

# Assessment of Quality Parameters in A Student Portal

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## Table of Contents:

#	Content
1	Abstract
2	Introduction
3	Hypothesis
4	Literature Review
5	Research Methodology
6	Responses by Target Group
6.1	Metrics Calculated for Student
6.2	Metrics Calculated for Instructor
6.3	Metrics Calculated for Academic Officer
7	Acceptance of Hypothesis
8	Recommendations

## Keywords:

Quality attributes: Essential characteristics for good quality

Student portal: Subset of learning management system equipped with basic functionality of enrollment and evaluations.

NUCES: National University of Computer and Emerging Sciences(FAST) Pakistan

Roles in system: Major users of system

Subsystems in Flex: Major functionality provided by Flex student portal

## 1. Abstract:

Popularity of learning management systems(LMS)has increased during pandemic of COVID-19. Higher education adopted this change and construction of LMS at various institutions grew rapidly. Student portal is a subset of learning managementsystem with major focus on provision of student record maintenance facility in safe and secure environment. Prevlagedaccess is given to student portal so that student entire data including fee details, educational, and personal records can be managed irrespective of security threats. LMSprovides wide variety of features for example uploading of course material in multiple forms(audio, video, textual), student collaboration feature and much more hence security is biggest challenge in such sort of system. The focus of this research is Flex[1] a student portal implemented at all campuses of NUCES[2] Pakistan. The system[1] is equipped with basic functionality of data maintenance in safe environment. The objective of this research is evaluation of various quality attributes and their importance with respect to different roles present in system[1].

Literature review has been conducted and comparison between LMS like google classroom[9] and Flex[1] has been drawn. Several factors indicating need of student portals in recent era are observed. Another comparison made during this research include contrast between student portal implemented at various higher education institutions of Pakistan in order to note shortcoming of the respective system[1]. Questionnaire has been designed observing different quality characteristics and distributed among three target groups using email service[3]. Responses obtained by target groups are analyzed in the form of metrics and the required test applied for acceptance of hypothesis. Rejection of alternative hypothesis and acceptance of Null hypothesis has proved that Flex[1] is capable of meeting essential functionality expected by student portal. Some recommendations made are presented at the end of this research paper.

## 2. Introduction:

Online student portal is subset of learning management system(LMS). As obvious from name (LMS is a management of shared repository and training programs. It enables students, researchers to collaborate. The factor contributing towards its popularityis 24/7 availability. Fulfillment of nonfunctional requirements(NFR)is also important along with functional requirements(FR)whileits construction.System functionality in LMS is subject to different roles. Challenging thing while its design is understanding of available roles and its associated functionality. Design is a sensitive part of its construction. Regular inspections are requiredthroughout developmentof these systems.E learning is an effective technique using contemporary teaching methods. This research surveyconcentrates its focus towards flex[1] a student portal currently operational at all campuses of NUCES[2] Pakistan. Its major roles include instructor, student, academic officer. Classification made to various rolesfor example instructor is further categorized as permanent employee or visiting faculty member isnot madein system[1] whereas such categorization exists in university[2] policy. Assurance of quality for all modules in flex[1] can yield significant product.Presence of student portals at higher educational institutions does not guaranty notifiable change in record keeping processes. Regular inspections are essential for significant results.Various subsystems present in student portalFlex [1] include attendance maintenance subsystem, student record keeping subsystem, student dew's maintenance subsystem etc. Each role is associated to different prospective present in Flex[1]. There is no overlap between intended functionality of different roles. No exception present in subcategories I.E both permanent and visiting instructor have same functionality.This survey identified major subsystems present in Flex[1], different roles present in system and their interactions. Importance of various quality parameters for example reliability, availability, performance etc. are observed with respect to different roles and their responsibilities.Questionnaire circulated among target group threw [3]. Facts highlighted by user responses further led the survey towards significant characteristics which may becomeactive agent in making improvements.

### 3. Hypothesis:

Construction of learning management systems(LMS) or its subsystem may become significant agent in improving educational processes only if quality parameters are considered along with functional requirements. Flex[1] works well in most of situation, but under heavy load the system begins malfunctioning. As presence of quality factors is equally important as major functionality of the system therefore there is a need to identify quality attributes effecting system's performance and highlight further improvements.

H\0: Flex[1] is capable of meeting all essential quality attributes required for the construction of effective student portal.

H\1: Flex[1] is incapable of meeting all essential quality attributes required for the construction of effective student portal.

