

Development Of A Web-Based Information System For Proposing Academic Functional Positions For Lecturer At Stekoms Semarang

Ester Yuli Suprapti

Universitas Sains dan Teknologi Komputer

Email: estertuli@gmail.com

Dani Sasmoko

Universitas Sains dan Teknologi Komputer

Email: estertuli@gmail.com

Neilin Nikhlis

Universitas Sains dan Teknologi Komputer

Email: estertuli@gmail.com

Jl. Majapahit 605, Semarang, tel/fax : (024) 6723456

Abstract

Semarang College of Electronics and Computers (STEKOM) which is based on Jl. Majapahit 605, has several campuses in Semarang and outside Semarang. With such campus location conditions, it makes it difficult for lecturers and related parties to process applications for Academic Functional Positions (JAFA). Lecturers have to repeatedly go to the central campus to process JAFA proposals and lecturers cannot know directly the extent of the credit figures that have been generated. Other related parties such as the personnel department, the Credit Score Assessment Team (TPAK) and STEKOM leadership find it difficult to monitor lecturers' activities in carrying out their tridharma duties. The Web-Based Information System for Proposing Academic Functional Positions for Lecturers which was developed using the Research and Development (R&D) method produces an application that will solve the problems surrounding JAFA proposals at STEKOM and can answer STEKOM's need for a JAFA lecturer proposal information system without being limited by place and time. . In creating this system, the author used Macromedia Dreamweaver MX 2004 software as the design medium and PHP as the programming language used, as well as the MySQL database as the storage medium.

Keywords: JAFA Lecturer Proposal, Information Systems, R&D, Web.

1. INTRODUCTION

The Academic Functional Position (JAFA) of lecturers is very important for every lecturer, both lecturers at state universities and private universities. The Functional Academic Position of a lecturer is recognition, appreciation and trust for competence, performance, integrity and responsibility in carrying out duties, as well as lecturers' etiquette in carrying out the duties of the Tri Dharma of Higher Education (Permenpan No. 17 of 2013). The academic functional position of a lecturer is related to the extent to which a lecturer can act as a supervisor and examiner in a thesis, thesis or dissertation. The Academic Functional Position of a lecturer also determines to what level a lecturer may become a Lecturer Workload assessor (BKD) for lecturers whose Functional Position is lower. Apart from that, the level of Academic Functional Position held by a lecturer will be very determining in passing rank/class. A lecturer's career will also be largely determined by the level of their

Academic Functional Position, so a lecturer must continuously improve their Academic Functional Position.

An absolute requirement to increase the functional position of a lecturer is to collect and fulfill credit scores, in addition to fulfilling other predetermined requirements. Provisions regarding credit figures have been regulated in the Minister of State Apparatus Empowerment and Bureaucratic Reform Regulation number 17 of 2013 as an update/refinement to the Decree of the Coordinating State Minister for Supervision of Development and Empowerment of State Apparatus No. 38/KEP/MK.Waspan/8/1999. The assessment of credit numbers is related to the lecturer's main task, namely carrying out his Tri Dharma duties. Lecturer academic positions consist of rank/class and functional positions, both of which function to control the quality of lecturers in Indonesia. The table below is a breakdown of the credit numbers for lecturer academic functional positions.

Table of Credit Scores for Lecturer Academic Functional Positions

Lecturer Functional Position	Credit Score
Expert Assistant	100
	150
Lector	200
	300
Associate Professor	400
	550
	700
Professor	850
	1050

Source: Ministerial Decree No. 17 of 2013

The process of proposing for Academic Functional Positions (JAFA) for lecturers continues to be updated along with the development of information technology where the need for information that is accurate, timely and able to present complete data is very much needed by agencies, both government agencies and private agencies, organizations and companies. Following the development of information technology, according to the letter from the Director of Educators and Education Personnel Number 1037/E4.3/2011 dated 5 May 2011, the management of proposals for Functional Lecturer Positions is carried out online.

