Observation and heuristics evaluation of student web-based application of SIPADU-STIS

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Abstract. Politeknik Statistika STIS has an integrated information system called SIPADU-STIS. One part of the system is a web-based application for students. Students use this system to support learning daily activities like check lecture schedule, grade, etc. This system was built by personnel and students. However, this new system was tested only by the black box method and tested to users with the System Usability Scale (SUS) questionnaire. The system has not been tested in terms of interface and interaction with users. Whereas the well-designed interface and user interaction can improve the quality of service to users (students). Therefore, researchers want to test the interface and interaction with users of the system. We conduct an observation of the application and evaluation of heuristics. The heuristic evaluation used is based on 10 principles by Nielsen. Respondents are chosen by students using convenience sampling. Based on the data obtained, all aspects still have shortcomings or problems, even though only 16.7% stated it. There is only one aspect that has a cosmetic problem that is the aspect of match between the system and the real world. Six aspects have minor usability problems, those are visibility of system status/feedback, consistency and standards, error prevention, recognition rather than recall, aesthetic and minimalist design, and help and documentation. There is one aspect that has a major usability problem, help user recognize, dialogue, and recovers from errors. Two of the last aspects that must be redesigned, are the aspect of user control and freedom and aspect of flexibility and efficiency of Use.

1. Introduction
Politeknik Statistika STIS (Polstat STIS) is one of the official colleges in Statistics Indonesia. By utilizing the development of information technology, Polstat STIS built an information system to support administrative activities in the teaching and learning process. The system is called the STIS Integrated Information System or abbreviated as SIPADU-STIS. This system was built by personnel and students in the thesis. The system consists of various application systems that run on desktop, web and android-based, both for students, lecturers, and employees. For this study, researchers only limited the scope of this study to student users. This is because the number of student users and their use is very intense.

In the development, this system has been tested, but most have only black-box testing. The system built in the student's thesis, in addition to black-box testing, also use System Usability Scale (SUS) test [1-3]. But SUS has not been able to capture more deeply about user interactions and system interfaces. Hardjantho [4] has conducted a study of user acceptance of SIPADU using TAM and SEM. But the whole system has not been tested on users.

SIPADU-STIS can also be said that this is a system used to serve the needs of users, namely students. Students can get services by accessing web applications for students. Students can use the
web application to view schedules, schedule changes (which include changes in days, sessions, rooms, and lecturers), course grade, semester GPA, GPA, attendance in lectures, achievements, violations and the process of preparing a thesis. Besides the thesis, all features can be accessed by all students. The thesis feature can only be accessed by students who are at the final level who are doing thesis planning. With this application, students no longer need to come to the academic administration (to check the schedule, grades, and GPA), student administration (to check achievements and violations), and study programs (thesis)

For excellent service, the UI design must be designed as well as possible. Bad interface design will certainly make it difficult for users [5-7]. Although the results of the black-box testing system have been running well, and from the SUS test results the system has been said to be feasible to use, if the user continues to experience difficulties, then the user might start to leave the system. This will certainly have an impact on the lack of service to users.

Because there is no testing in terms of system interface and interaction with users, the researcher wants to evaluate SIPADU. We use the observation method and heuristics evaluation method. Research with heuristic methods has been carried out [8-17]. Nielsen's heuristic method was chosen because this method is the most widely used by experts [17]. With this method, researchers can evaluate the system so that later the results obtained can be material for improvement for future system development.

This study aims to evaluate the interface design and interaction with SIPADU-STIS application users using heuristic evaluation. From the results of this evaluation, it is expected that researchers can provide an idea of how well the interface design and interaction with users of existing systems. In addition to the results of the analysis, researchers are expected to provide suggestions for improvements for the development or renewal of the system in the future.

2. Methods

2.1. Data collection

2.1.1. Application observation.
We do application observation to get an overview of the existing system and how the business processes of the system. This observation was also carried out to support the description of the analysis of the data that will be obtained from the users through a questionnaire.

2.1.2. Questionnaire.
To conduct an evaluation, researchers will provide a questionnaire containing questions related to heuristic evaluation consisting of 10 aspects. Questionnaire designed using the heuristic method based on the Nielsen principle [11] [18]. The questionnaire was divided into 10 heuristic aspects based on Nielsen with 2 kinds of questions. The first group questions about the assessment per system item and the second question about usability assessment based on the whole first group question items. Some questions were adopted from [8]. This questionnaire will be distributed to user representatives. User selection based on convenience sampling.

