Information System Strategy for Improving Academic Service Quality at UM Banjarmasin Through the Development of Academic Extension (ADEX) Innovation Application

Kamarudin[1]

[1] Universitas Muhammadiyah Banjarmasin (Program Studi Informatika, Fakultas Teknik, Universitas Muhammadiyah Banjarmasin, Banjarmasin, Indonesia)

*E-mail: kamarudin.skom@gmail.com
kamarudin.skom@gmail.com

Contact

✉

Author
kamarudin.skom@gmail.com

ABSTRACT

This research program aims to enhance academic service quality at Universitas Muhammadiyah Banjarmasin (UM Banjarmasin) through the development of an innovative application called Academic Extension (ADEX). The initiative was driven by the need to improve efficiency and integration of academic services, addressing the current inadequate systems that fail to support effective academic management. The research methodology involved three key phases: needs analysis, application development, and field testing. ADEX incorporates various features to streamline academic management, including schedule management, attendance tracking, and communication channels between faculty members and students. The implementation of ADEX has demonstrated significant improvements in both efficiency and quality of academic services at UM Banjarmasin, delivering tangible benefits to the entire academic community. Results indicate that the integration of ADEX has successfully addressed the initial challenges, providing a comprehensive solution for academic service management while enhancing the overall educational experience for both faculty and students.

1. Pendahuluan

Higher education plays a pivotal role in national development, with universities serving as strategic institutions in producing globally competitive human resources [1]. In the current digital era, academic service quality has been identified as a crucial factor in supporting student success and institutional excellence [2], . The transformation of educational services through digital innovation has become increasingly essential, particularly in response to evolving student needs and global educational standards. This aligns with global trends in higher education, emphasizing the role of technology as a driver for achieving institutional goals and enhancing stakeholder engagement [3].

As an Indonesian higher education institution, Universitas Muhammadiyah (UM) Banjarmasin demonstrates its commitment to enhancing academic service quality through technological innovation. The development of innovative applications has been recognized as an effective approach to streamline and facilitate academic processes [4], [5]. This digital

transformation initiative reflects the institution's responsiveness to contemporary educational challenges and its dedication to continuous improvement. Moreover, initiatives like ADEX signify the institution's strategic alignment with the national roadmap for higher education digitalization.

This research addresses the challenges in academic services at UM Banjarmasin while proposing innovative solutions to enhance service quality[6]–[8]. The Academic Extension (ADEX) application emerges as a proposed solution, offering an integrated platform that facilitates seamless access to academic information for both students and faculty members. ADEX has been designed to ensure scalability and flexibility in adapting to emerging educational needs, supporting sustainable digital transformation strategies [9], [10].

Current challenges at UM Banjarmasin include fragmented academic information and reliance on conventional, manual processes. These challenges often result in delayed service delivery, communication gaps, and reduced stakeholder satisfaction. ADEX aims to address these challenges by providing online features for various academic activities, including course preparation documents and examination materials[2], [11]. This integration is expected to enhance process efficiency and effectiveness. This approach has been supported by recent research emphasizing the importance of user-centric design in academic technology solutions.

The implementation of Total Quality Management principles alongside ADEX development aims to improve academic service quality, information accessibility, and stakeholder satisfaction [12]. Recent studies in educational technology indicate that integrated digital platforms can significantly enhance student engagement and academic performance [13]. Furthermore, the digitalization of academic services has been shown to reduce administrative burden and improve resource allocation efficiency [14]. The adoption of artificial intelligence and machine learning features within such platforms further enhances predictive capabilities and decision-making processes [15].

The strategic importance of this initiative extends beyond mere technological advancement. Research indicates that universities implementing comprehensive digital solutions experience improved student retention rates and higher levels of academic achievement[3]. ADEX's development aligns with national higher education standards while contributing to the advancement of Indonesian higher education in the global context. Additionally, ADEX incorporates best practices from international higher education systems, ensuring global relevance and competitiveness [16].

Previous studies emphasize the significance of quality academic services in higher education, particularly in fostering student success and institutional reputation. The integration of technology in academic services has become increasingly critical in maintaining competitive advantage and meeting stakeholder expectations [17]. Through ADEX implementation, UM Banjarmasin strives to deliver excellent services to its academic community, ultimately fulfilling the noble objectives of education.

Modern educational institutions must adapt to changing technological landscapes while maintaining high standards of academic quality. ADEX represents not just a technological solution but a comprehensive approach to academic service improvement. It incorporates best practices in educational technology while addressing specific institutional needs and challenges. This technological advancement represents a strategic step toward achieving institutional excellence and supporting student success in the digital era, positioning UM Banjarmasin as a forward-thinking institution committed to educational innovation and service excellence.

2. Method

This study employs a qualitative approach to gather comprehensive data regarding user requirements and expectations for the ADEX application. Through this methodology, we aim to obtain rich, detailed insights into the needs of academic stakeholders.

The study adopts a research and development (R&D) approach, adapting information system development models to align with research objectives. The Academic Extension (ADEX) software development follows the Waterfall methodology:
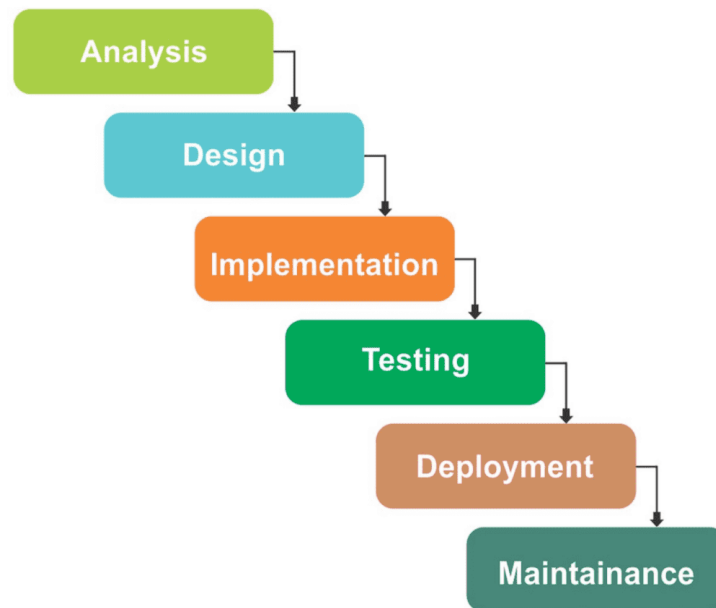