College of Electronics and Computers (STEKOM) which is based on Jl. Majapahit 605 is a high school that has several campuses in the city of Semarang, including on Jalan Majapahit, on Jalan Siliwangi and several campuses outside the city of Semarang, namely in Ungaran and Kendal, with a total of 100 lecturers at STEKOM. STEKOM, with its campus location being far from the central campus and having quite a few lecturers, makes it difficult

for the personnel department to monitor the Tri Dharma activities of lecturers which are needed for Jafa proposals, both new proposals and proposals for increases in Jafa lecturers, this is also due to the Jafa management system at STEKOM The existing ones are still not well structured so that the collection of data needed for Jafa proposals is not yet organized and disciplined, and as a result Jafa proposals are often late or delayed. The table below shows the status of STEKOM lecturers who have Jafa and those who do not.

Table of Functional Academic Position Status for STEKOM Lecturers in 2012
 (Source: STEKOM 2012 Personnel Section)

No	Campus Location	Lecturer	Lecturer Status	Lecturer Functional Position		
			Don't have Jafa yet	Expert Assistant	Lector	Associate Profess
1.	STEKOM Center Jln. Majapahit	45	20	8	16	1
2.	STEKOM Siliwangi	22	16	4	2	0
3.	STEKOM Ungaran,	19	14	4	1	0
4.	STEKOM Kendal	14	11	3	0	0

It can be seen from the table that there are still many lecturers who still do not have Jafa status.

The parties involved in the Jafa proposal process are the lecturer concerned, the STEKOM Credit Score Assessment Team (TPAK), the STEKOM Senate, the Personnel Section, the Head of the Study Program and the STEKOM Leadership. The Jafa proposal process includes fulfilling and calculating credit numbers which results in a recapitulation. Through calculating the credit numbers it can be seen whether the lecturer is eligible or has not submitted a Jafa lecturer proposal for both new applications and Jafa increase applications. In the current process at STEKOM, the calculation of credit scores, collection of supporting files, collection of physical evidence is still done manually by the lecturer concerned and managed by the Credit Score Assessment Team (TPAK), so that the lecturer concerned does not know whether the data and files are those collected have met the requirements to be proposed for a Functional Position. Lecturers also cannot know directly whether the results of the assessment of the required credit figures are sufficient or not, according to the proposed Jafa credit figures. This makes the Jafa application process

complicated and long. And other related parties such as the personnel department and STEKOM leadership find it difficult to monitor lecturers' activities in carrying out their Tri Dharma duties.

2. Theoretical basis

1) Understanding Systems

According to Jogiyanto (2009) a system is a network of procedures that are interconnected, gathered together to carry out an activity or to complete an activity or a certain target.

A system has certain characteristics or properties, namely:

a) System Components

A system consists of a number of interacting components that work together to form a single unit.

b) System Limits

The area that limits a system to other systems or the external environment.

c) External System Environment

Anything outside the boundaries of the system that affects system operation.

d) System Liaison

It is a connecting medium between one subsystem and another subsystem.

e) System Input

Energy enters the system from the external environment, causing the system to work.

f) System Output

The resulting energy is processed and classified into useful output.

g) System Processor

A system can have a processing part that will convert input into output.

h) System Goals

i) A system must have a goal or target. If a system does not have a goal, then the system operation will be useless.

A system can be classified from several points of view, including the following. Jogiyanto (2008)

A. Systems according to their physical form:

1) Abstract System (abstract system)

An abstract system is a system in the form of thoughts or ideas that are not physically visible.

Example: A theological system is a composition of ideas about God, humans and nature

2) Physical System (physical system)

A physical system is a system that exists physically.

Examples: circulatory system, school system, transportation system, computer system.

B. System according to system occurrence:

1) Natural System (natural system)

Natural systems are systems that occur through natural processes, not made by humans.

For example: changing day and night, erosion and natural disasters.

2) Man-Made System (human made system)

A man-made system is a system designed by man.

Examples: Computer systems and irrigation systems.

C. System according to future events

1) Certain System (deterministic system)

A particular system is a system that operates with predictable behavior.

Example: Football match results and achievements.

2) Uncertain System (probabilistic system)

An uncertain system is a system whose future conditions cannot be predicted because it contains an element of probability.

Example: Death system.

D. Systems according to their nature

Closed System (closed system)

1) A closed system is a system that is not connected to and is not influenced by the external environment, this system works automatically without any interference from outside parties. Theoretically, this closed system exists, but in reality there is no truly closed system, there are only relatively closed systems (relatively closed, but not completely closed).

Example: Baduy community customary system.