Table 1. Question and answer list for online questionnaire of all aspects.

| Question                                           | Answer                                                                 |
|----------------------------------------------------|------------------------------------------------------------------------|
| **1. Visibility of System Status**                 |                                                                        |
| Is the status of the system always visible?        | Never (1), rarely (2), sometimes (3), always (4)                       |
| Is the main menu easy to understand?               | very difficult (1), difficult (2), easy (3), very easy (4)             |
| How do you rate the status of the existing system? | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes (4) |
| **2. Match between the system and the real world** |                                                                        |
| How is the text used on the page?                  | poor (1), bad (2), good (3), very good (4)                             |
| Question                                                                 | Answer                                                                                                                                   |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Are the terms used as they should be?                                  | Very inappropriate (1), inappropriate (2), some inappropriate (3), all appropriate (4)                                               |
| Are the steps in accordance with the business processes that should be? |                                                                                                                                           |
| How do you assess the suitability of the existing system with that of the actual system? | Not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |
| 3. User control and freedom                                             |                                                                                                                                           |
| Can users easily cancel activities just done in the system?             | Hard (1), difficult (2), easy (3), very easy (4)                                                                                         |
| Does the user can easily control the activities carried out in the system? |                                                                                                                                           |
| How do you assess the control and freedom of users in the system?       | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |
| 4. Consistency and standards                                           |                                                                                                                                           |
| Are there inconsistencies in the system?                               | Very many (1), many (2), few (3), none (4)                                                                                              |
| Is the layout of the system part consistent?                           |                                                                                                                                           |
| Is the colour consistent?                                              | Not at all (1), many are inconsistent (2), some are inconsistent (3), all are consistent (4)                                            |
| Is the language consistent?                                            |                                                                                                                                           |
| Is the image/logo consistent?                                          |                                                                                                                                           |
| Is the layout of the posts consistent?                                 |                                                                                                                                           |
| How do you rate the consistency and standards in the system?           | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |
| 5. Recognition rather than recall                                       |                                                                                                                                           |
| Are the steps easy to understand?                                      |                                                                                                                                           |
| Are the steps easy to learn?                                           | Hard (1), difficult (2), easy (3), very easy (4)                                                                                         |
| Are the steps easy to remember?                                        |                                                                                                                                           |
| How do you rate the recognition in the system?                         | no usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |
| 6. Error prevention                                                    |                                                                                                                                           |
| Does the system provide a warning before you take a risk action?       | never (1), rarely (2), sometimes (3), always (4)                                                                                         |
| How do you rate the error prevention warnings?                         | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |
| 7. Flexibility and efficiency of use                                   |                                                                                                                                           |
| What is the speed of the application when first opened?                | Very slow (1), slow (2), fast (3), very fast (4)                                                                                         |
| What is the speed of the menu response when clicked?                   |                                                                                                                                           |
| What is the speed when moving pages?                                   | Very inflexible (1), inflexible (2), slightly flexible (3), very flexible (4)                                                             |
| Is the system flexible?                                                |                                                                                                                                           |
| How do you rate the flexibility and efficiency in the system?          | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |
| 8. Aesthetic and minimalist design                                     |                                                                                                                                           |
| Is the system design good?                                             | Poor (1), bad (2), good (3), very good (4)                                                                                              |
| How do you rate the aesthetic design in the system?                    | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |
| 9. Help users recognize, diagnose, and recover from errors             |                                                                                                                                           |
| Are there any solutions displayed to resolve the error?                | never (1), rarely (2), sometimes (3), always (4)                                                                                         |
| Is the error message easy to understand?                               | Hard (1), difficult (2), easy (3), very easy (4)                                                                                         |
| Can the user recognize the error message that occurs?                  | Hard to recognize (1), difficult to recognize (2), easy to recognize (3), very easy to recognize (4)                                      |
### Questionnaire

| Question                                                                 | Answer                                                                 |
|-------------------------------------------------------------------------|-------------|
| Does the error message use good and polite sentences?                   | Very impolite (1), impolite (2), polite (3), very polite (4) |
| Did the error message appear helpful?                                   | Very unhelpful (1), unhelpful (2), helpful, very helpful (4) |
| Can users diagnose errors that occur?                                   | Hard to diagnose (1), difficult to diagnose (2), easy to diagnose (3), very easy to diagnose (4) |
| What is the level of ease in getting assistance information?            | Hard (1), difficult (2), easy (3), very easy (4) |
| Can the user return to the state before the error occurred if an error occurred? | Never can (1), rarely can (2), sometimes can (3), always can (4) |
| How do you rate the error marks?                                        | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |

| **10. Help and documentation**                                         |
|-------------------------------------------------------------------------|
| Is the help menu and documentation easy to find?                       | Hard (1), difficult (2), easy (3), very easy (4) |
| Are the help and documentation menus helpful enough?                   | very unhelpful (1), unhelpful (2), helpful (3), very helpful (4) |
| How do you rate the help menu and available documentation?             | not a usability problems, cosmetic problems, minor usability problems, major usability problems, usability catastrophes |

2.2. Data Analysis

The results of the data collection obtained will be analysed descriptively. This analysis will illustrate how well the interface design and interactions with users of the system according to observations and the results of the questionnaire based on the heuristic evaluation.