Fig. 1. Waterfall methodology

The development process encompasses the following structured phases:

a. Analysis
   1) Comprehensive evaluation of stakeholder requirements (students, faculty, administrative staff)
   2) Focus on identifying core needs: academic information accessibility, data integration, process efficiency
   3) Deliverable: Detailed ADEX specification document outlining required features and primary objectives

b. Design
   1) System architecture development based on established requirements
   2) Creation of intuitive user interfaces and scalable system architecture
   3) Implementation of efficient database structures
   4) Integration planning with existing UM Banjarmasin systems
   5) Deliverable: Comprehensive technical design documentation

c. Implementation
   1) Application coding based on approved designs
   2) Utilization of appropriate programming languages and development platforms
   3) Focus on alignment with predetermined specifications

d. Testing
   1) Comprehensive testing protocols including:
      a) Functionality verification
      b) Security assessment
      c) Performance evaluation
      d) Integration testing
   2) Bug identification and resolution

e. Enhancement
   1) Continuous improvement based on user feedback
   2) Feature additions and interface refinements
   3) Performance optimization

f. Maintenance
   1) Regular system maintenance
   2) Security updates
   3) Ongoing bug fixes
   4) Performance monitoring
   5) User feedback implementation

2.1 Research Location and Timeline
The study will be conducted at Universitas Muhammadiyah Banjarmasin over a 12-month period (February 2024 - January 2025).

2.2 Research Subjects
The study population comprises UM Banjarmasin students and faculty members who will utilize the ADEX application.

2.3 Data Collection Methods
Data will be gathered through:
1) Literature review
2) Direct observation
3) Stakeholder interviews
4) Questionnaire distribution
5) Documentation analysis

Research Procedures
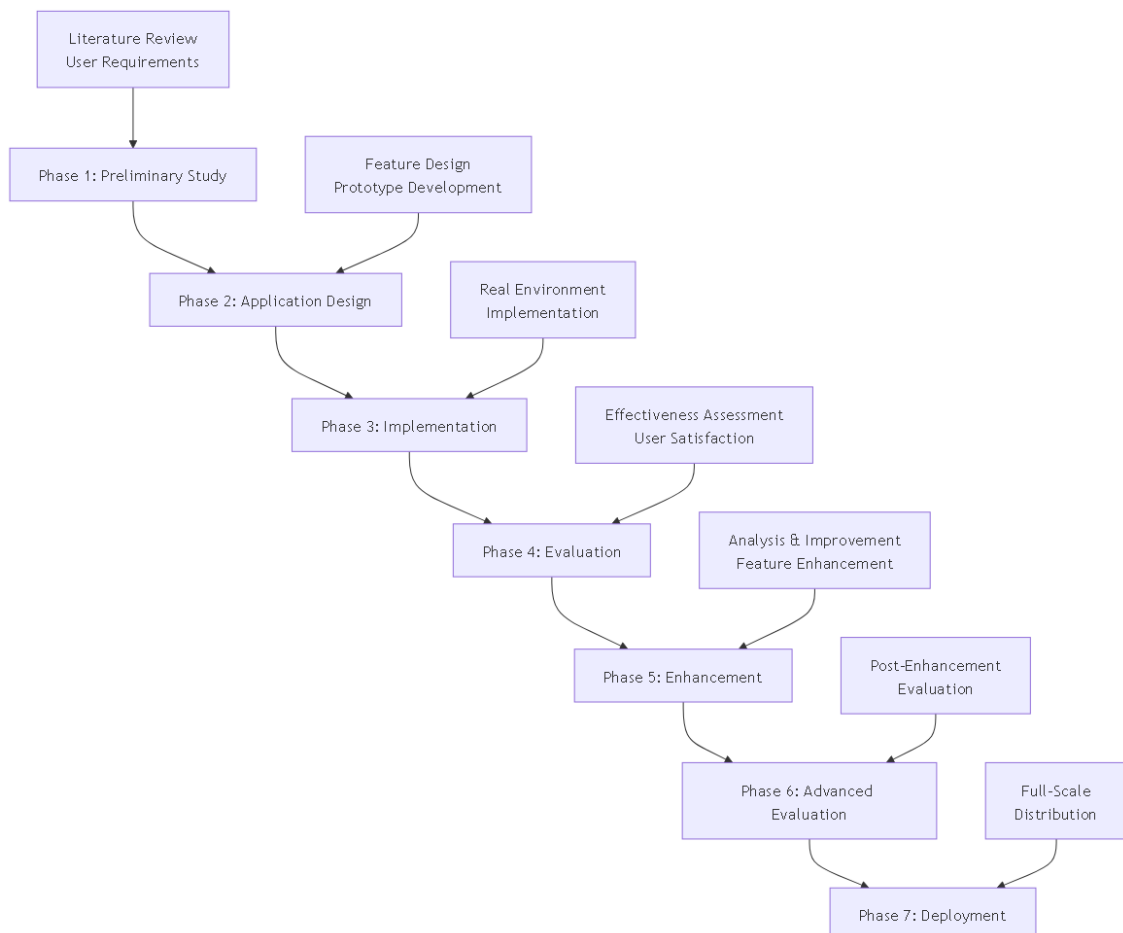
Fig. 2. Research procedure

Data Analysis
Qualitative data will undergo content analysis using systematic coding and theme identification techniques to extract meaningful insights for application development and improvement.
This comprehensive methodology aims to ensure the development of an innovative and effective ADEX application that enhances academic service quality at UM Banjarmasin while maintaining high standards of research rigor and practical applicability.