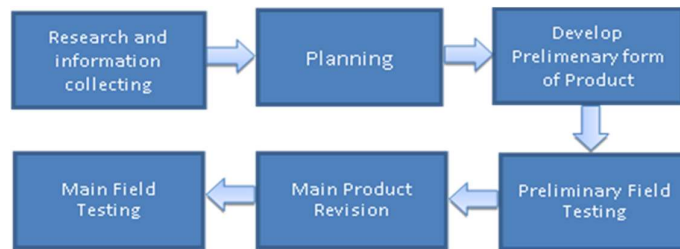
3) An open system is a system that is connected and influenced by its external environment. This system receives input and produces output for the external environment or other subsystems.

Example: Deliberation system

3. Methodology

The development method in this research uses the Borg and Gall Research and Development (R&D) model, which through this model aims to produce a web-based application for the

development of an information system for proposing academic functional positions for lecturers. The Research and Development (R&D) model has 10 steps, including Research and information collecting, Planning, Develop preliminary form of product, Preliminary field testing, Main product revision, Main field testing, Operational product revision, Operational field testing, Final product revision, Dissemination and implementation . The system development carried out in this research only reached the 6th (sixth) stage to produce a final product in the form of a prototype, so it did not reach the product implementation stage. To arrive at the product implementation stage, further research can be carried out. Procedurally, the 6 (six) steps of the R&D model are as shown in Figure 3.1 below:



Six-step R&D design model (Borg& Gall, 1983)

Figure 3.1. Six-step R&D design model (Borg& Gall, 1983)

4. Results and Discussion

Results: The development of an information system for proposing functional academic positions for lecturers, carried out using the Research and Development (R&D) method, has produced a prototype information system application for proposing functional academic positions for lecturers.

The following are several examples of the prototype interface for the information system application for proposing academic functional positions for lecturers as follows:

- a. Main page of Information System for Proposing Functional Academic Lecturer Positions

The main display as in Figure 4.1 is the beginning of the JAJA lecturer proposal information system application. At this stage, each user is required to log in before proceeding to the features provided by the system being built.

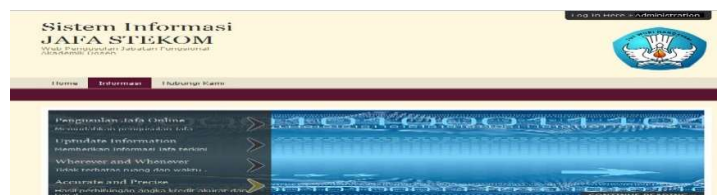




Image: Main page of the Jafa Lecturer Information System

b. Information Page

On the information page the user can display information about Jafa that has been updated from Dikti or Kopertis VI and the user can download the required information.

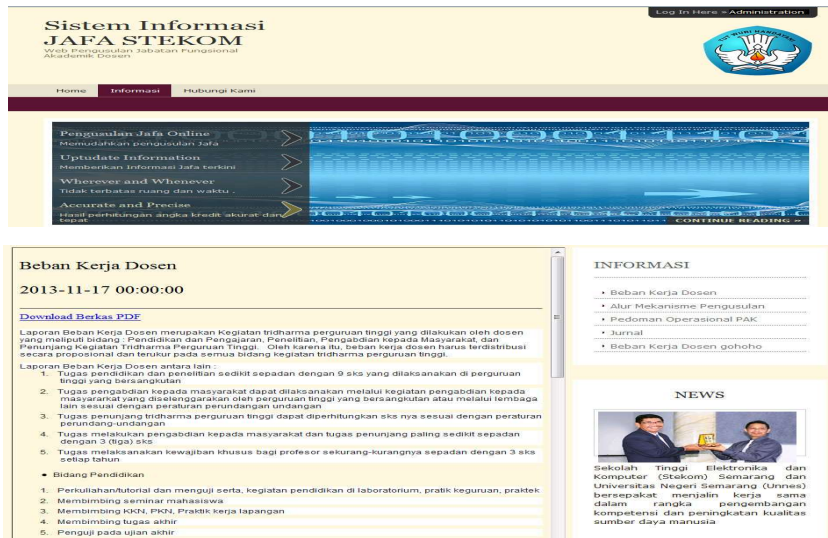


Image: Information Page

c. Contact Us Page

This Contact Us page displays information on the address of the Human Resources Office, contact telephone number and email where you can be contacted.

