Development of Web-based Research and Community Service Database at Universitas Negeri Surabaya

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Abstract. One of the data used as a benchmark for determining the progress of a university can be seen from the productivity of research and community service. The research objectives are to (1) analyze Unesa lecturer research based on the distribution of faculties/departments/study programs; (2) analyzing trends in the research focus of Unesa lecturers; (3) analyzing the achievement of Unesa lecturer research outcomes compared with the target research outcomes; and (4) analyzing the profile of the service to the Unesa lecturer community based on the distribution of faculties/departments/study programs. The reference used in analyzing is from 2015-2019. The development model used is the Waterfall model with a linear development system. The research subject used was the procedure of developing Sistem Informasi Riset dan Pengabdian Kepada Masyarakat (SIRIP) in Higher Education. Data analysis techniques were carried out in three stages, namely pre-development, development, and post-development. Based on the results and discussion, the conclusions in this study are as follows. The results of the trial of Sistem Informasi Riset dan Pengabdian Kepada Masyarakat (SIRIP) using the black box testing method in accordance with 18 functional requirements of the system can run successfully. The profile of research in Unesa from 2015-2019 experienced a significant increase and decrease (fluctuation). The number of research titles funded from 2015-2019 was as many as 250 titles, 585 titles, 700 titles, 480 titles, and 447 titles. Meanwhile, the number of community service titles funded from 2015-2019 was 46 titles, 51 titles, 29 titles, 22 titles, and 338 titles, respectively.

1. Introduction

At present, the use of information systems is a necessity that must be owned by various institutions, both private and government, not least in higher education institutions. Through the use of information systems, all required data can be accessed easily because it has been recorded and stored in a database. Meanwhile, through all the data that has been stored in the database, higher education institutions or universities can quickly determine whether they are in positive trends or vice versa [1,] [2]. One of the data that can be used as a benchmark for assessing the progress of a university can be seen from the
productivity of research and community service. The productivity includes the number of outputs, the number of scientific article publications, and the acquisition of intellectual property generated by researchers [3].

Besides, other data that can be used as benchmarks are the results of an assessment of research performance and community service based on data collected by each college in Simlitabmas [4], [5]. Where the evaluation of research performance and community service is divided into four clusters. Based on the analysis of data that has been verified, 47 universities are included in the independent group, 146 main groups, 479 middle groups, and 1,305 target groups [6]. Aspects measured in performance appraisal generally include aspects of resources, aspects of management, aspects of the resulting output, and revenue that can be generated from research activities and community service. [7].

We can imagine the benefits that can be obtained if all the data can be accessed easily both for the needs of supporting research data and the need to measure the extent of the trend (progress) of the university from year to year. Besides, by implementing an open access policy through the use of information and communication systems, it can support government policies as stated in Law No. 14 of 2008, concerning Public Information Openness. [8]. The essence and this law are to give an obligation to every Public Agency to open access for every applicant for public information in obtaining general information, except for certain confidential information.

Universitas Negeri Surabaya (Unesa) is one of the institutions of higher education that continues to strive to improve the quality of Higher Education Tridharma, which includes teaching, research, and community service. Even based on the results of an assessment of research performance and community service, Unesa became one of 47 universities included in the independent cluster. This shows that all Unesa academicians, lecturers, students, and employees must be able to show consistency in the preparation of research proposals and community service. Through this consistency, it certainly has a positive impact on improving the quality and quantity of research in the Unesa environment. However, unfortunately, until now, no information system facility can store or record research results for lecturers, students, and employees as the cause of Institute for Research and Community Service (RCSI) difficulty in determining trends in research productivity and service to the Unesa community.

Based on the description of the background and existing problems, the formulation of the research includes: (1) how is the research profile of Unesa lecturers starting in 2015-2019 based on the distribution of faculties/departments/ study programs ?; (2) what is the trend in the focus area of Unesa lecturer research starting in 2015-2019 ?; (3) how is the achievement of Unesa lecturer research outcomes starting in 2015-2019 compared to the target research outcomes?; and (4) how is the profile of the service to the Unesa lecturer community from 2015-2019 based on the distribution of faculties/ departments/study programs?