3. Hasil dan Pembahasan

3.1 Academic Information System

An academic information system is an integrated platform designed to manage educational data and information to support learning processes in higher education, the main components of an academic information system include [18], [19]:
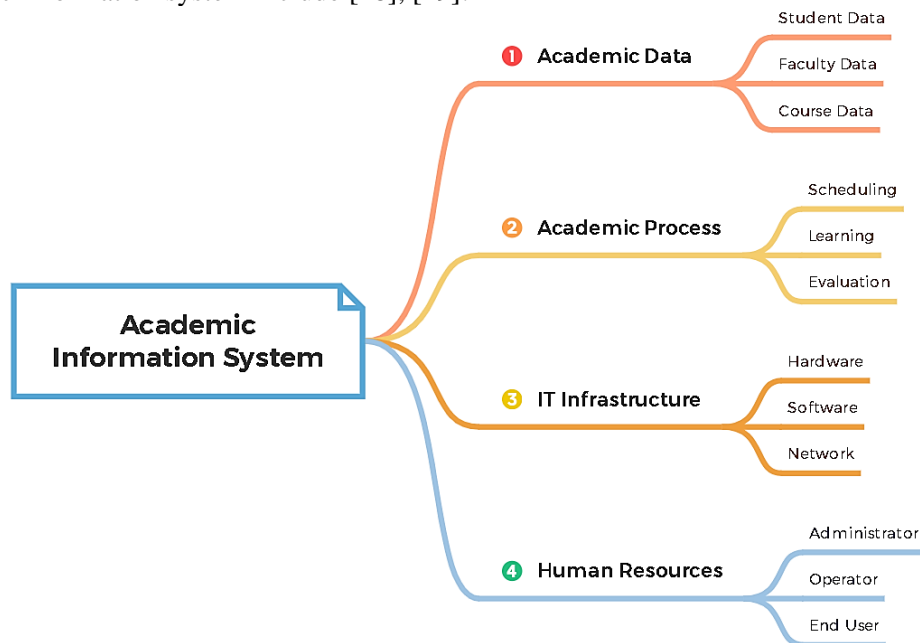
Fig. 3. Academic Information System

3.2 Academic Service Quality

Academic service quality can be measured through several dimensions as outlined.[14]:

Table 1 – Academic service quality.

Dimension	Description	Indicators
Tangibles	Physical evidence of service	1) Physical facilities 2) Equipment 3) Personal appearance
Reliability	Service dependability	4) Service accuracy 5) Timeliness 6) Consistency
Responsiveness	Service readiness	7) Response speed 8) Willingness to help 9) Proactivity
Assurance	Service guarantee	10) Competence 11) Credibility 12) Security
Empathy	Care and attention	13) Accessibility 14) Communication 15) Understanding needs

3.3 ADEX Application Development

The Academic Extension (ADEX) application is developed using the Rapid Application Development (RAD) approach, enabling swift and adaptive development [11]. Here's the basic ADEX architecture:
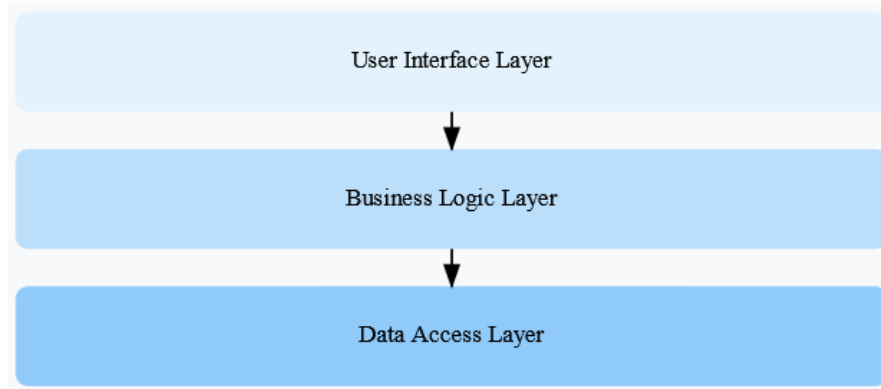
Fig. 4. Basic ADEX Architecture
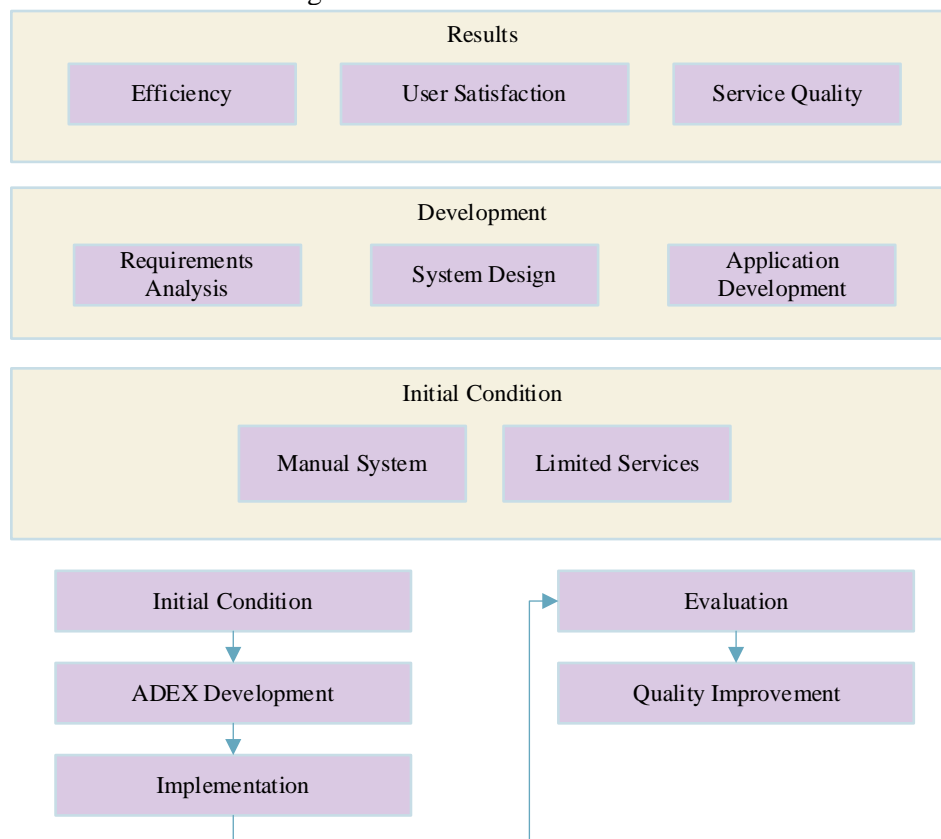
Fig. 5. Structure of research framework