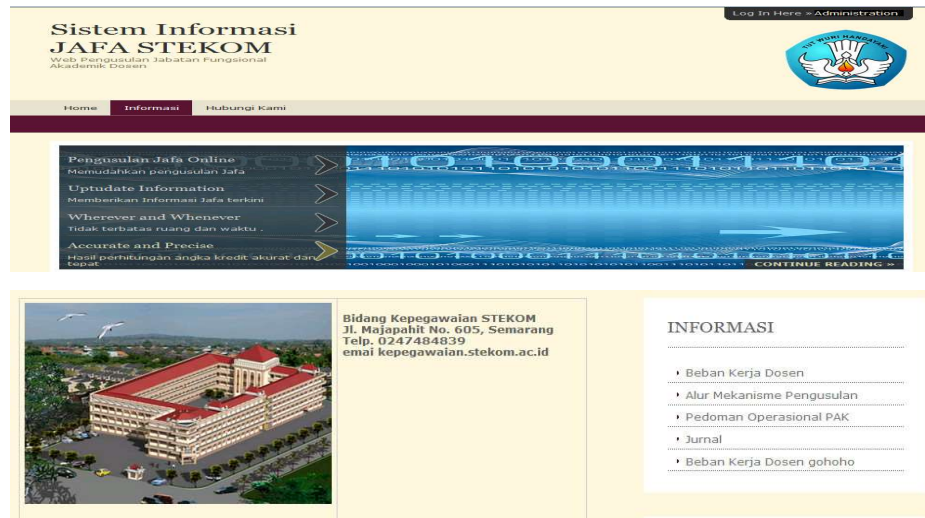


Image: Contact Us page

d. Login Page

Can manage the access rights of each user. When logging in, all you have to do is enter the user name and password data for each user who will use the system.

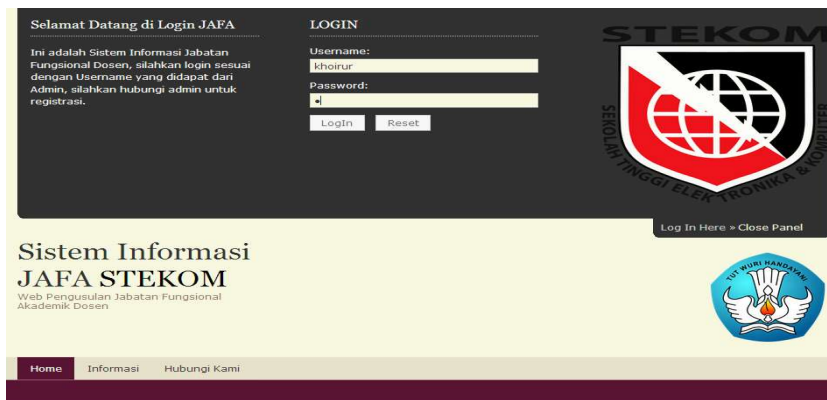


Figure 4.4. Login Page



Image of Login Successful Page

e. Admin Main Page

The Admin Home Page has a master input menu including: Lecturer Master, Official Master, Credit Number Element Master, Credit Number Subelement Master, Proposed JAJFA, Memo, Information Master



Picture. Admin Main Page

f. Lecturer Master Data Input Form

This form is used to fill in lecturer data and set user access rights.

Image: Lecturer Master Data Input

g. Lecturer Data List Table

The lecturer data list table contains lecturer data that has been input by the admin via the lecturer master form. In the lecturer list table there is a detail, edit, delete menu.

NID / NIDN	NAMA DOSEN	JK	JENJANG JAJFA	Pendid. Ter	ACTION
01.005.006	Budi Hartono	blank	Lektor 200	S2 - Teknik Informatika	DETAIL / EDIT / DELETE
01.009.006	Sukestiyarno	Laki-Laki	Lektor 300	S2 - Teknik Informatika	DETAIL / EDIT / DELETE
01.009.008	Vivi K	Perempuan	AA-100	S2 - Teknik Informatika	DETAIL / EDIT / DELETE
04.05.450	Ruthjono	blank	AA-100	S2 - Teknik Informatika	DETAIL / EDIT / DELETE
22.02.009 / 0459403453	Khoirun Rozikin	Laki-Laki	Lektor 200	S2 - Teknik Informatika, 27 September 2010	DETAIL / EDIT / DELETE
23.04.006	Iwan Kumiawan	Laki-Laki		S2 - Teknik Informatika	DETAIL / EDIT / DELETE
24.02.021	Budi Hartono	Laki-Laki		S2 - Teknik Informatika	DETAIL / EDIT / DELETE

Image of Lecturer Data List Table

h. Lecturer Profile

Displays each lecturer's data profile as a result of the master lecturer's input.



