weighting. Explicit knowledge is obtained by searching for data in the form of SKs and lecturer assignment letters which can then be identified so that they can be converted into credits.

3.2 Method 5C

In this process, explicit data processing will be carried out that has been obtained, namely data related to lecturer assignments in the field of education and supporting factors to be converted into information. The 5C method consists of contextualization, categorized, calculated, corrected, and condensed.

3.2.1 Contextualization

In this process, the benefits of the data that have been collected are identified to see the influence and interactions of the data. The benefits of this data are grouped into data in the fields of education, research, community service and support.

3.2.2 Categorized

In this process, an understanding of the unit of analysis or key components of the data is carried out. The categorical data obtained is transformed into numerical data. The following is a change in the form of categorical data to numerical data on four variables.

Table 5. Study Program Variables

Categorical Data	Numerical Data
Statistics Study Program	0
Digital Business Study Program	1
Actuarial Study Program	2
Mathematics Study Program	3
Informatics Study Program	4
Information Systems Study Program	5

Table 6. Education Level Variable

Categorical Data	Numerical Data
S2	0
Master in Study Period	1
S3	2

Table 7. Employment Status Variables

Categorical Data	Numerical Data
Non ASN	0
ASN	1

Table 8. Functional Position Variable

Categorical Data	Numerical Data
Non	0
Asiten Ahli	1
Lektor 200	2
Lektor 300	3

3.2.3 Calculated

In this process the data will be processed mathematically or statistically to find out information about the amount of data that has been obtained. After carrying out the calculations, information was obtained regarding the number of lecturers according to employment status categories, education level, functional positions and study programs.

Apart from calculating the number of lecturers according to the categories that have been created, in this calculated process, BKD calculations are also carried out in the fields of education, research, community service and support for each lecturer. Meanwhile, descriptive statistical values for BKD data for the Even Semester 2021/2022 and Odd Semester 2022/2023 data are in the following table.

Table 9. Descriptive Statistics from BKD data for Even Semester 2021/2022

	Education	Research	Community Service	Supporting
Mean	18,38961	2,811373	2,893333	1,908039
Minimum	0	0	0	0
Maximum	32,02	23	11	6,5
Standard Deviation	8,927006	4,285623	2,520722	1,768638

From Table 9, it is known that the Research BKD has a large standard deviation when compared to the average value. So it is known that there is a big difference in each JMTI Lecturer's research BKD value in the Even Semester 2021/2022.

Table 10. Descriptive Statistics from BKD data for Odd Semester 2022/2023

	Education	Research	Community Service	Supporting
Mean	16,29784	10,90946	4,256311	2,917869
Minimum	0	0	0	0
Maximum	32,525	327,8	30,5	9,625
Standard Deviation	7,297999	42,73307	4,924202	2,545637

From Table 10, it is known that the Research BKD and Community Service BKD have a large standard deviation when compared to the average value. So it is known that there is a big difference in each JMTI Lecturer's research and community service BKD value in the Odd Semester 2022/2023.

3.2.4 Corrected

At this stage, a data correction process and previous processes will be carried out so that the validity of the information obtained is more optimal. The following is the number of lecturers in each cluster which is divided into Even Semester 2021/2022 data and Odd Semester 2022/2023 data.

Table 11. Final Partition Data for Even Semester 2021/2022

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	6	14,138	1,44785	2,16088
Cluster2	42	258,806	2,42041	3,61391
Cluster3	3	12,438	2,02192	2,34004

Table 12. Final Partition Data for Odd Semester 2022/2023

	Number of observations	Within cluster sum of squares	Average distance from centroid	Maximum distance from centroid
Cluster1	24	152,851	2,41594	4,22394
Cluster2	35	153,282	2,03620	3,25868
Cluster3	1	0,000	0,00000	0,00000
Cluster4	1	0,000	0,00000	0,00000

3.2.5 Condensed

In the Condensed stage, data will be simplified and visual improvements will be made to make it easier to understand. The data obtained will be made in graphic or diagram form to make it easier for readers to understand. The cluster visualization for each semester can be seen in the following figures.