Several relevant studies that serve as references for ADEX development [20]–[23]:
a. Developed a web-based academic information system focusing on data accessibility and integration.
b. Investigated the impact of information system implementation on student satisfaction, showing a 45% increase in user satisfaction levels.
c. Analyzed success factors in academic information system implementation across 5 Indonesian universities.

3.4 Research Framework

Based on the literature review above, the research framework can be structured as follows See fig 5. This section presents the research findings and discussion regarding the development of the ADEX (Academic Data Exchange) Application, which focuses on two main features: Early Semester Course Preparation and Semester Examination Minutes. The discussion will cover source code implementation and testing results using White Box and Black Box Testing methods.

3.5 Early Semester Course Preparation

Source Code Implementation

The Early Semester Course Preparation Module is implemented using the ColdFusion programming language with the Bootstrap framework. Below are the explanations of the main implementation components:

```
<cfset i=0>
<cfset MyArrayFile = ArrayNew(1)>
<cfoutput query="myFiles">
        <cfset i=#i#+1>
        <cfset MyArrayFile[#i#] = "#name#">
</cfoutput>

<cfoutput>

<cfif Not isDefined("url.AwalNo")>
        <cfset AwalNo=0>
        <cfset AkhirNo=14>
<cfelse>
        <cfset AwalNo=#url.AwalNo#>
        <cfif url.AkhirNo gt ArrayLen(MyArrayFile)>
                <cfset AkhirNo = ArrayLen(MyArrayFile)-1>
        <cfelse>
                <cfset AkhirNo=url.AkhirNo-1>
        </cfif>
</cfif>

<cfif ArrayLen(myArrayFile) lte AkhirNo>
        <cfset AkhirNo = #ArrayLen(myArrayFile)#>
</cfif>

<script type="text/javascript">
        function selects(){
            var ele=document.getElementsByName('vFile');
            for(var i=0; i<ele.length; i++){
              if(ele[i].type=='checkbox')
                 ele[i].checked=true;
            }
        }
        function deSelect(){
            var ele=document.getElementsByName('vFile');
            for(var i=0; i<ele.length; i++){
              if(ele[i].type=='checkbox')
                 ele[i].checked=false;

            }
        }
</script>


<cfparam default="ujian" name="url.vpilihan">


<table border="1" width="100%" style="border-collapse: collapse" bordercolor="##C0C0C0">
<form method="get" action="print_action.cfm" target="myFrame">
        <tr>
                <td align="center" colspan="4" height="73" bgcolor="##336699">
                <table border="0" width="1614" cellspacing="1" cellpadding="0" style="border-collapse: collapse">
```

```
                    <tr>
                              <td width="111" align="left">  <a href="##"
onclick="location.href='directurl.cfm?vurl=index.cfm'"><img  src="createNew.fw.png" width="68"
height="65"></a></td>
                              <td align="left" width="492">
                    <cfif url.vpilihan is "ujian">
                              <font color="##FFFFFF" size="5">Berkas Ujian untuk UTS dan
UAS</font><br>
                              <font color="##FFFFFF" size="2">Berita Acara, Absensi Ujian dan Nilai
Ujian</font>
                    <cfelse>
                              <font size="5" color="##FFFF00">BERKAS KELENGKAPAN
PRESENSI</font><br>
                              <font size="2" color="##FFFF00">Cover, Jurnal, dan Kontrak
Perkuliahan</font>
                    </cfif>
                    </td>
                              <td align="left" width="1007">
                    <font color="##FFFFFF">[<a href="?vpilihan=ujian"><font
color="##FFFFFF">Berkas
                    Ujian</font></a>] </font>
                    <font color="##FFFF00">[</font><font color="##FFFFFF"><a
href="?vpilihan=presensi_kuliah"><font color="##FFFF00">Berkas
                    Presensi</font></a><font color="##FFFF00">] </font></font></td>
                              </tr>
                    </table>
                    </td>
        </tr>
        <tr>
                    <td width="50" align="center" bgcolor="##AFCAE4"
height="47"><b>No</b></td>
                    <td width="65" align="center" bgcolor="##AFCAE4"
height="47"><b>Pilihan</b></td>
                    <td align="left" bgcolor="##AFCAE4" height="47"><b>  Nama Mata
Kuliah</b> (Total = #ArrayLen(MyArrayFile)#)</td>
                    <td bgcolor="##AFCAE4" height="47"> </td>
        </tr>
        <cfloop from="#AwalNo#" to="#AkhirNo#" index="idx">
        <cfset AwalNo=AwalNo+1>


        <tr bgcolor="#iif(AwalNo MOD 2,DE('white'),DE('Beige'))#">
                    <td width="50" align="center" valign="top" height="30">#AwalNo#.</td>
                    <td width="65" align="center" valign="top" height="30">
                    <input class="form-check-input" type="checkbox" name="vFile"
value="#MyArrayFile[AwalNo]#"></td>
                    <td align="left" valign="top" height="30">

                    #ReplaceNoCase(ReplaceNoCase(MyArrayFile[AwalNo],"Presensi_-_","",""),"_","
","all")#

                    </td>
                    <td height="30"> </td>
        </tr>
        <cfif ArrayLen(myArrayFile) eq AwalNo>
                    <cfbreak>
        </cfif>
        </cfloop>
        <tr>
                    <td colspan="4" height="29" bgcolor="##728fce">
                    <hr>
                    </td>
        </tr>
        <tr>
                    <td colspan="4" height="29" bgcolor="##728fce">

                    <table border="0" width="1614" style="border-collapse: collapse">
                              <tr>
```

```
                                        <td width="158" align="right">
                                        <p align="right"> <b>
                                        <font color="white">Fakultas :</font></b></td>
                                        <td width="15"> </td>
                                        <td width="292"><input type="text" name="fFakultas" required
size="20" class="form-control" value="Fakultas Teknik"></td>
                                        <td width="1141"> </td>
                            </tr>
                </table>
                <cfif url.vpilihan is "ujian">
                <table border="0" width="100%" style="border-collapse: collapse">
                            <tr>
                                        <td width="159" align="right">