2. Method
In this study, the waterfall model is used as a software development model. The waterfall model has five stages developed by Winston Royce and is a classic development model with a linear development system [9]. The stages in this model include analysis requirements, design, implementation, verification, and maintenance [10], [11]. The scheme of developing the Waterfall model can be seen in Figure 1.
The research subject used was the development procedure Sistem Informasi Riset dan Pengabdian Kepada Masyarakat (SIRIP). Actors, as well as users involved in this information system, include lecturers, research centers, community service centers, and research and community service institutions. The sample used in this study includes data on research results and community service for five years in a row (2015-2019). Data collection techniques through documentation analysis. Data analysis techniques were carried out in three stages, namely pre-development, development, and post-development. Pre-development is carried out with observation techniques to analyze the simlitabmas system that already exists in Kemenristekdikti. Development is done by testing the system using the black box testing method. Then post-development is done by questionnaire method to find out the user's response to the developed system.

3. Results and Discussion

3.1 Development of web-based research and service information systems

3.1.1 System Requirements Analysis

Analysis of system requirements in this study is divided into two parts, namely: functional requirements and non-functional requirements. The functional requirements of SIRIP generally describe the system that will be developed in this study. Functional needs consist of nine components which include: (1) lecturer data management; (2) research and service data management; (3) faculty, department and study program data management; (4) data management of research and service outcomes; (5) data management of research and service types; (6) data management in the fields of science, excellence, research, service; (7) data management research and community service schemes; (8) group or space data management; and (9) research and service data analysis.

The non-functional requirements of a career center system are the needs that are used to support the running of the system following the results of interviews and observations. Non-functional system requirements, namely the system, can store research data and devotion to lecturers and web-based systems that can be accessed for 24 hours.

3.1.2 System Design

SIRIP system design in this study was made by referring to the results of the system requirements analysis. The system design is made in the form of a Business Process / Flow Diagram as the flow of SIRIP in Unesa. Use Case Diagrams (UCD) are used to explain the distribution of user access rights. The role or power of access is adjusted to the needs analysis that has been done before. Entity Relationship Diagram (ERD) is used to explain the relationships between tables in the system. Contextual Data Model (CDM) and Physical Data Model (PDM) are used to connect 18 tables in the SIRIP system that are interconnected with each other.

3.1.3 System Implementation

The system developed in this study was carried out after the design stage. The intended event is to make a web-based SIRIP at Surabaya State University. The system was developed using the PHP programming language and MySQL database while facilitating development using the Laravel
framework. Laravel Framework is used to manage files with the concept of MVC (Model View Controller).

3.1.4 System Testing
The system testing will be carried out using the black box testing method in accordance with the functional requirements of the system that have been defined in the system requirements analysis. The result is that all components are categorized as successful when tested.

3.1.5 System Maintenance
System maintenance is a process of improvement of the development of web-based SIRIP based on the results of system trials that have been carried out in the previous stage. This system maintenance serves to make improvements to the system in accordance with the functional requirements of the system. System maintenance refers to the results of system trials that have been carried out. In the future this system will develop according to the needs when implemented at the RCSI at Surabaya State University. So that this system will always develop according to needs.

3.2 Unesa Research Profile from 2015-2019
RCSI Unesa in 2015-2019 has had significant performance achievements. Lecturers and students have competed at the national, university, faculty and graduate levels to obtain research funding. At present Unesa has seven faculties, namely Faculty of Education (FEd), Faculty of Languages and Arts (FLA), Faculty of Mathematics and Natural Sciences (FMNS), Faculty of Social Sciences and Law (FSSL), Faculty of Engineering (FEng), Faculty of Sports Science (FSS), and Faculty of Economics (FEc). Thus, the research activities carried out by Unesa lecturers and students cover various types and fields of research both internally and externally funded. To guarantee the quality of research from proposal selection to reporting results, the LPI Unesa RPI Center involves internal and external reviewers. Now, Unesa has internal reviewers reaching tens of people (94 lecturers) and 15 nationally certified reviewers.