Lecturer Profile Picture

i. Lecturer Profile Edit Form

This form is used to edit incorrect input data.



Image of Lecturer Profile Edit Form

j. Official Data Input Form

This form is used to enter data on officials who certify lecturers' JAJA. The data entered directly can be seen in the table below the form and the data can be edited or deleted if the user makes a mistake.



Image of Official Data Input Form

k. Credit Number Element Master Input Form

This form is used to enter master data for credit number elements. When data is entered, the data will immediately appear below the form and the data can be edited or deleted if the user makes a mistake.

Kode UNSUR	KETERANGAN	ACTION
1	PENDIDIKAN	EDIT / DELETE
2	MELAKSANAKAN PENDIDIKAN DAN PENGADARAN	EDIT / DELETE
3	MELAKSANAKAN PENELITIAN	EDIT / DELETE
4	MELAKSANAKAN PENGABDIAN KEPADA MASYARAKAT	EDIT / DELETE
5	PENUNJANG TUGAS POKOK DOSEN	EDIT / DELETE
6	UNSUR PENUNJANG	EDIT / DELETE

Image of Credit Number Element Master Input Form

1. Credit Number Sub-Element Master Input Form

This form is used to enter credit score sub-element master data.

Kode SUBUNSUR	KETERANGAN	ACTION
1-1	Mengikuti pendidikan sekolah dan memperoleh gelar/sebutan/ijazah/akta	EDIT / DELETE
1-2	Mengikuti pendidikan sekolah dan memperoleh gelar/sebutan/ijazah/akta tambahan yang setingkat atau lebih tinggi di luar bidang ilmunya	EDIT / DELETE
1-3	Mengikuti pendidikan dan pelatihan fungsional dosen dan memperoleh Surat Tanda Tamat Pendidikan dan Pelatihan (STTP)	EDIT / DELETE
2-1	Melaksanakan perkuliahan/tutorial dan membimbing menguji serta menyelenggarakan pendidikan di laboratorium, praktik kejuruan, bengkel/studio/kebun percobaan teknologi pengajaran dan praktik lapangan	EDIT / DELETE
2-10	Menduduki jabatan pimpinan perguruan tinggi	EDIT / DELETE

Image of Credit Number Sub-Element Master Input Form

m. Preview of Lecturer Data Proposing JAJA

Displays data on lecturers who proposed JAJA. Users can view lecturer JAJA data, send memos if there are corrections and provide status as corrected by the user

NAMA DOSEN	NIP / NIDN	JENJANG JAJA	JAJA DIUSULKAN	TANGGAL DIUSULKAN	STATUS	ACTION
Iwan Kurniawan	23.04.006		AA-150	2013-11-18 00:00:00	koreksi tpak	LIHAT JAJA / KIRIM MEMO / SUDAH DIKOREKSI
Ruthjono	04.05.450	AA-100	Lektor 200	2013-11-10 00:00:00	koreksi tpak	LIHAT JAJA / KIRIM MEMO / SUDAH DIKOREKSI

Preview Image of Lecturer Data Proposing JAJA

n. Preview of JAJA Lecturer Proposals

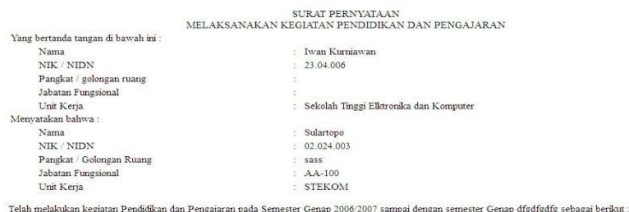
Displays the attached lecturer's JAJA data and there is a link to download the lecturer's JAJA proposal file, as well as a print attachment link to print the lecturer's JAJA recapitulation.



Preview Image of JAJA Lecturer's Proposal

o. Print JAJA Lecturer Recapitulation

Displays the results of the final report which can be printed in the form of a recapitulation of the lecturer's JAJA.