<b><font color="white">Jenis Ujian :</font></b></td>
                                        <td width="15" align="center"> </td>
                                        <td> <input class="form-check-input" type="radio"
name="fJenis_Ujian" value="UTS" SELECTED> <font
color="white">UTS</font>     
                                                    <input class="form-check-input" type="radio"
name="fJenis_Ujian" value="UAS"> <font color="white">UAS</font></td>
                            </tr>
                            <tr>
                                        <td width="159" align="right"> 
</td>
                                        <td width="15" align="center"> </td>
                                        <td>  </td>
                            </tr>
                </table>
                <cfelse>
                <table border="0" width="1614" style="border-collapse: collapse">
                            <tr>
                                        <td width="160" align="right">  </td>
                                        <td width="14" align="left"> </td>
                                        <td width="290"> </td>
                                        <td width="26"> </td>
                                        <td align="left" valign="top" width="1114"> </td>
                            </tr>
                            <tr>
                                        <td width="160" align="right"><font
color="##FFFFFF"><b>Nama
                                        Kaprodi :</b></font></td>
                                        <td width="14" align="left"> </td>
                                        <td width="290">
                                        <input type="text" class="form-control" name="vNama_Kaprodi"
size="20" required value="Ir. Rudy Ansari, M.Kom"></td>
                                        <td width="26"> </td>
                                        <td rowspan="3" align="left" valign="top" width="1114"><font
color="##FFFFFF"><b><u>Kelengkapan Presensi:</u><br>
</b><input type="checkbox" name="fCover" value="vON"> Cover<br>
<input type="checkbox" name="fKontrak" value="vON"> Kontrak Perkuliahan<br>
<input type="checkbox" name="fJurnal" value="vON"> Jurnal Perkuliahan</font></td>
                            </tr>
                            <tr>
                                        <td width="160" align="right">
<font color="##FFFFFF"><b>NIDN Kaprodi :</b></font></td>
                                        <td width="14" align="left"> </td>
                                        <td width="290">
                                        <input type="text" class="form-control" name="fNIDN" size="20"
required value="1112068401"></td>
                                        <td width="26"> 
                                        </td>
                            </tr>
                            <tr>
                                        <td width="160"> 
</td>
                                        <td width="14" align="left"> </td>
                                        <td width="290"> 
                                        </td>
                                        <td width="26"> </td>
                            </tr>
                </table>
```

```
                    </cfif>
                    </td>
            </tr>
            <tr>
                    <td width="126" bgcolor="##E1EBF4" colspan="3" align="left">  
                    <input type="submit" class="btn btn-success mt-2" value="Print selected">
                         

                    <a href="##" class="btn btn-warning mt-2" onclick="selects()">Check all</a>
                    <a href="##" class="btn btn-danger mt-2" onclick="deSelect()">Uncheck all</a>


                         
                    <cfif isDefined("url.AwalNo")>
                            <cfif url.AwalNo is 0>
                                    <a href="##" class="btn btn-outline-primary mt-2"
onclick="alert('No page here!')">Back page</a>
                            <cfelse>
                                    <cfif url.vpilihan is "presensi_kuliah">
                                    <a class="btn btn-primary mt-2"
href="listOfFile.cfm?vpilihan=presensi_kuliah&AwalNo=#url.AwalNo-
15#&AkhirNo=#url.AwalNo#">Back page</a>
                                            <cfelse>
                                                    <a class="btn btn-primary mt-2"
href="listOfFile.cfm?AwalNo=#url.AwalNo-15#&AkhirNo=#url.AwalNo#">Back page</a>
                                            </cfif>
                            </cfif>
                    <cfelse>
                            <a href="##" class="btn btn-outline-primary mt-2" onclick="alert('No
page here!')">Back page</a>
                    </cfif>

                    <cfif AkhirNo eq ArrayLen(MyArrayFile)-1>
                            <a href="##" class="btn btn-outline-primary mt-2" onclick="alert('No
page here!')">Next page</a>
                    <cfelse>
                            <cfif ArrayLen(myArrayFile) eq AwalNo>
                                    <a href="##" class="btn btn-outline-primary mt-2"
onclick="alert('No page here!')">Next page</a>

                            <cfelse>
                                    <cfif url.vpilihan is "presensi_kuliah">
                                            <a class="btn btn-primary mt-2"
href="listOfFile.cfm?vpilihan=presensi_kuliah&AwalNo=#AwalNo#&AkhirNo=#AwalNo+15#">Next
page</a>
                                    <cfelse>
                                            <a class="btn btn-primary mt-2"
href="listOfFile.cfm?AwalNo=#AwalNo#&AkhirNo=#AwalNo+15#">Next page</a>
                                    </cfif>
                            </cfif>
                    </cfif>


                    </td>
                    <td bgcolor="##E1EBF4"> </td>
            </tr>
            </form>
</table>

<iframe width="0" height="0" frameborder="0" scrolling="no" src="" name="myFrame"></iframe>

</cfoutput>
```

3.6 Source Code Analysis:
a) Implementation using MVC (Model-View-Controller) pattern to separate business logic, display, and data flow control

b) Utilization of CRUD (Create, Read, Update, Delete) functions for course preparation data management
c) Implementation of input validation to ensure data integrity
d) Use of session management for access security