The number of studies conducted at each faculty in Unesa in the period 2015-2019 is as follows.

| Faculty | 2015 | 2016 | 2017 | 2018 | 2019 |
|---------|------|------|------|------|------|
| FEd     | 17   | 78   | 134  | 57   | 58   |
| FLA     | 36   | 87   | 81   | 67   | 67   |
| FMNS    | 53   | 105  | 90   | 81   | 79   |
| FSSL    | 54   | 106  | 106  | 97   | 92   |
| FEng    | 70   | 134  | 177  | 105  | 81   |
| FSS     | 7    | 26   | 58   | 29   | 29   |
| FEc     | 13   | 49   | 54   | 44   | 41   |
| **Total** | **250** | **585** | **700** | **480** | **447** |

From table 1 above, if the graph is made, it will be like the following figures 2 and 3.
Meanwhile, for 2019 the total research titles are funded by 447 titles. This has declined slightly from 2018. The cause is that there are a number of studies that were not continued by DRCS because they did not reach the promised output targets. In addition, the higher H-Index as one of the requirements for proposing proposals is also the reason for the low number of research proposals in 2018. Of the 447 titles, the details are Fed (58 titles), FLA (67 titles), FMNS (79 titles), FSSL (92 titles), FEng (177 titles), FSS (58 titles), and FE (54 titles). In 2018, a total of 99 titles were funded by the Directorate of Research and Community Service (DRCS). Meanwhile, the total research funded by students is 43 titles.

Figure 2. Distribution Bar Diagram Number of Research Titles at Unesa starting from 2015-2019

Figure 3. Graph of Distribution of Number of Research Titles at Unesa starting from 2015-2019

From figures 2 and 3, it can be seen that the research profile at Unesa from 2015-2019 experienced a significant increase and decrease (fluctuations). The number of research titles funded from 2015-2019 was as many as 250 titles, 585 titles, 700 titles, 480 titles, and 447 titles. The most number of studies in Unesa achieved in 2017 reached 700 titles consisting of Fed (134 titles), FLA (81 titles), FMNS (90 titles), FSSL (106 titles), FEng (177 titles), FSS (58 titles), and FE (54 titles). In 2018, the acquisition of research titles at Unesa was 480 titles, down from the previous year. The details are Fed (57 titles), FLA (67 titles), FMNS (81 titles), FSSL (97 titles), FEng (105 titles), FSS (29 titles), and FEc (44 titles). In 2018, a total of 99 titles were funded by the Directorate of Research and Community Service (DRCS). Meanwhile, the total research funded by students is 43 titles.
titles), FEng (81 titles), FSS (29 titles), and FEc (41 titles). For the national competitive scheme, mono-year research is funded by 37 titles and multi-year research by 33 titles. So the total research titles supported by DRCS in 2019 are 70 titles. Whereas for research on Non-Tax State Revenue (NTSR) funds, the overall research proposals funded were 162 titles with 137 NTSR competitive research details and assignment research (university strategic policy research and collaborative research) of 25 titles. While the number of research students funded in 2019 increased to 52 titles, an increase from the previous year, which was only 43 titles.

Students interest in researching in 2019 is very high. This is indicated by the number of proposals included in the desk evaluation reaching 550 titles, and only 52 titles were funded (very competitive). Meanwhile, for 2019, this research has been carried out by functional education staff for the first time and has passed 11 research titles. The involvement of Unesa lecturers in conducting research can be seen in Table 2.

Table 2 Number of Unesa Lecturers Conducting Research in 2015-2019

| Faculty | 2015 | 2016 | 2017 | 2018 | 2019 |
|---------|------|------|------|------|------|
| FEd     | 44   | 197  | 391  | 160  | 176  |
| FLA     | 104  | 241  | 1161 | 179  | 185  |
| FMNS    | 142  | 218  | 235  | 225  | 236  |
| FSSL    | 127  | 184  | 261  | 258  | 282  |
| FEng    | 192  | 326  | 533  | 262  | 217  |
| FSS     | 19   | 64   | 178  | 83   | 94   |
| FEc     | 36   | 121  | 156  | 116  | 109  |
| **Total** | **664** | **1351** | **2915** | **1283** | **1299** |

Figure 4. Bar Diagram of Number of Unesa Lecturers Who Conduct Research Starting from 2015-2019
Therefore, the interest in researching Unesa lecturers needs to be maintained and enhanced in the years to come by carrying out various supportive activities. Among them are conducting research socialization through social media (RCSI Unesa website, Whatsapp/WA, Facebook, etc.), conducting direct socialization to all faculties/departments, and conducting workshops on preparing national research.

