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IS QUALITY MODEL ON ACADEMIC INFORMATION SYSTEM SOFTWARE: A PROPOSED MODEL

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ABSTRACT

Academic information system software currently available does not fully apply the quality model as its system instrument. Quality instruments are needed as a determinant of the quality of academic information system software. **IS Quality Model is a conceptual quality instrument model that implements and focuses the standardization of usability and security behavior on a website-based academic information system.** IS Quality Model consists of Usability-Focused IS Quality Instruments, and Security-Focused IS quality instrument. **Quality Structure and Quality Factors, IS Quality Model and Quality Model Questionnaire Method are the most appropriate methods to describe a proposed IS Quality Model.** Usability-Focused IS Quality Instrument are quality instrument IS that that determine usability behavior in academic information system software, namely understandability, learnability, operability, attractiveness, and usability compliance. Six of security-focused IS quality instruments that must be possessed by an academic information system namely privacy, confidentiality, integrity, authentication, availability, and access control. **IS Quality Model will provide quality assurance for a software that has a comprehensive quality factor that is easy to learn and use, providing satisfaction in interacting, a high level of reliability, safety, and the availability of information**

Keywords: *IS Quality Model, Academic Information System Software, Usability-Focused IS Quality Instrument, Security-Focused IS Quality Instrument*

1. INTRODUCTION

Quality model is a software that becomes a reference for quality measurement of a product. Quality model is used to measure the quality of academic system software quality. An academic information system is an administrative module used to display academic data such as students, academic staffs, lecture subjects, academic activities and curriculum information. portability, usability, safety, maintainability, and reusability of a system. In addition to quality factor that becomes an measurement object of a software, quality model is also used to audit the maturity of Information and Communication Technology (ICT) in an educational institution or organization.

Software engineering quality models used to build an academic information system software by adopting the quality factors of each quality model. It will be a reference for academic information system software.

There are several qualities that become a reference for quality of an information system software including. Academic information system software (AISS) is a system software that provides academic services in an educational institution, college or high school [1].The current AISS does not fully adopt the quality model as its instrument system [1]. Each of the quality models has different quality instruments [1]. The IS quality model is the aim of this paper which is to propose a quality model that is a reference for an academic information system. Academic information systems (AIS) are currently being built using website-based applications [2]. Website-based applications have a standard of two quality sides, namely security quality [3] and usability quality [4]. Implemented security instruments must be able to provide quality security in the domain of academic information systems (AIS) and high usability functions.

The quality of the system significantly influences the quality of information [5]. The IS quality model is a quality instrument model that implements and focuses the standardization of usability and security behavior that must be possessed by an academic information system based on website applications.

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The IS quality instrument focused on usability is the IS quality instrument that determines the usability behavior of academic information system software (AISS). There are five reusability behaviors of IS quality instruments that AISS must possess. First, understandability is AISS reusability behavior that is easily understood by users. The usability behavior of the second IS quality instrument is learnability, which is the easy to use AISS reusability behavior resulting in an efficient use of time because AISS has complete user documentation and assistance facilities. Operability is the third IS instrument quality reusability behavior, which is the AISS usability behavior that is easy to operate to assess and control the level of software usage by users. The usability behavior of IS quality instruments is furthermore an interesting interaction, and adjusting the appearance of the user interface is an attractiveness-focused usability behavior that AISS must have. Usability compliance is the last AISS usability behavior, which is the ability of AISS to meet the rules of related software usability.

IS quality focused security instruments are IS quality instruments which are the basic aspects of academic information system software security (AISS). There are five basic aspects of IS quality instrument safety that must be owned by AISS, the first is privacy and confidentiality. Each of these aspects is implemented for data whose properties and objectives are different. The privacy aspect is used for private data, while the confidentiality aspect is for data provided to other parties for certain purposes. The second IS security-focused quality instrument is the aspect of integrity, that is, the basic aspect of security of the information received must be exactly and exactly as when the information was sent. The third IS security-focused quality instrument is authentication, which is a basic aspect of security related to methods or ways to state that the information is truly genuine, the person accessing or providing information is really the intended person or the server being contacted is really the original server. The basic framework for the security aspect of an AISS is the availability of the basic aspects of security related to the availability of data and information in a system and can be utilized by those who are entitled. Access control is an IS focused quality instrument of security which is the last basic security aspect related to how access is managed to information.