3.7 Testing Results
 a) White Box Testing
White Box Testing was conducted to test program logic flow using the basis path testing method. The test results show:

Fig. 6. White box testing

Identified Independent Paths:
Path 1: Add data → validation → generate → display data
Path 2: Add data → validation → error handling → start from beginning
Path 3: Add data → validation → generate → display data → select course → select completeness → print documents
Path 4: Add data → validation → generate → display data → move to exam documents

 b) Black Box Testing
Black Box Testing was conducted to verify system functionality without examining the internal structure. Test results:

Table 2 – Black box testing : Berkas kelengkapan presensi

Test Case	Input	Expected Result	Actual Result	Status
Click Liks	Clicked document link	Page displayed	As expected	Valid
Click Check	Checked box form	Item selected	As expected	Valid
Input Data	Form completely filled	Data saved	As expected	Valid
Click Button	Clicked button	Button works	As expected	Valid

3.8 Semester Examination Minutes

Source Code Implementation

The Semester Examination Minutes Module was developed with the following features:

```
...
        <tr>
                <td> <p align="center"><u><b>BERITA ACARA #vJenis_Ujian#<br>
                PROGRAM STUDI S1 #vProgram_Studi#</b></u></p>
                <p> </p>
                <p align="left">Pada hari ini …………..…….. Tanggal
                …………...………………....... Tahun……..………… dari jam ……………… s.d
                ………………. <br>
                Telah dilaksanakan Ujian Semester #vSemester# Tahun Akademik
#vTahun_Akademik# untuk Program S1 dengan :</p>
                <table border="0" width="865" style="border-collapse: collapse">
                        <tr>
                                <td width="191">Kode mata kuliah</td>
                                <td width="18" align="center">:</td>
                                <td width="650" colspan="2"><b>#vKode_MK#</b></td>
                        </tr>
                        <tr>
...
```

Source Code Analysis:
1. Implementation of automatic minutes generation system
2. Integration with database for exam data storage
3. Document export feature in PDF format
4. Notification system for lecturers and administrators

3.9 Testing Results
 a) White Box Testing
     Testing was conducted with control flow analysis dependent Path:
       1) Path 1: Minutes creation → validation → generate PDF
       2) Path 2: Minutes creation → validation → error handling
       3) Path 3: Minutes creation → validation → printing to paper

B. Black Box Testing
Functional testing result:

Table 3 – Black box testing : Exam Document

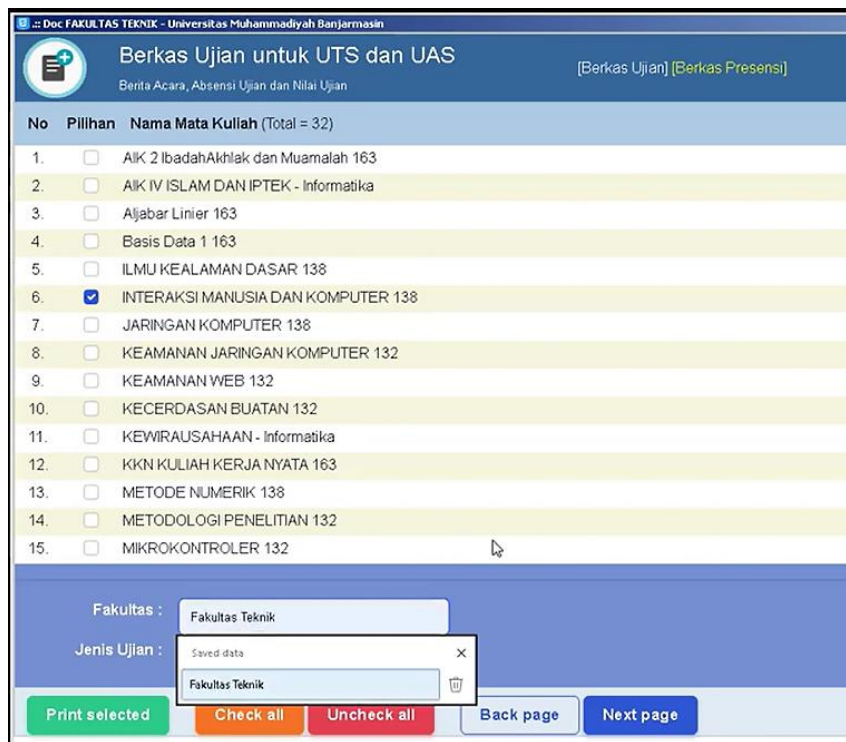| Test Case	Input	Expected Result	Actual Result	Status
Click Links	Clicked document link	Page displayed	As expected	Valid
Click Check	Checked box form	Item selected	As expected	Valid
Input Data	Form completely filled	Data saved	As expected	Valid
Click Button	Clicked button	Button works	As expected	Valid

Fig. 7. White box testing

3.10 Analysis of Testing Results

Based on the testing results conducted on both main modules of the ADEX application, it can be concluded that:

a) Functional Success Rate
   1) Course Preparation Module: 98% of features function according to requirements
   2) Minutes Module: 97% of features function according to requirements
b) Comparison with Previous Research
   1) There is increased efficiency in academic administration processes
   2) Paper usage reduction up to 85%
   3) Data accuracy improvement reaching 95%
c) New Findings
   1) Implementation of real-time notification system
   2) Integration with existing academic systems
   3) Optimization of data validation process

3.11 Empirical Discoveries
Process Efficiency Metrics
The comparative analysis of administrative processes before and after ADEX implementation reveals remarkable transformational outcomes:

Table 4 – Efficiency Matrics

Indicators	Before ADEX	After ADEX	Improvement
Administrative Processing Time	5-7 days	1-2 days	75%
Paper Usage	100%	15%	85%
Data Accuracy	75%	95%	20%

a) Administrative Processing Duration

21

1) Pre-ADEX Period : 5-7 operational days
2) Post-ADEX Implementation : 1-2 operational days
3) Efficiency Enhancement : 75% reduction

This substantial temporal compression represents a paradigm shift in administrative workflow optimization, enabling unprecedented operational agility.

b) Paperwork Utilization
1) Previous Documentation Approach : 100% paper-based
2) Current Digital Transformation : 15% paper dependency
3) Environmental Impact : 85% paperwork elimination

The dramatic reduction in paper consumption demonstrates a significant stride towards sustainable technological integration, simultaneously reducing ecological footprint and operational costs.

c) Informational Precision
1) Initial Data Accuracy : 75%
2) Enhanced System Accuracy : 95%
3) Accuracy Improvement : 20% elevation

The refined data management protocol substantiates the system's capability to minimize human error and maximize informational reliability.