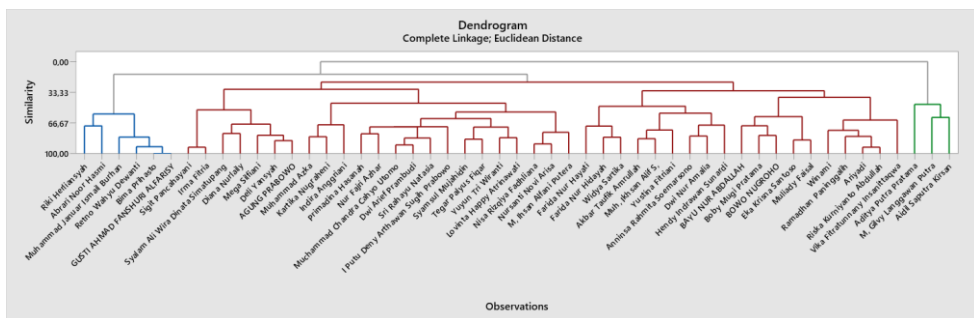


Fig. 3. Data Deondrogram for Even Semester 2021/2022

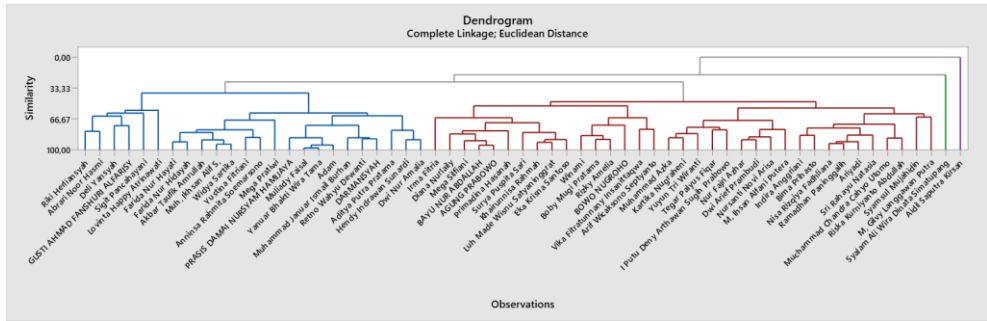


Fig. 4. Odd Semester Data Deondogram 2022/2023

3.3 Method 4C

The process consists of comparison, consequences, connection and conversation stages.

3.3.1 Comparison

Comparison is a stage for comparing information that has been obtained at stage 5C. At this stage, a comparison of the BKD values for each cluster that has been obtained is carried out for both the 2021/2022 Even Semester data and the 2022/2023 Odd Semester data.

The following are the results of a comparison of the 2021/2022 Even Semester data with the clusters that have been obtained.

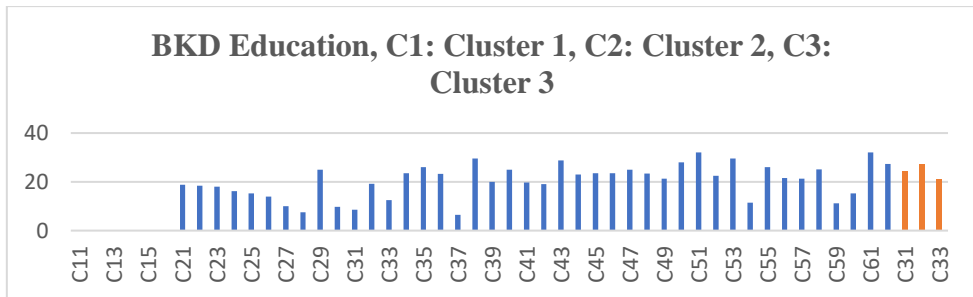


Fig. 5. Comparison of Education BKD in Each Cluster for Even Semester 2021/2022 Data

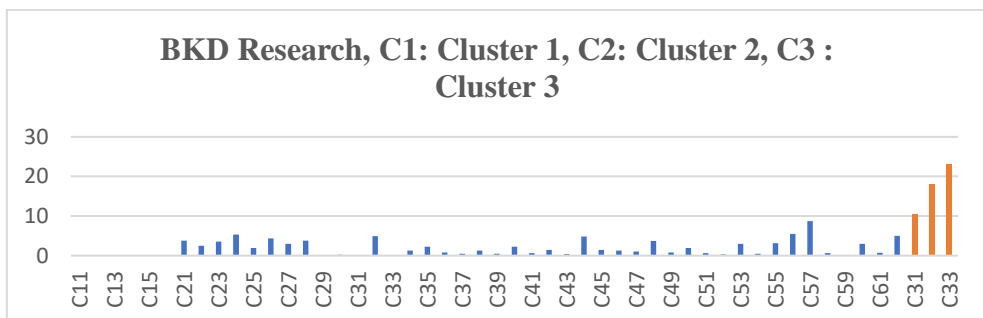


Fig. 6. Comparison of Research BKD in Each Cluster for Even Semester 2021/2022 Data