The proposed IS Quality Model in academic information system software can provide a new discourse that can be a reference for the implementation of information systems, especially on usability and security quality instruments. Where IS quality instruments focus on usability and security focuses which show the quality of the system significantly influences the quality of information.

2. THE MATERIAL

2.1 Software Quality Assurance

Software quality assurance is a match between functional and needs, software quality standards and the implicit characteristics expected of professional software developers. Under IEEE [6] software quality assurance is a plan and systematic pattern needed to produce products that meet the requirements, and a series of activities created to carry out an evaluation process based on the product being built. The objectives of software quality assurance in software development are as follows:

1. Ensure the level of software confidence is based on requirements
2. Ensuring the level of confidence that the software will be in accordance with the specified time and development funds that have been determined to determine the requirements.
3. Initiation and management activities to increase and improve the efficiency of software development and software quality assurance

2.2 Web Based Application Quality Model (WBAQM)

The Academic Information System (AISS) software implements WBAQM as the main framework for its system quality instrument. The academic information system software quality instrument is a quality measurement tool specifically implemented at AISS. At present, many AISS are built using web-based applications [7]. WBAQM was built with different programming models, technologies and languages and is used to implement highly interactive applications that have very high quality requirements. ISO / IEC 9126 [8] and ISO / IEC 25010: 2011 are software quality standards that are widely used, where ISO / IEC 9126 has six quality factors namely functionality, reliability, usability, efficiency and maintainability. Whereas ISO / IEC 25010 is a quality model that improves the previous quality model namely ISO / IEC 9126 by adding safety characteristics [9]. In addition, ISO / IEC 25010 is used because of its flexibility and generality. Implementation of quality factors from quality models that have quality standards is the reason Web Based Application Quality Model (WBAQM) becomes the main framework of a Software Academic Information System (AISS).

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3. THE METHOD

3.1 Quality Model Questionnaire Method

Quality Model Questionnaire Method is a research method in the form of selected questions consisting of Basic Quality Questionnaire Method for AISS, Basic Quality Model Questionnaire Method, Usability Questionnaire Method and Security Questionnaire Method. The purpose of the Quality Model Questionnaire Method is to determine the most appropriate parameters as a description of a quality model.

3.1.1 Basic Quality Questionnaire Method for AISS

Attractiveness
1. Annoying/Enjoyable
2. Bad/Good
3. Unlikeable/Pleasing
4. Unattractive/Attractive
5. Unfriendly/Friendly

Efficiency
1. Slow/Fast
2. Inefficient/Efficient
3. Impractical/Practical
4. Cluttered/Organized

Perspicuity
1. Not understandable/Understandable
2. Difficult to learn/Easy to learn
3. Complicated/Easy
4. Confusing/Clear

Dependability
1. Unpredictable/Predictable
2. Obstructive/Supportive
3. Not secure/Secure
4. Does not meet expectation/Meet expectation

Stimulation
1. Interior/Valueable
2. Boring/Exiting
3. Not interesting/Interesting
4. Demotivating/Motivating

Novelty
1. Dull/Creative
2. Conventional/Inventive
3. Usual/Leading edge
4. Conservative/Innovative

3.1.2 Usability Questionnaire Method

A. The choice of parameters below is the most appropriate parameter to describe understandability as an IS quality instrument focused on usability

* Satisfy users / Not satisfy users
* Consistent to obey the rules / Inconsistently obey the rules
* Facilitate users / Not satisfy users
* Has a quick tool / Does not have a quick tool
* Informative feedback / Feedback is not informative
* Can prevent user errors / Can not prevent user errors
* Provides simple, specific, and constructive instructions for recovery when an error occurs / Cannot make a mistake when an error occurs
* Provides support to users / Does not provide support to users
* Simple / Complicated