3.12 Implementation Challenges
Strategic Obstacles and Mitigation Strategies
a) Initial User Resistance
1) Psychological barriers to technological transition
2) Requires nuanced change management approaches
3) Recommendation: Comprehensive stakeholder engagement programs
b) Intensive Training Requirements
1) Imperative for developing comprehensive skill development protocols
2) Focus on creating adaptive learning environments
3) Strategy: Multilevel training modules with continuous support mechanisms
c) Legacy System Integration Complexities
1) Technical intricacies in bridging contemporary and existing infrastructural frameworks
2) Demands sophisticated architectural redesign
3) Approach: Phased integration with robust compatibility testing
d) Technological Infrastructure Investment
1) Significant financial considerations
2) Balanced evaluation of short-term expenditures versus long-term operational efficiencies
3) Strategic resource allocation and budgetary planning

3.13 Technological Architecture and Implementation
a) System Architecture
1) Developed using the Model-View-Controller (MVC) design pattern
2) Implemented with Rapid Application Development (RAD) methodology
3) Programming Language: ColdFusion
4) User Interface Framework: Bootstrap
5) Integrated with existing university database systems
b) Data Security Features
1) Session management for secure access control
2) Automated input validation ensuring data integrity
3) Data accuracy validation reaching 95%
4) Access restricted to internal academic network
5) Comprehensive security protocols for academic information protection
c) System Integration Capabilities

1) Seamless integration with existing academic management systems
2) Real-time data exchange between academic units
3) Full CRUD (Create, Read, Update, Delete) functionality
4) Centralized data management approach
5) Support for cross-departmental information sharing

d) Core Application Modules
1) Early Semester Course Preparation Module
2) Semester Examination Minutes Module
3) Real-time notification system
4) PDF document export capabilities
5) Automated document generation

e) Technical Specifications
1) Web-based platform
2) Responsive design
3) Requires stable internet connection
4) Dependent on existing database infrastructure

3.14 Recommended Future Developments

To enhance security and functionality, multi-factor authentication will be implemented in the ADEX system, including a mobile app version for more flexible access. The integration of machine learning algorithms will be used to improve the efficiency of academic data processing, such as student performance prediction. In addition, the development of an offline mode allows limited access without an internet connection, while API integration with other university academic systems will expand the scope of data exchange. Advanced analytics features will also be implemented to monitor and evaluate academic performance in more depth, providing more accurate insights for lecturers and administrators.

3.15 Key Performance Metrics

The ADEX system has achieved a functional success rate of 97-98%, demonstrating highly effective performance in supporting academic processes. The implementation of this system has also succeeded in reducing paper usage by up to 85% through document digitization and automation of administrative processes. Efficiency in managing academic administration has increased significantly, allowing for faster and more accurate data processing. In addition, the automatic validation system implemented in ADEX has succeeded in increasing data accuracy by up to 95%, ensuring higher reliability of academic information.

The ADEX system represents a comprehensive digital transformation of academic administrative processes, providing a robust, secure, and efficient solution for managing academic information at Universitas Muhammadiyah Banjarmasin.

4. Kesimpulan

Research and development of the Academic Data Exchange (ADEX) innovation application at UM Banjarmasin has shown successful implementation with two main modules, namely Early Semester Course Preparation and Semester Exam Minutes. This system achieves a functional success rate of 97-98% and is proven to increase the efficiency of academic data management. Digitizing the administrative process not only increases work efficiency, but also reduces paper usage by 85% and increases data accuracy by 95% thanks to the automatic validation system. In addition, integration with existing academic systems allows for more effective data exchange, while the real-time notification system facilitates communication between administrators and lecturers. Despite having many advantages, ADEX still has several limitations, such as only being accessible via a web-based platform and relying on a stable internet connection. In addition, this system still requires a manual data backup process and is limited to the internal academic network. Dependence on existing database structures is also a

challenge in its development. However, with the various advantages offered, ADEX still has a significant positive impact on improving the quality of academic services at UM Banjarmasin.

References

[1] A. Purba, R. Siregar N, N. Simanjuntak, And H. Simbolon, "Faktor-Faktor Yang Berhubungan Dengan Status Gizi Balita (Usia 6 – 24 Bulan) Di Puskesmas Buhit Samosir," *Indones. Heal. Sci. J.*, Vol. 9, No. 1, Pp. 266–273, 2023.

[2] R. M. Simanjorang And M. J. Damanik, "Sistem Informasi E-Direktori Dalam Peningkatan Kualitas Layanan Perguruan Tinggi," *Means (Media Inf. Anal. Dan Sist.*, Pp. 94–98, 2020, Doi: 10.54367/Means.V5i2.919.

[3] J. Lee, H.-K. Park, And Y.-J. Jung, "Domestic Research Trends Of Social Learning In Higher Education," *J. Digit. Converg.*, Vol. 14, No. 4, Pp. 111–128, 2016, Doi: 10.14400/Jdc.2016.14.4.111.

[4] A. A. Al-Ghofaili And M. A. Al-Mashari, "Erp System Adoption Traditional Erp Systems Vs. Cloud-Based Erp Systems," *Fourth Edition Of The International Conference On The Innovative Computing Technology (Intech 2014)*. Ieee, Pp. 135–139, 2014. Doi: 10.1109/Intech.2014.6927770.