### 4. Literature Review:

Learning management system(LMS) at higher educational institutions is significant agent in the formation of learning environment which facilitates its users through 24/7 availability. Its development has gone through several stages. Prior to the development of LMS interactive tutoring systems were introduced. These systems presented peers with course content by evaluating user's weak concepts. LMS is a shared repository that manages activities. It is an efficient way of maintaining student's record related to their educational activities. The focus of this research survey is Flex[1] a subset of LMS(student portal) currently operational at all campuses of NUCES[2] Pakistan. Different roles present in Flex[1] include instructor, student, and academic officer. Some roles are further divided into subroles for example the instructor is categorized as permanent or visiting faculty member. Similarly, student is classified as full time or parttime. These subcategories are defined in university[2] policies whereas there exists no distinction between different roles using system. Presence of quality from all perspectives is crucial part of successful student portals. Software quality assurance guarantees that the product will fulfill its purpose. Identification of quality parameters in Flex[1] and their importance with respect to different user perspective is the goal of this survey.

According to research[4] good LMS should help driving organization's training program by simplifying two critical operations:

- A server that allows professionals to perform core functions of creation, management, and delivery of course material.
- A data repository for key information on learner's journey and performance.

Flex[1] focuses on critical functionality of managing student's journey. Uploading of course material feature is not implemented in the system. Student portal's look and feel varies according to organization's objectives yet there exist some fundamental tasks which every student record keeping system should support. According to research[4] such features include:

- Course registration
- Tracking and analyzing user data
- Performance based tasks(skill gap analysis)
- Course administration
- LMS and student portals can be classified into three ways:
  - Cloud based or installed
  - Open source or proprietary
  - Free or commercial

Flex[1] is an example of installed system with a maintenance expert at client side. It is a closed type of student portal. Its objectives include:

Student enrollment, uploading evaluations, maintaining student's study plan, maintaining record of entire degree program, track student attendance, save individual's personal information etc. Assurance of quality is important with respect to all prospectives in system. Multiple roles present in flex[1] i.e., Instructor, Student and Academic officer are associated to different operations. Students are linked to degree programs. Evaluation criteria for students depend on their program of enrollment such as Bachelors, Masters or PHD. Evaluation criteria differences depends on university policies. no exception between part time, or full-time student in flex[1] present. Student enrolled in different degree programs such as Bachelors degree, or Masters degree program can be treated according to university[2] defined rules through manual input. Assessment of different quality attributes like reliability, efficiency and scalability is performed using system's objectives.

Student be an important role present in Flex[1]. System's functionality associated to the respective role include: Course enrollment/Withdrawal of courses, view attendance, view evaluation scores, make study plan, view class average, print chalan form, view details of dues submitted during degree program. Student's personal data is also maintained using Flex[1]. We have research[8] which highlights the fact student feedback is highly significant for effective teaching and learning processes. Conventional teaching methods lack of this characteristic therefore need for online student portals arise. Flex[1] is equipped with feedback mechanism. Student is incapable of making changes to his/her data using system. Academic officer has authority to make such changes. Along with functional requirements (FR) fulfillment of nonfunctional requirements (NFR) is equally important as Quality attributes majorly focus on nonfunctional requirements (NFR).

Instructor be another role associated to respective system[1]. This role is responsible for marking student's attendance, uploading marks and grades. Changes to evaluations can be made till final grade has been uploaded. Weightages for tasks is set by instructor.

Academic officer be a highly privileged role. This role is responsible for Offering courses, associating instructors to courses, register students manually, view student's record, make changes to student data etc. According to research[7] course enrollment may become challenging task if improperly managed. The respective role also ensures all activities are performed systematically. Academic officer deal with university policies hence requires system[1] should follow standards set by organization[2]. Quality attributes to be observed include: Functionality, Usability, Correctness, Reliability, Performance, Supportability, Localizability, Flexibility, Integrity, Portability, Interoperability. Quality attributes are categorized as product specific and Organization specific attributes.

Significant quality attributes regarding cognitive model of LMS construction are discussed in research[5] these characteristics enhance customer's experience for using educational services. Flex[1] is a student portal yet various attributes mentioned in research[5] are applicable to it. Highlighted quality parameters in research[5] include: Usability, Understandability, Ubiquity, Rememberability, safety and reliable design. Measurement of these parameters are important for enhancement of user experience from all prospectives. The result concluded in research [6] indicated that 60 percent users does not trust service providers with inaccessible websites therefore evaluation of quality from better user experience is an important factor.

High Level Functional Requirements Regarding Student Role:

1. The system shall allow student to add/drop courses.
2. The system shall enable student to view scores of different evaluations.
3. The system shall allow student to view fee details.
4. The system shall allow student to provide feedback for different facilities being offered by university.
5. The system shall enable student to evaluate him/herself W.R.T class average.