B. The choice of parameters below is the most appropriate parameter describing the implementation of an IS quality learnability instrument focused on usability in an AISS

* Webside based / spreadsheet based
* Having a quick tutorial / Not having a quick tutorial
* Easy to understand / Difficult to understand
* Easy to learn and use / Difficult to learn and use
* The use of efficient time / Time-consuming
* Effectiveness of aid facilities / No assistance facilities
* More complete / Functional incomplete
* Motivate users to use software / Not motivate users to use software

C. The parameter choices below are the parameters that best describe the operability of an IS quality instrument focused on the reusability of an AISS

* Easy to operate / Difficult to operate
* Check input validity / No input validity
* Cancel user operation / Cannot cancel user operation
* Delaying user operations / Unable to delay user operations
* Customed / No customed
* Monitoring operating status / There is no monitoring of operating status
* Operational consistency / no operational consistency
* Message clear / Message unclear
* Recovering operational errors / Unable to recover operational errors

D. The choice of parameters below is the parameter that best describes the attractiveness of IS quality instruments focused on usability in an AISS

* Attractive interactions are focused on color attributes and graphic design / Unattractive interactions
* The appeal (charm) of a software / One of the security holes in the software
* User interface design can be adjusted / User interface design is not adapted to the user
* Attractive and fun website graphic design / Monotonous website graphic design

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* Easily find information / Not easily find information
* Having tools / No tools
* Content in accordance with the software function / Content does not correspond to the software function
* Content size must fit / Content size does not fit
* Different information groupings must be done correctly / There is no grouping of information

E. The choice of parameters below is the parameter that best describes the usability compliance instrument IS quality focused reusability on an AISS

* Learnability shows that AISS is easy to learn and use / It is common knowledge that users don't like to spend a lot of time learning how the system works.

Efficiency refers to ways that AISS can do to support users in doing their work / AISS efficiency is not needed to support users in carrying out their work.

* Memorability shows the ability of AISS is a system that is easy to remember / A system that is difficult to remember requires users to learn AISS from the start.
* Errors and security involve protecting users from unwanted and dangerous conditions and situations / No need to prevent users from making mistakes.
* Satisfaction shows a situation where the user feels satisfied after using AISS due to the convenience possessed by AISS.

3.1.3 Security Questionnaire Method

A. The parameter selection below is the parameter that best describes the privacy security-focused IS quality instrument in an AISS

* Efforts to safeguard information from people who are not entitled to access / Privacy is not one aspect of security.
* Privacy data on security-focused IS quality instruments are private / Private is not the data settings relating to the regulation of access to information.
* Privacy is one of the basic aspects of security / a basic aspect of security is the effort to protect information from people who have the right to access information.
* Privacy related to how to regulate access to information / Information settings do not require privacy.
* Data classification related to regulating access to information / Private is not data classification.
* Privacy and authentication are mechanisms used to limit system access / Unlimited access for all users.

B. The choice of parameters below is the parameter that best describes the confidentiality of security-focused IS quality instruments in an AISS

* Ability to maintain the confidentiality of data for certain purposes and are only allowed for certain purposes / Confidentiality of data only for certain people.
* Confidentiality is a protection of data and information / Confidentiality is the limitations of data and information.
* Protection of data and information from unauthorized disclosure / Ignorance of data and information from unauthorized disclosure.
* Data and information can only be accessed by authorized people / Data and information cannot be accessed and changed.
* Confidentiality relates to data provided to other parties for certain purposes and is only allowed for certain purposes / Confidentiality does not relate to access to information.
* The basic aspects of information security / Confidentiality are not basic aspects of system security.