No	Kegiatan Pendidikan dan Pengajaran	Tempat/Instansi	Tanggal	Jumlah Angka Kredit	Ket / Bukti Fisik
(1)	(2)	(3)	(4)	(5)	(6)
	Melaksanakan Perkuliahan				
	1. Aplikasi Presentasi (1) (2 sks, 2 kelas)	STEKOM	Smt Genap 2006/2007	2	
	2. Dasar Animasi (2 sks, 2 kelas)			2	I.B.a.1.a (1)
	Sub Jumlah			4	
	Melaksanakan Perkuliahan				
	1. Logika dan Algoritma (2 sks, 2 kelas)	STEKOM	Smt Gasal 2007/2008	2	
	2. Aplikasi Pengolah Data (3 sks, 2 kelas)			3	I.B.a.1.a (3)
	Sub Jumlah			5	

Image of JAJA Lecturer Report Printout

p. Memo Menu

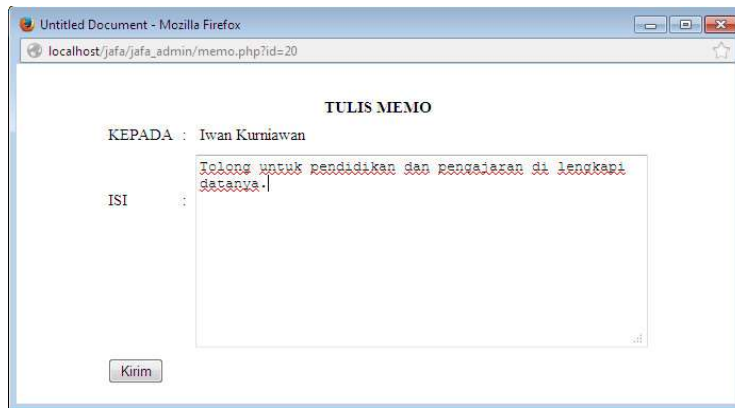
Display memos received by other users as a medium of communication between lecturers and interested parties in JAJA proposals. There is a read and reply menu to respond to memos.



Memo Menu Image

q. Memo Form

Used to send memo messages to lecturers proposing JAJA.



Memo Form Image

r. Lecturer Home Page

The lecturer's main page has a menu of attachments I to attachment V, there is also an attached number of Credit Scores that have been input by the lecturer.



Image of the Lecturer's Main Page

s. Appendix I page

Displays the contents of each sub-element from Appendix I in accordance with the lecturer's Jafa recapitulation format. The way to fill in lecturer data per sub-element is by clicking the EDIT link, then a form to fill in according to the selected sub-element will appear. The page concept from Appendix I to Appendix V is the same, but the difference is that each attachment is adjusted to the order of filling in the Jafa recapitulation and the form in it is adjusted to the selected sub-elements.

NO	UNSUR YANG DINILAI	ANGKA KREDIT	AKSI
I	UNSUR UTAMA		
A	PENDIDIKAN		
1.	Mengikuti pendidikan sekolah dan memperoleh gelar/sebutan/ijazah/akta	50.0	EDIT
2.	Mengikuti pendidikan sekolah dan memperoleh gelar/sebutan/ijazah/akta tambahan yang setingkat atau lebih tinggi di luar bidang ilmunya	0.0	EDIT
3.	Mengikuti pendidikan dan pelatihan fungsional dosen dan memperoleh Surat Tanda Tamat Pendidikan dan Pelatihan (STTP)	0.0	EDIT
	JUMLAH	50.0	

Image of Appendix I Page

t. Form for filling out Appendix I Sub-Element 1

Used to fill in the data in Appendix I, Sub-Element 1. The concept of filling in each sub-element is adjusted to the Jafa recapitulation, as well as the concept of filling in each appendix 1 to V in the sub-elements is adjusted to the Jafa recapitulation.

input Jafa

Pendidikan Terakhir: S2
 Tanggal Ijazah: 30 Januari 2010
 Lulusan: Universitas Dian Nuswantoro (UDINUS)
 Angka Kredit: 50.0
 Upload Ijazah: Browse... arga.7z

Update Reset Cancel

Mengikuti pendidikan sekolah dan memperoleh gelar/sebutan/ijazah/akta

Show 10 entries Search:

Pendidikan Terakhir	Lulusan	Tanggal Ijazah	Angka Kredit	Action
S2	Universitas Dian Nuswantoro (UDINUS)	2013-11-19	50	EDIT / DELETE

Showing 1 to 1 of 1 entries Previous Next

Image of the form for filling out Appendix I Sub-Element 1

u. Memo Page

Displays all memo messages sent by other users, namely Admin, TPAK and leadership. Users can read and reply to memos received.