High Level Functional Requirements With Respect To Instructor Prospective in Flex:

1. The system shall allow instructor to teach more than one course.
2. The system shall enable instructor to assign different weightage to evaluations.
3. The system shall enable instructor to mark student attendance.
4. The system shall allow instructor to upload/change student scores.
5. The system shall not allow instructor to make important announcements to class.

High Level Functional Requirements Associated to Academic Officer:

1. The system shall enable academic officer to offer courses.
2. The system shall enable academic officer to associate instructor to an offered course.
3. The system shall enable academic officer to manually register student.
4. The system shall enable academic officer to modify student's data.
5. The system shall enable academic officer to view student feedback provided about different services provided by university.

High level system specifications are mentioned for the assessment of quality attribute (fulfillment of functional requirements) in system [1]. The comparison between student portal Flex [1] is made with learning management system Google Classroom [9] for identifying need of student portal in era of LMS.

Comparison Between Student Portals and Learning Management System:

Feature	Flex	Google Classroom
Sign in with proper privileges	Provided	Provided
Student's evaluations kept personal	Provided	Not provided
Calculation of Max/Min/Class average	Provided	Not provided
Record student attendance	Provided	Provided
Maintenance of student account's data	Provided	Not provided
Maintenance of student personal profile	Provided	Not provided
Scale up-to few dozen student in class	Provided	Provided

Comparison table highlights the fact student portals are still important in today's era of advancement as they provide secure record maintenance system for personal data. Student record related to financial transactions or evaluation of grades which is supposed to be private is maintained using student portal. Learning management systems are equipped with collaboration feature hence data security is big challenge for this type of ERP systems. It is observed student portal Flex [1] is complementing LMS instead of substituting it.

Comparison between Student Portals Operational at Different Universities in Pakistan:

Available functionality in student portals implemented in Lahore University of Management Science LUMS [10] and National University of Science and Technology NUST [11] is observed along with Flex [1] for comparison between services and implementation of quality attributes in different student portals implemented in Pakistan.

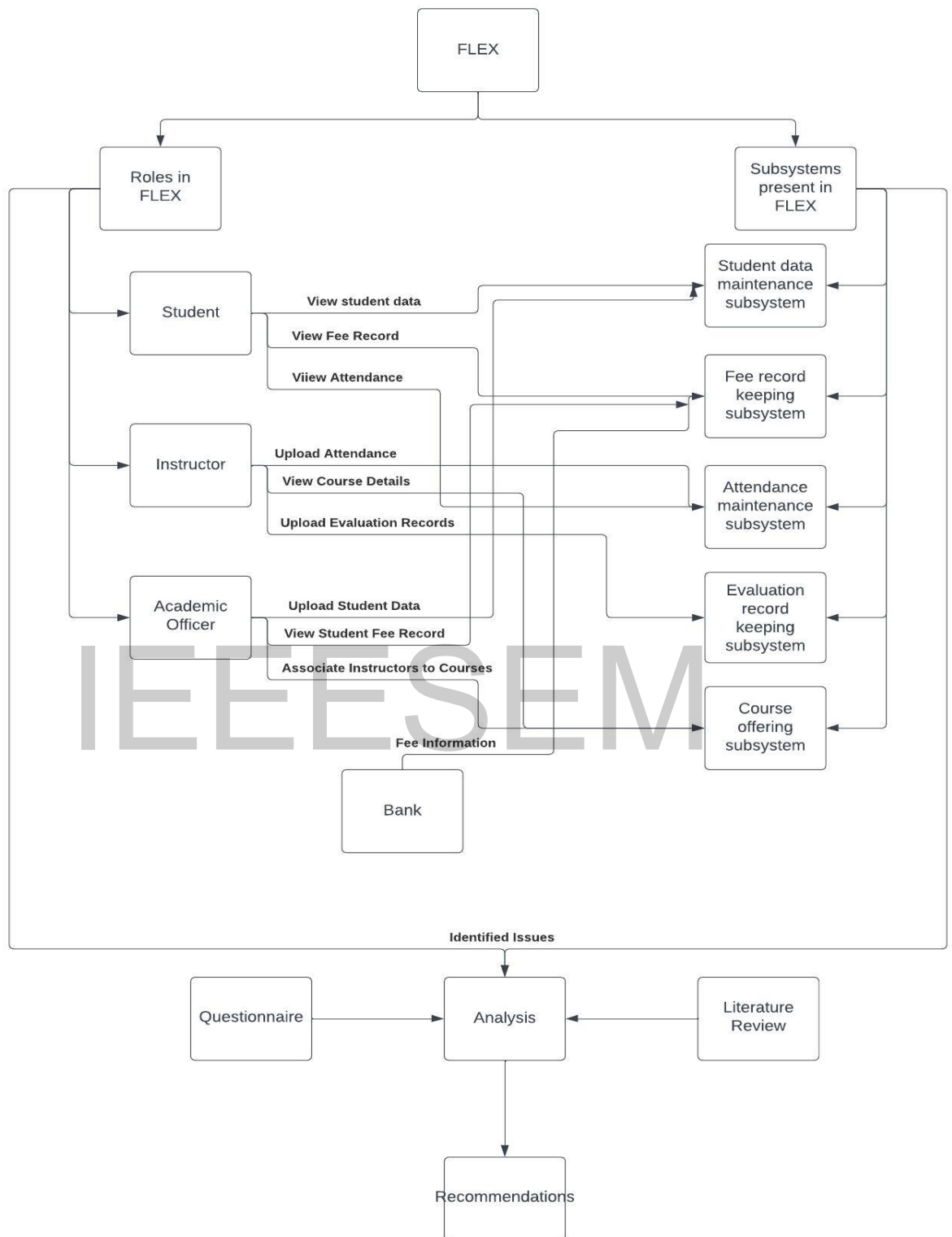
Feature	NUCES	LUMS	NUST
User Management	Provided	Provided	Provided
Instructor granted full right for setting evaluations for	Not provided	Not provided	Not provided
Progress tracking	Provided	Provided	Provided