C. The choice of parameters below is the parameter that best describes the integrity security-focused IS quality instrument of an AISS

* Information may not be changed without the permission of the owner of the information / Information may be changed without the permission of the owner of the information
* Information received must be exactly and exactly as when the information was sent / Information received does not have to be the same as when the information was sent.
* Viruses, Trojan horses, other users are an integrity problem / Integrity problems lie in the system.
* Access to change data and information can only be done by the rightful owner of the data and information / Anyone who has access to change data and information is the owner of the data and information.
* Appropriate data integrity is needed to maintain and maintain data and information / Data integrity is not required from people who are not entitled to access information.
* Ability to maintain and maintain data and information / Inability to maintain and maintain data and information.

D. The parameter selection below is the parameter that best describes the safety security-focused IS quality instrument on an AISS

* The password method is used to connect to the server and get service / Connect with server and get service does not require a password.

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* Authentication is a way to state that the information is truly authentic / Authentication is a method of obtaining information.
* How to declare the server that we are contacting is really the original server by using a password / No need to use a password when cross-checking.
* A character given by the user to the server and the server recognizes it in accordance with the existing policy / password does not need to be used when wanting to access information on the server.
* Authentication is a way of stating that the person accessing the information is really the person in question / No authentication is required to certify that the person accessing the information is the same.
* The way of stating that the person providing the information is really the person meant by entering the password into the server, if the server recognizes that person is the giver of information / Password is an ancient method for connecting to the server and getting service.

E. The parameter options below are the parameters that best describe the availability of security-focused IS quality instruments on an AISS

* Availability of data and information when needed / Absence of data and information when needed.
* Data and information in a computer system are available and can be used by people who are entitled / Data and information can be used by people who are not entitled.
* A server down due to hacking is a matter of system availability / Availability related to the unavailability of information.
* Availability relates to the availability of information when needed / Information does not always exist when needed.
* People who are entitled to can make use of available data and information / Availability of data and information cannot always be utilized.
* DoS attacks cause the unavailability of data and information services on a server / unavailability of data and information services on a server not related to the availability aspect.

F. The choice of parameters below is the parameter that best describes the access control security-focused IS quality instrument on an AISS

* Access control is related to how to manage access to information / Arrangement of access to information is not necessary.
* Classification of data relating to the way arrangements for access to information need to be done so that users are limited according to the level of needs / Access to information is not linear with the level of information needs.
* The authentication and privacy mechanism used to classify data / access control does not require data classification.
* User ID and password used for access control / access control is not used as a limitation of user access.
* Privacy related to how to regulate access to information / Information settings do not require privacy.

4. RESULTS AND DISCUSSION

4.1 Proposed IS Quality Model

This study proposes a quality model that is IS Quality Model. The structure of IS Quality Model consists of two quality instruments namely *Usability-Focused IS Quality Instruments and Security-Focused IS Quality Instruments.*

IS Quality Model is a quality instrument model that implements and focuses the standardization of usability and security behavior on a website-based academic information system. Usability-Focused IS Quality Instrument is an IS quality instrument that determines usability behavior in academic information system software, namely *understandability, learnability, operability, attractiveness* and *usability compliance*.
Security-Focused IS Quality Instrument is safety-focused IS quality instruments are the instruments contained in the proposed IS Quality Model, which determine the security behavior of an academic information system software that is *privacy, confidentiality, integrity, authentication, availability and control access.* IS Quality instruments are focused on security that must be possessed by an academic information system.

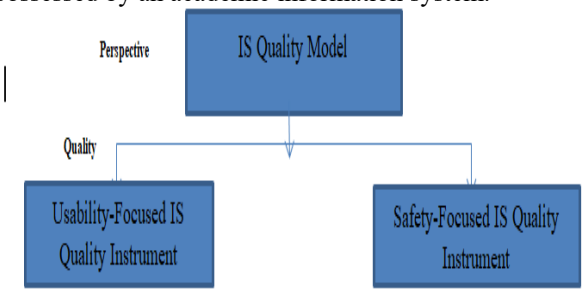

Figure 1. Structure of IS Quality Model

Usability-focused IS quality instrument and security-focused IS quality instrument of IS quality model can be seen from table 1 and table 2:

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Table 1. Usability-Focused IS Quality Instrument of IS Quality Model

	Quality Instrument	Description
Usability-Focused IS Quality Instrument	Understandability	User interaction satisfaction quality instrument
	Learnability	Quality instruments are easy to learn and use by users
	Operability	Quality instruments created to overcome problems faced by users
	Attractiveness	Quality instruments make interesting interactions, and user interface display can be adjusted.
	Usability compliance	Quality instruments are defined as the degree of ability of a software to help users complete a task.