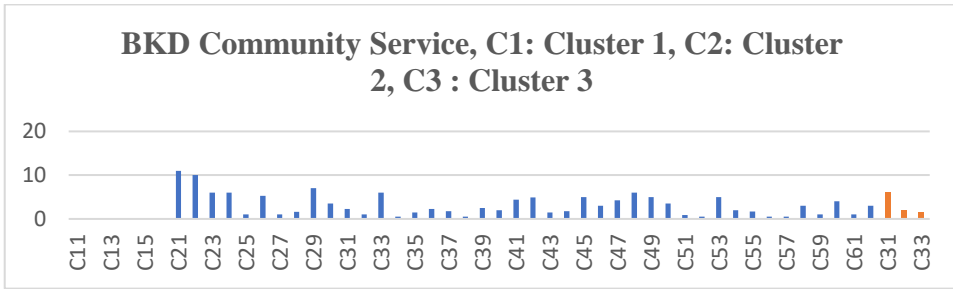


Fig. 7. Comparison of Community Service BKD in Each Cluster for Even Semester 2021/2022 Data

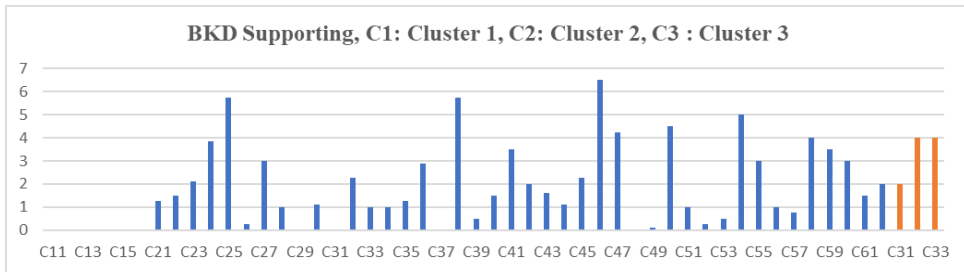


Fig. 8. Comparison of Supporting BKD in Each Cluster for Even Semester 2021/2022 Data

Based on Figures 5-8, it is known that in BKD research cluster 3 has a greater value than the other clusters. This is in accordance with Table 9, which describes that the research BKD data has a large standard deviation. Meanwhile, the other BKD values are not much different. So the division of clusters in the 2021/2022 Even Semester data is based on the research BKD.

The following are the results of comparing the 2022/2023 Odd Semester data with the clusters that have been obtained.

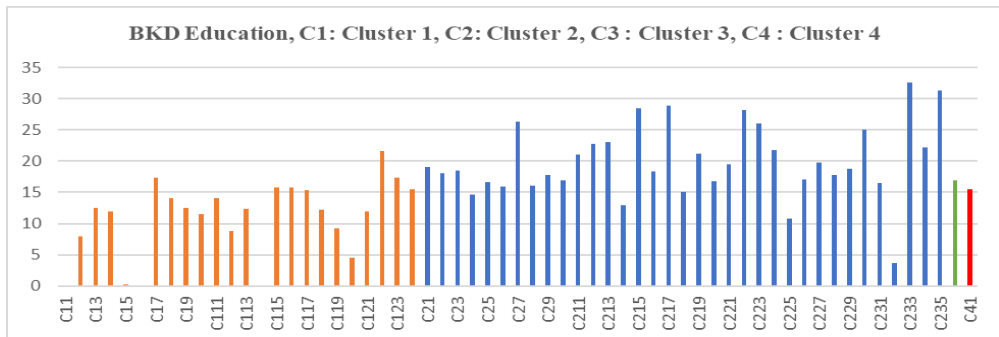


Fig. 9. Comparison of Education BKD in Each Cluster for Odd Semester Data 2022/2023