Content creation	Not provided	Provided	Provided
Mobile accessible	Provided	Provided	Provided
Personalize record maintenance	Provided	Provided	Provided
Feedback mechanism	Provided	Provided	Provided
Uploading lectures	Not provided	Provided	Provided
Student collaboration	Not provided	Provided	Provided

Flex[1] grants limited access to student and instructor role. Students are unable to communicate through the required system[1] similarly, instructor may use slate[12] another system implemented at NUCES[2] for making announcements. Features which are not provided by Flex[1] is due to unavailability of blended learning facility. This facility is provided by LUMS[10] and NUST[11] hence uploading of lectures and collaboration among customers is provided by other student portals being discussed. The instructor is not provided with full authority for customizing evaluations according to program's demand using Flex[1]. Let's take an example of mid evaluation scores. The rule defined in university[2] policy two midterm evaluations for bachelor's degree program whereas one sessional exam for master's program. Flex[1] is unable to provide instructor the right of setting either single mid evaluation or two evaluations based on course requirement. There exists some malfunctioning with respect to Flex[1] and such shortcomings needed to be improved for providing high quality service to all customers.

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### 5. Research Methodology:



## 6. Responses by Target Group:

Questionnaire circulated among academic officers and 45 responses obtained. A subset of instructors from NUCES Lahore campus were chosen and 20 responses received. A subset of students chosen included currently enrolled individuals at NUCES Lahore campus and 30 responses recorded.

### 6.1. Metrics Calculated With Respect TO Student:

Quality Attribute	Percentage of User Satisfaction	Effect
Functionality	75 percent	Sustain for five years
Correctness	50 percent	Require improvements for scale up the system
Usability	50 Percent	Need improvement for improving user experience design
Reliability	90 percent	Attracts users to use the respective system
Supportability	58 percent	Heavy loss due to lack of supportability
Localizability	95 percent	Attainment of necessary information achieved
Performance	75 Percent	Capable of performing more work in less time
Flexibility	10 Percent	Need modifications for the implementation of new features
Integrity	80 Percent	Capability of maintaining information confidential
Portability	90 percent	Capability of adopting new technology
Interoperability	10 percent	Strong data storage required in case of failure

### 6.2. Metrics Calculated With Respect TO Instructor Responses:

Quality Attribute	Percentage user satisfaction	Effect
Functionality	95 Percent	System always uploaded up to date data
Correctness	80 Percent	Ease in system modification
Usability	80 Percent	Increase in usage frequency of system
Reliability	80 Percent	System sustainability for long time
Supportability	75 Percent	High user satisfaction
Localizability	30 Percent	Managerial tasks centrally controlled
Performance	80 Percent	Capable of performing tasks in less time
Flexibility	50 Percent	Modifications to design needed for scale up system
Integrity	80 Percent	Capable of keeping confidential data
Portability	90 Percent	Easily transferred to new



		technology
Interoperability	No data shared	Need strong storage mechanism in case of system crash