Figure 5. Graph of Number of Unesa Lecturers Conducting Research Starting from 2015-2019

Based on table 2 about the number of Unesa lecturers, it shows that the interest of lecturers in conducting research has been very encouraging. Data from Pangkalan Data Pendidikan Tinggi (PDDIKTI) until 22 November 2019, the number of Unesa permanent lecturers was 1,003 lecturers. Compared to table 2 above, it can be seen that almost all Unesa lecturers have been involved in research both national competitive and decentralized (DRCS funds, NTSR funds, and BOPTN funds). In addition, lecturers are also involved in postgraduate / faculty / department / study program policy at Unesa. Figure 6 below shows the distribution of Unesa lecturers who conducted research and published in accredited national journals (Sinta) from 2015-2019 which consisted of Professors (52 people), Associate Professors (274 people), Lectors (225 people), Expert Assistants (158 people), teaching staff (17 people), and those that are not identified (244 people).

Figure 6. Distribution of Unesa Lecturers conducting research starting from 2015-2019

Therefore, the interest in researching Unesa lecturers needs to be maintained and enhanced in the years to come by carrying out various supportive activities. Among them are conducting research socialization through social media (RCSI Unesa website, Whatsapp/WA, Facebook, etc.), conducting direct socialization to all faculties/departments, and conducting workshops on preparing national research.
competitive research proposals (centralization and decentralization) as well as NTSR funding research and policy research graduate/faculty/department/study program. Traces of the research activities of lecturers and students from 2015 to 2019 have been recorded in RCSI Unesa's internal data system. From 2016 to October 2018, Unesa's research performance has been established in the Main cluster. Whereas since November 2019, Unesa's research performance has been established in an independent caster. This is surely a proud achievement and needs to be maintained and improved in the years to come.

Based on the results of the Higher Education Research Performance assessment period 2016-2018 and based on the Decree of the Director-General of Strengthening Research and Development Number B/5678/EI.2/HM00.03/2019 dated November 13, 2019, concerning Clusters or grouping of research-based Higher Education Institutions for the period of 2016-2018, Universitas Negeri Surabaya (UNESA) is included in the "Independent" group which was previously included in the "Main" group. Unesa was ranked 38th out of 47 universities that were included in the "Independent" group. This achievement must continue to be improved in the coming years by increasing the quantity and quality of research, research funding, and research outputs. This is undoubtedly a proud achievement and needs to be maintained and improved in the years to come.

The performance of community service to RCSI Unesa in 2015-2019 has been categorized as good. In general, Unesa lecturers have competed to get community service funds at the national, university, faculty, and graduate levels. The amount of community service that has been carried out at each faculty in Unesa in the 2015-2019 period is presented in Table 3.

| Featured Fields           | 2015 | 2016 | 2017 | 2018 | 2019 |
|--------------------------|------|------|------|------|------|
| Food                     | 10   | 20   | 17   | 4    | 9    |
| Energy                   | 2    | 5    | 0    | 0    | 0    |
| Health                   | 3    | 0    | 1    | 1    | 2    |
| Transportation           | 0    | 0    | 0    | 0    | 0    |
| ICT                      | 0    | 0    | 0    | 0    | 3    |
| Defense and security     | 0    | 0    | 0    | 0    | 0    |
| Advanced Material        | 3    | 0    | 1    | 0    | 0    |
| Maritime                 | 0    | 0    | 0    | 0    | 0    |
| Disaster                 | 0    | 0    | 0    | 6    | 5    |
| Social humanities,       | 19   | 26   | 10   | 11   | 319  |
| Culture, Education       |      |      |      |      |      |

From Table 3, it can be seen that the profile of community service in Unesa from 2015-2019 experienced a significant increase and decrease (fluctuation). In 2015, the number of community service proposals funded was 46 titles. In 2016, the number of funded community service proposals increased to 51 titles. In 2017, the number of proposals for community service fell to 29 titles. In 2018, the number of proposals for community service was funded by 22 titles. In 2019, the number of proposals for community service was 338 titles. The most community service acquisition in Unesa occurred in 2019 with 338 titles. From the data in Table 5.5 above, if a graph is made, it will look like the Figure 7.
From various community service schemes funded from 2015-2019, it is also seen that community service activities are more dominated by educational activities and community empowerment with a percentage of 58%. While the training and empowerment activities of Micro, Small and Medium Enterprises (MSME) with the application of Appropriate Technology (AT) with a percentage of 42%. The details can be seen in Figure 2.22 below.