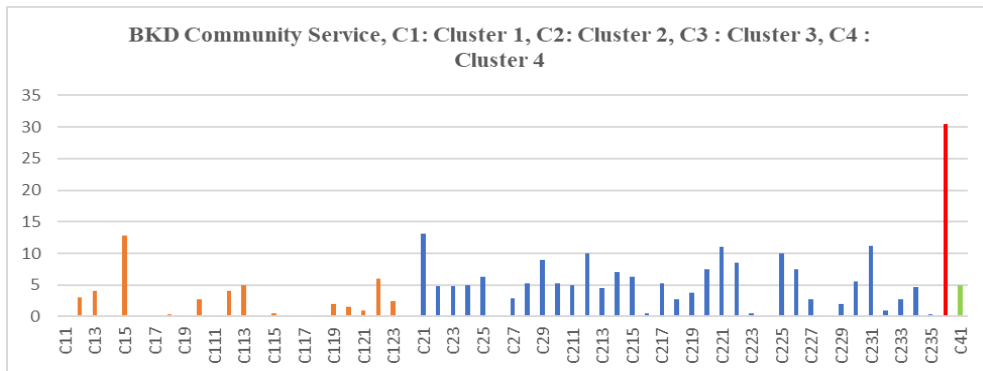


Fig. 10. Comparison of Research BKD in Each Cluster for Odd Semester Data 2022/202

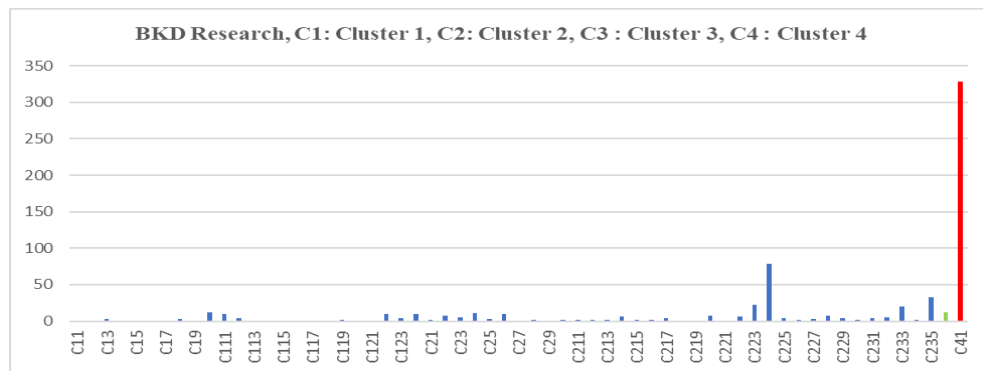


Fig. 11. Comparison of Community Service BKD in Each Cluster for Odd Semester Data 2022/2023

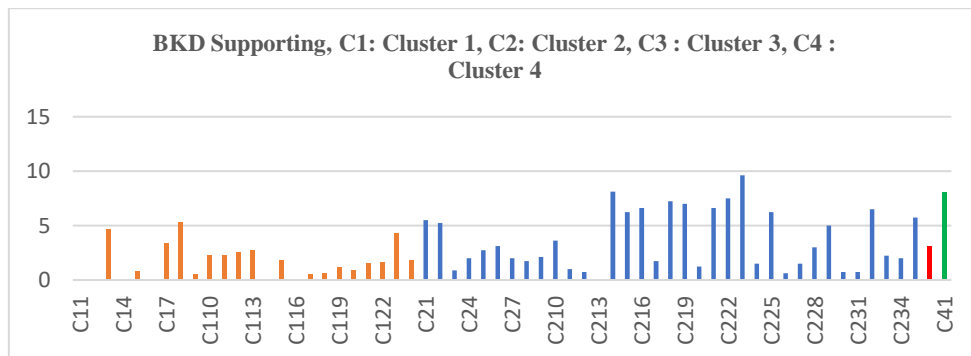


Fig. 12. Comparison of Supporting BKD in Each Cluster for Odd Semester Data 2022/2023

Based on Figures 9 – 12, it is known that the research BKD cluster 4 has a greater value than the other clusters and the community service BKD cluster 3 also has a large value compared to the other clusters. This is in accordance with Table 8, which describes that the BKD research and community service data have a large standard deviation. Meanwhile, the BKD values for other variables between clusters are not much different. So the division of clusters in the 2022/2023 Odd Semester data is based on BKD research and community service.