Scrap Page Image

v. Password Change Form

This form is used to change the user password.



Picture. Password Change Form

w. Home Credit Score Assessment Team (TPAK)

The TPAK main page contains the Application List and Submission Application and Password Change menu.

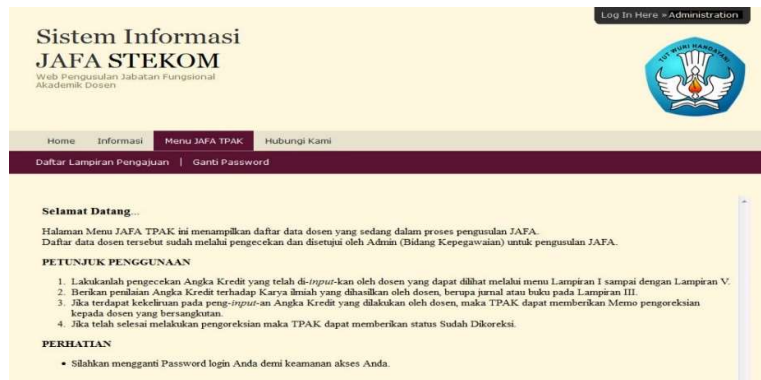


Image of the Main Page of the Credit Score Assessment Team (TPAK)

x. Preview List of Submission Attachments

Displays a list of lecturers who proposed JAJA, which has gone through Admin correction (Personnel Division). In the list of attachments to this submission, TPAK

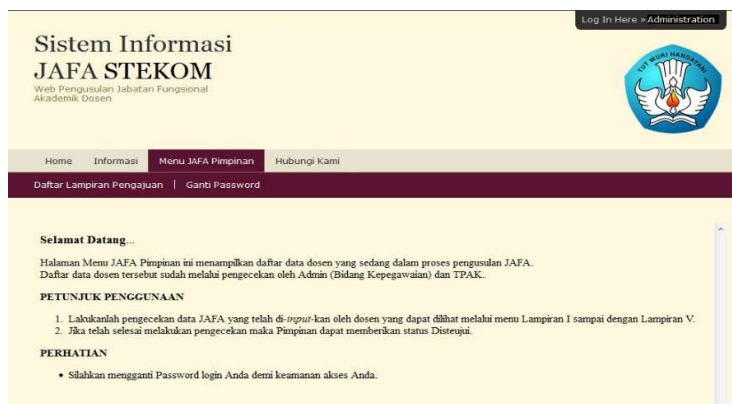
can see the JAJA data that has been input by each lecturer in the form of the Preview of the Lecturer's JAJA Proposal. If TPAK has finished correcting the lecturer's JAJA then TPAK will give the status Corrected on the Preview link for the Lecturer's JAJA Proposal then the status will change to leadership correction status.

NAMA DOSEN	NIP /NIDN	JENJANG JAJA	JAJA DIUSULKAN	TANGGAL DIUSULKAN	STATUS	
Iwan Kurniawan	23.04.006		AA-100	0000-00-00	koreksi tpak	LIHAT JAJA / KIRIM MEMO / SUDAH DIKOREKSI
Ruthjono	04.05.450	AA-100	Lektor 200	0000-00-00	koreksi tpak	LIHAT JAJA / KIRIM MEMO / SUDAH DIKOREKSI

Preview Image of List of Submission Attachments

y. Leadership Home Page

The Leadership main page contains the Submission Attachment List and Password Change menu.



Leadership Home Page Image

z. Preview List of Submission Attachments

Displays a list of lecturers who proposed JAJA, which has gone through Admin (Personnel Affairs) and leadership corrections. In the list of attachments to this submission, leaders can see the JAJA data that has been input by each lecturer in the

form of the Preview of the Lecturer's Jafa Proposal. If the leader has finished correcting the lecturer's Jafa, the leader will give Approved status on the Preview link for the Lecturer's Jafa Proposal.