3. Result and discussion

3.1. Visibility of system status

From the data obtained, 50% of respondents stated that the status of the system is always visible, while another 50% is sometimes and rarely. This indicates that there are parts of the system that need to be repaired so that the status of the system can be seen by users. The survey results show all the main menus are easy to understand. This needs to be maintained. From the survey results, it can be seen that, there were 33.3% of respondents who stated that there was a need for improvement, 50% of respondents stated that there was a problem but did not really affect the user and 16.7% of respondents stated that visibility status was not a problem. Thus it can be concluded that there are actually some system deficiencies in terms of visibility of the system status, but the user is not too disturbed by this. If there is loose time, it will be better if the system status is completed.

![Figure 1. Result for Visibility of system status](image)
3.2. Match between the system and the real world

From the data obtained, only 33.3% stated that text writing was not good, while the rest stated that writing was good. All the terms used and the steps that are there are as they should. This means that the system is compatible with what is in the real world. From the survey results, it can also be seen that 33.3% stated that there were no problems in the system and 66.7% stated that there were problems but had no effect on users. Thus it can be concluded that a little problem but no effect on the user.

Figure 2. Result for Match between the system and the real world

3.3. User control and freedom

There are 33.3% of users who find it difficult to cancel activities that have just been done. But all users can easily control the activities carried out in the system. This is certainly what should be in the system. In addition, there were 16.7% of respondents stated that there was a need for a redesign of the system because it could have fatal impacts and 16.7% of respondents stated that there was a need for improvement. Thus it needs attention because 33.3% of users who feel the difficulty is the one who feels the need for improvement and redesign.

Figure 3. Result for User control and freedom
3.4. Consistency and standards
There were 33.3% of respondents who stated that there were many inconsistencies, while the rest stated that there were few or none. When seen in more detail the details, it can be seen from the data that the inconsistencies exist in the image/logo (16.7%) and the layout of the writing (16.7%) while the layout of the system, colour and language are consistent. This inconsistent image/logo may be caused by the logo not being updated after an institutional logo change. Therefore there are 16.7% which states that it needs to be done so that users can carry out activities smoothly.

![Figure 4. Result for Consistency and standards](image)

3.5. Error prevention
33.3% of respondents stated that the system sometimes gave a warning before the respondent took a risk action. However, only 16.7% of respondents felt the need to make improvements to error prevention warnings.

![Figure 5. Result for Error prevention](image)
3.6. Recognition rather than recall

There are 16.7% of users who feel that the steps in the system are difficult to understand, difficult to learn and hard to remember while others feel they are easy to understand, learn and remember. The user also stated that there needed to be an improvement in the system.

3.7. Flexibility and efficiency of use

Almost all respondents stated that the system was fast when first opened, when the menu was clicked and when moving pages. Besides that the system was already flexible, only 16.7% of respondents stated that the system was inflexible and needed to be redesigned.

3.8. Aesthetic and minimalist design

There were 33.3% of respondents stated that the design was not good but 66.7% stated that there needed to be an improvement in aesthetic design.
3.9. Help users recognize, diagnose, and recover from errors.

There are as many as 16.7% of respondents stated that there was never a solution displayed to overcome errors and 50% of respondents stated that solutions sometimes exist. But the error message appeared was easy to understand and recognized by all respondents. But apparently, not all error messages help. There were 16.7% of respondents who stated that error messages did not help which made it difficult for respondents to diagnose errors that occurred. In addition, there are 33.3% of respondents find it difficult to get assistance information. This certainly needs to be a concern because there are 16.7% of users who rarely feel able to return to the condition before an error occurs if an error occurs. There are 16.7% of respondents feel the need to be improved so that users can carry out activities smoothly and 16.7% of respondents feel there needs to be an improvement because it affects the process.

Figure 9. Result for Help users recognize, diagnose, and recover from errors

Continued
3.10. Help and documentation

There were 33.3% of respondents who stated that the help menu and documentation were difficult to find, even so, the menu was able to help the user, although there were 16.7% who felt the menu could not be helped. Therefore the respondent felt the need for improvement.

4. Conclusion

In this study, researchers conducted research with heuristic observation and evaluation methods on the SIPADU-STIS student web application. From this research, it was found that from all aspects of the research there was at least a problem even though it only appeared, while the most severe problem was having to redesign the system. Researchers can advise that developers should redesign aspects of control and freedom and flexibility and efficiency of use. Improvements must be made again in order to improve services to students, especially in the aspects of help users to recognize, dialogue, and recovers from errors.

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