Figure 7. Distribution Bar Diagram Number of Community Service Unesa Title 2015-2019

From various community service schemes offered from 2015-2019, it can be seen that the distribution of Unesa lecturer community service is more in the Science and Technology for the Community (STC) or Community Partnership Program (CPP) scheme with a percentage of 81%, followed by the Real Work Lecture scheme -Learning for Community Empowerment (RWL-CE) of 8%, Campus Intellectual Product Unit Development Program (CIPUDP) scheme, Science and Technology for Campus Innovation and Creativity (STCIC), and Regional Superior Product Development Program (RSPDP) by 3% while the Science and Technology for Entrepreneurship (STE) scheme is only 2%. In full, the distribution of funded community service schemes can be seen in Figure 8.

Figure 8. Distribution Scheme of Community Services Funded Year 2015-2019

From various community service schemes funded from 2015-2019, it is also seen that community service activities are more dominated by educational activities and community empowerment with a percentage of 58%. While the training and empowerment activities of Micro, Small and Medium Enterprises (MSME) with the application of Appropriate Technology (AT) with a percentage of 42%. The details can be seen in Figure 2.22 below.
Based on a database of research outputs and community service of Unesa lecturers from 2015-2019, it can be seen that the scientific publication of Unesa lecturers has increased significantly. Based on Figure 10 it can be seen that Scopus indexed international scientific articles from 2015-2018 produced by Unesa lecturers increased sharply with 2015 details of 50 articles, 61 articles in 2016, 106 articles in 2017, 2011 totaling 431 articles. Meanwhile, until November 2019, international scientific articles indexed by Scopus only reached 121 articles. It is likely that this number will continue to grow until December 2019 because some articles are still under review by editors. During the period of 2015-2019, the total international scientific articles indexed by Scopus has reached 769 articles.

Unesa lecturer scientific publications in international journals indexed by Web of Science (WoS) starting in 2015-2018 have begun to appear, although not so significant. From Figure 11 it can be seen that in 2015, scientific articles indexed as many as 6 articles WoS, in 2016 as many as 6 articles, in 2017 increased to 13 articles. Whereas in 2018 it dropped to 9 articles. For 2019 the results have not been released. Starting in 2015-2018, total scientific articles indexed by WoS at Unesa were 34 articles.
The research output in the form of books that have been ISBN from 2015-2019 in Unesa has reached 344 books. While research outputs and community service in the form of patents and simple patents have reached 92 patents. This is quite encouraging and needs to be improved in the years to come.

Based on the assessment results of Higher Education Community Service for the period 2016-2018 and based on the Decree of the Director-General of Strengthening Research and Development Number 29/E/KPT/2019 dated September 27, 2019, regarding Ranking of Universities based on Community Service Performance for the period 2016 - 2018, Universitas Negeri Surabaya (UNESA) belongs to the "Excellent" group which was previously included in the "Very Good" group. Unesa was ranked 23 out of 24 universities included in the "Excellent" group. This achievement must continue to be improved in the coming years by increasing the quantity and quality of community service, funding...
for community service, and output/output of community service. This is undoubtedly a proud achievement and needs to be maintained and improved in the years to come.

4. Conclusions
Based on the results and discussion, the conclusions in this study are as follows. The results of the trial of Sistem Informasi Riset dan Pengabdian Kepada Masyarakat (SIRIP) using the black box testing method in accordance with 18 functional requirements of the system can run successfully. The profile of research in Unesa from 2015-2019 experienced a significant increase and decrease (fluctuation). The number of research titles funded from 2015-2019 was as many as 250 titles, 585 titles, 700 titles, 480 titles, and 447 titles. Meanwhile, the number of community service titles funded from 2015-2019 was 46 titles, 51 titles, 29 titles, 22 titles, and 338 titles, respectively.

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