3.3.2 Consequencess

At this stage, the process of searching for implications between the information and knowledge obtained and the policies that must be taken by the Institution's management is carried out. The following is a table of the number of lecturers whose BKD weight is less than 12 credits (not meeting BKD), in the range 12 – 16 credits (meeting BKD), or more than 16 credits (overload) in each cluster, both in the even semester of the 2021 academic year /2022 and odd semester 2022/2023.

Table 13. Number of Lecturers with BKD status in each Cluster

Data Type	Jenis Cluster	Number of Lecturers		
		Does not meet BKD	Meet BKD	Overload BKD
Even Semester 2021/2022	Cluster 1	6	-	-
	Cluster 2	2	3	37
	Cluster 3	-	-	3
Odd Semester 2021/2022	Cluster 1	4	8	12
	Cluster 2	-	-	35
	Cluster 3	-	-	1
	Cluster 4	-	-	1

3.3.3 Connection

At this stage, the process At this stage, the relationship between small pieces of information and other information will be found. The BKD status of study program lecturers will be compared with mapping in several clusters.

Table 14. Number of Study Program Lecturers with BKD status in each Cluster, Even Semester 2021/2022

Study Program	Cluster 1			Cluster 2			Cluster 3		
	TM	M	O	TM	M	O	TM	M	O
Statistics	1	-	-	-	1	7	-	-	-
Digital Business	-	-	-	1	1	3	-	-	-
Actuarial Science	1	-	-	1	-	3	-	-	-
Mathematics	2	-	-	-	-	5	-	-	2
Informatics	2	-	-	-	-	10	-	-	-
Information Systems	-	-	-	-	1	9	-	-	2

Note: TM (Not Compliant), M (Compliant), O (Overload)

Table 15. Number of Study Program Lecturers with BKD status in each Cluster, Odd Semester 2022/2023

Study Program	Cluster 1			Cluster 2			Cluster 3			Cluster 4		
	TM	M	O	TM	M	O	TM	M	O	TM	M	O
Statistics	1	2	2	-	-	4	-	-	1	-	-	-
Digital Business	-	-	4	-	-	4	-	-	-	-	-	-
Actuarial Science	1	1	1	-	-	3	-	-	-	-	-	-
Mathematics	1	3	3	-	-	3	-	-	-	-	-	-
Informatics	-	2	-	-	-	12	-	-	-	-	-	-
Information Systems	1	-	2	-	-	9	-	-	-	-	-	1

Note: TM (Not Compliant), M (Compliant), O (Overload)

From the table above, it is known that the majority of JMTI ITK lecturers have an overloaded BKD weight status. However, there are several lecturers, both new and existing lecturers, who need attention to increase the weight of BKD research, community service and its support. Meanwhile, the weight of BKD for education is distributed evenly. Hamukti, et al [6] conducted the same research regarding the workload of lecturers and obtained the results that the level of functional position of lecturers had an influence on the division of work of lecturers due to DIKTI regulations which stipulate that some lecturer tasks may only be carried out by lecturers with a certain level of functional position.

3.3.4 Conversation

At this stage, a discussion was held with the Head of the JMTI ITK Department regarding the results of mapping research by JMTI ITK lecturers in the even semesters 2021/2022 and odd semesters 2022/2023 so that in the future a policy regarding this matter would be provided.

4 Conclusion

Based on the data analysis that has been carried out, the following conclusions can be drawn:

1. Analysis of HR mapping for JMTI ITK lecturers in the even semester of the 2021/2022 academic year consisting of 3 clusters. The first cluster consists of 6 lecturers who are lecturers with learning assignments, the second cluster consists of 42 lecturers with heterogeneous characteristic variables, and the third cluster consists of 3 lecturers whose research BKD is higher than the others.
2. Analysis of HR mapping for JMTI ITK lecturers in the odd semester of the 2022/2023 academic year consisting of 4 clusters. The first cluster consists of 24 lecturers with heterogeneous characteristic variables, the second cluster consists of 35 lecturers who have BKD overload and are ASN. For the third cluster, there is 1 lecturer with a very high BKD for community service and the fourth cluster consists of 1 lecturer whose BKD for research is very high.
3. Based on the mapping analysis that has been carried out, the results obtained are that the main cause of clusterization is based on the weight of the BKD explicit data, after that looking at the JMTI ITK explicit data variables.
4. There are 10% of lecturers who need special attention regarding increasing the weight of research, community service and support BKD.
5. The weight of BKD Education is evenly distributed in JMTI ITK.

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