NAMA DOSEN	NIP /NIDN	JENJANG Jafa	Jafa DIUSULKAN	TANGGAL DIUSULKAN	STATUS
Iwan Kurniawan	23.04.006	AA-100	0000-00-00	koreksi pimpinan	LIHAT Jafa / KIRIM MEMO / DISETUJUI

Preview Image of List of Submission Attachments

5. Conclusion

1. Conclusion About the Product

Based on the results of research and thesis preparation that the author carried out at PT. Triconville Indonesia, there are several conclusions from the research, namely:

- A. With a client server-based PPIC information system, it is easier for users to process data for the PPIC section and related sections, thus helping to calculate production material requirements/Bill of Materials (BOM) and production planning quickly and efficiently. So that the production department can carry out production according to schedule and orders can be sent on time.
- B. The existence of this PPIC information system can make it easy for users to obtain the data they need from other departments because all transactions are stored and connected in one database, so that information and reports can be executed quickly and effectively.
- C. The existence of a PPIC information system with an integrated database means that reports can be submitted quickly to leadership, making it easier for management to make decisions.

2. Limitations of Research Results

The limitations of the results of this inventory information system research include:

- A. The resulting product is only a prototype so it cannot be implemented and requires long testing to be used generally.

- B. Research on the products produced is only in the process of calculating production schedule planning and stock mutations.
- C. This research does not discuss the calculation of the cost of production, so it cannot produce a report on the cost of production.

BIBLIOGRAPHY

1. Adyanata Lubis, 2016; "Basic Database", Yogyakarta : Deepublish.
2. Agus Mulyanto, 2009; "Information Systems Concepts and Applications", Yogyakarta: Student Library.
3. Binarto, S, 2012; "Tips & Tricks for Creating Sales Programs using Visual Basic 6.0". Jakarta: Mediakita.
4. Borg, Walter R., & Gall, M.D., 1983; "Educational research: An introduction (4ed)". New York & London: Longman.
5. Diana Anastasia, Lilis Setiawati, 2011; "Accounting information system". Yogakartakarta: Andi Publisher.
6. Fauzi. M. Miftakul Amin, 2012; "Visual Basic 6 and SQL Server 2000 Database Programming". Yogyakarta: Andi Offset.
7. Handoko, T, 2012; "Basics of Production and Operations Management". Yogyakarta: BPFE-Yogyakarta.
8. Hoffer, JA, Mary BP, Heikki, T,. 2009; "Modern Database Management Systems 9th Edition", New Jersey : Pearson Education.
9. I Nyoman Yudha Astana, 2007; journal: "Raw Material Planning Based on the MRP (Material Requirements Planning) Method". Denpasar: Udaya University, Civil Engineering Scientific Journal Vol. 11, no. 2. July 2007.
10. Jogiyanto, 2005: "Information Systems Analysis & Design, Structured Approach to Theory and Practice of Business Applications." Andi : Yogyakarta.
11. MADCOMS, 2010; "Computer Network Systems for Beginners", Yogyakarta : CV. Andi Offset.
12. Marlinda, Linda, 2004: "Database Systems". Yogyakarta : Andi.
13. Mc. Leod, Raymond, 2008; "Management Information Systems", Edition 10, Jakarta : Salemba Empat.
14. Mu'tazilah, 2014; thesis: "Multi User Based Production Planning and Inventory Control Information System at PT. Sai Garment Industries Semarang", Semarang: College of Electronics and Computers (STEKOM).
15. Sugiyono, 2013; "Educational Research Methods Quantitative, Qualitative and R&D Approaches". Bandung: Alfabeta.
16. Sutarman, 2012; "Introduction to Information Technology". Jakarta: Bumi Literacy.
17. Sutabri, 2012; "Introduction to Information Technology". Yogyakarta: Andi.

18. Sutanta, Edhy. 2011; "Databases Under Conceptual Review". Yogyakarta : Andi Offset.
 19. Vincent Gasperz, 2009; "Production Planning and Inventory Control Based on the MRP II and JIT system Approach Towards Manufacturing 21", Jakarta: PT. Gramedia Pustaka Utama.
 20. Jacob, 2012; "Introduction to Information Systems", Yogyakarta : Graha Ilmu.
-