### 6.3. Metrics Calculated With Respect To Academic Officer:

Quality Attribute	Percentage of user satisfaction	Effect
Functionality	53 percent	User prefer to use system for most of tasks
Correctness	51 percent	Ease of scalability
Performance	47 percent	Incapable of completing more tasks in less time
Usability	50 percent	Effort required for making system usable
Reliability	57 percent	Increase in user satisfaction
Localizability	59 percent	Attainment of better managerial control
Flexibility	29 percent	Incapability of accommodating changes
Integrity	10 percent	Unable to maintain confidential data
Portability	89 percent	Ease in accessing system using required platform
Interoperability	3 percent	Data needed manual updating on regular basis
Supportability	38 percent	Discomfort in performance of basic operations

### 7. Acceptance of Hypothesis:

T test applied using 30 responses by students the result indicated that Flex[1] is capable of meeting all essential quality attributes required for the construction of effective student portal therefore  $H_1$  is rejected and  $H_0$  is accepted in case of Flex services provided to students.

T test applied using twenty responses by instructor the result indicated that Flex[1] is capable of meeting all essential quality attributes required for the construction of effective student portal therefore  $H_1$  is rejected and  $H_0$  is accepted with respect to Flex services provided to instructors.

Z test applied using 45 responses by academic officers at NUCES. The result indicated that Flex[1] is capable of meeting all essential quality attributes required for the construction of effective student portal therefore  $H_1$  is rejected and  $H_0$  is accepted regarding Flex services provided to academic officers.

### 8. Recommendations:

Result concluded by surveying students indicated that Flex[1] is capable of providing major functional requirements associated to it, however several improvements can be made to system upon evaluation of user feedback. The system does not provide facility for taking quiz and uploading assignments whereas this characteristic is highly required. Scores of different examinations are visible as soon as the instructor uploads it. Display of maximum and average scores provides students with self-evaluation capability, but broadcasting of minimum scores to all class is

not desired by the respective group. Most of students are not comfortable in providing fair response as end of semester feedback due to less trust in system for disclosure of person's identity. Under heavy load the system crash is encountered hence results in provision of poor service to customers. Flex[1] malfunctioning is observed as inability of student to submit fee through banking system during prescribed dates, return of student fee due to course drop is not timely updated, unable to view exact amount to be submitted whenever course drop occur prior to fee submission. Modification to system design may affect system in positive way for example uploading assignments, taking online quiz and scale up system for better performance under heavy load may enhance major functionality.

Results obtained by performing T test for instructors highlighted the fact Flex[1] is providing satisfactory service to the respective group. Instructors are fully capable of marking student's attendance and upload scores of various evaluations. The respective target group is capable to set weightages according to course requirements, however an instructor may not set number of examinations per semester. I.E Bachelors degree program require two mid term exams whereas masters program need single sessional for evaluation. A recommendation obtained by responses highlight fact that there should be a difference between student consolidated report and faculty consolidated report for ease of analysis by head of department.

Responses by academic officer proves that Flex[1] is capable of performing intended functionality. Some problems faced by respective group include number of seats is not directly proportional to number of eligible students per semester, incapability of system displaying accurate status of seat availability in section, too much time required for resolving registration issues etc. Flex shall provide updated status of student enrollment in every section. Student registration may become timely activity if course enrollment priorities are defined in system. The system shall analyze graduating students and assign high priority for such students during course registration. If student feedback is displayed as percentage of students highly satisfied, percentage having average satisfaction level, and percentage of students having least satisfaction level by particular service the academic officer will easily analyze the results.

#### References:

- 1 <https://www.flex.nu.edu.pk>
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## 4 A Brief History Of The LMS

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# IEEESEM

By Dr. RK Prasad  
December 28, 2020

### 5 Quality Attributes for an LMS Cognitive Model for User Experience Design and Evaluation of Learning Management Systems

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## 6 ECOMMERCE DEVELOPMENT

# Building an Accessible Website for Visually Impaired & Disabled

MARCH 4, 2022

7 Student\_s\_Experiences\_a

<sup>8</sup> Using the Sakai Learning Management System to change the way Distance Education nursing students learn: are we getting it right?

Volume 35, 2020 - Issue 3

Michael A. Tagoe

&

Yaa Cole

- <https://doi.org/10.1080/02680513.2019.1704232>

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<sup>10</sup> <https://www.lums.edu.pk>

<sup>11</sup>

<https://www.nust.edu.pk>

<sup>12</sup> <https://www.slate.nu.edu.pk>