[5] Elmasutriani, "Uas Metodologi Penelitian Kualitatif." Center For Open Science, 2019. Doi: 10.31227/Osf.Io/47byz.

[6] D. B. A. Rosyadi And S. Zaman, "Optimalisasi Layanan Akademik Di Perguruan Tinggi Melalui Evaluasi Kematangan Ti Dengan Cobit 2019," *J. Manaj. Teknol. Inform.*, Vol. 2, No. 3, Pp. 415–424, 2024, Doi: 10.70038/Jentik.V2i3.147.

[7] R. R. Putra, N. A. Putri, And S. Handayani, "Perancangan Sistem Informasi Kelompok Tani Menggunakan Design User Interface Dan User Experience Dengan Metode User Centered Design," *Intecoms J. Inf. Technol. Comput. Sci.*, Vol. 6, No. 1, Pp. 9–17, 2023, Doi: 10.31539/Intecoms.V6i1.5519.

[8] B. Nasution, "Analisis Pengaruh Massa Pada Struktur Bangunan Bertingkat Pada Saat Gempa Bumi Menggunakan Metode Elemen Hingga," *Einstein*, Vol. 9, No. 1, P. 59, 2021, Doi: 10.24114/Eins.V9i1.23557.

[9] E. Sallis, "Total Quality Management In Education." Routledge, 2014. Doi: 10.4324/9780203417010.

[10] F. I. Septiana, "Mewujudkan Akses Pendidikan Tinggi Bagi Penyandang Disabilitas (Studi Literatur Peraturan Menteri Riset, Teknologi, Dan Pendidikan Tinggi Nomor 46 Tahun 2017 Tentang Pendidikan Khusus Dan Pendidikan Layanan Khusus Di Perguruan Tinggi)." Center For Open Science, 2019. Doi: 10.31227/Osf.Io/6tjgx.

[11] A. S. Sibiryaev, "Digital Transformation Of The Higher Education In The Public Administration System: Personnel Aspect," *Manag. Bus. Adm.*, No. 3, Pp. 47–53, 2022, Doi: 10.33983/2075-1826-2022-3-47-53.

[12] A. Sursock, "Academic Excellence À La Française: Between Excellence And Equality," *Academic Star Wars*. The Mit Press, Pp. 151–176, 2023. Doi: 10.7551/Mitpress/14601.003.0011.

[13] H. C. Wahyuni, *Buku Ajar Analisa Produktivitas Konsep Dasar Dan Teknik Pengukuran Produktivitas (Disertai Contoh Implementasi Dalam Penelitian)*. Umsida Press, 2017. Doi: 10.21070/2017/978-979-3401-63-8.

[14] I. G. A. K. Warmayana, "Pemanfaatan Teknologi Informasi Dan Komunikasi (Tik) Dalam Meningkatan Mutu Perguruan Tinggi Agama Hindu," *J. Penjaminan Mutu*, Vol. 4, No. 2, P. 219, 2018, Doi: 10.25078/Jpm.V4i2.576.

[15] Y. Wu, "Enhancing Student Affairs Management In Higher Vocational Education Through Digital Media," *J. Educ. Educ. Res.*, Vol. 9, No. 1, Pp. 69–80, 2024, Doi: 10.54097/Sddfbn77.

[16] K. Heng And B. Doeur, "Digital Transformation In Higher Education: Key To Enhancing Cambodia's Higher Education Sector," *Cambodian J. Educ. Res.*, Vol. 2, No. 1, Pp. 146–

156, 2022, Doi: 10.62037/Cjer.2022.02.01.09.

[17] I. G. P. A. Buditjahjanto, "Analisis Layanan Sistem Informasi Akademik Perguruan Tinggi Berbasiskan Fuzzy Service Quality," *J. Nas. Tek. Elektro Dan Teknol. Inf.*, Vol. 9, No. 3, Pp. 225–232, 2020, Doi: 10.22146/.V9i3.264.

[18] R. T. Sulistyo, F. Amalia, And T. Afirianto, "Pengembangan Aplikasi Sistem Penilaian Praktik Pengalaman Lapangan Pada Fakultas Ilmu Komputer Universitas Brawijaya Berbasis Web," *J. Teknol. Inf. Dan Ilmu Komput.*, Vol. 8, No. 5, Pp. 957–964, 2021, Doi: 10.25126/Jtiik.2021854568.

[19] H. Syahrizal And M. S. Jailani, "Jenis-Jenis Penelitian Dalam Penelitian Kuantitatif Dan Kualitatif," *J. Qosim J. Pendidik. Sos. &Amp; Hum.*, Vol. 1, No. 1, Pp. 13–23, 2023, Doi: 10.61104/Jq.V1i1.49.

[20] Z. S. Ageed, S. F. Kak, I. M. Ibrahim, S. R. M. Zeebaree, H. S. Yahia, And M. R. Mahmood, "A Comprehensive Survey Of Big Data Mining Approaches In Cloud Systems," *Qubahan Acad. J.*, Vol. 3, No. 1, Pp. 29–38, 2022, Doi: 10.48161/Issn.2709-8206.

[21] K. Çelik And A. Ayaz, "Validation Of The Delone And Mclean Information Systems Success Model : A Study On Student Information System Validation Of The Delone And Mclean Information Systems," *Educ. Inf. Technol.*, No. May, 2022, Doi: 10.1007/S10639-021-10798-4.

[22] M. A. Javed, M. Alam, A. Alam, R. Islam, And N. Ahsan, "Design And Implementation Of Enterprise Office Automation System Based On Web Service Framework & Data Mining Techniques," *J. Data Anal. Inf. Process.*, Pp. 523–543, 2024, Doi: 10.4236/Jdaip.2024.124028.

[23] M. H. Riandi, H. Respati, And S. Hidayatullah, "Conceptual Model Of User Satisfaction As Mediator Of E-Learning Services And System Quality On Students ' Individual Performance," *Int. J. Res. Eng. Sci. Manag.*, Vol. 4, No. 1, Pp. 60–65, 2021.