Table 2. Security-Focused IS Quality Instrument of IS Quality Model

	Quality Instrument	Description
Security-Focused IS Quality Instrument	Privacy	Efforts to safeguard information from people who have no right to access and the nature of private data
	Confidentiality	Data is provided to other parties for a specific purpose and is only allowed for that particular purpose.
	Integrity	The nature of information must not be changed without the permission of the owner of the information
	Authentication	The way to state that information, people, or servers are truly authentic.
	Availability	Availability of data and information when needed and utilized.
	Access control	How to manage information access

4.2. Quality Structure and Quality Factors of Usability-Focused IS Quality Instrument

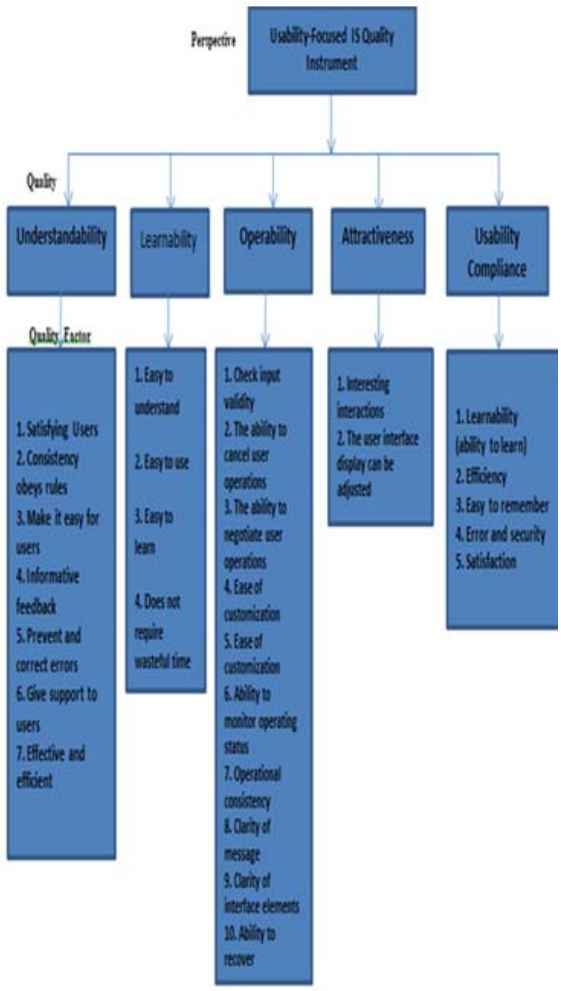

Figure 2. Quality Structure and Quality Factors of Uability-Focused IS Quality Instrument

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Website-based applications are currently widely used as a model of software quality building academic information systems. Website-based applications have a standardization of two aspects of quality, namely the quality of reusability [4] and the quality of security [3].

The proposed IS quality model will be tried to be implemented in website-based applications, because website-based applications have standardization from two sides, namely security quality and usability quality besides Web Base Application Quality Model (WBAQM) is the main framework of Academic Information System Software (AISS). The reusability and safety quality in this paper are respectively adopted from some ISO / IEC 9126 quality model instruments and ISO 25010 quality models.

Figure 1. shows the structure of the IS quality model which consists of two levels:

Level 1: Identify perspectives using a quality model

Level 2: Quality categorization of the perspective of quality models.

Identification of perspectives using the quality model is the first level of an IS quality model structure where the IS quality model is a perspective that uses the quality model as a reference. Quality categorization of the perspective of the quality model is the second level of the IS quality model where there are two types of quality contained by the IS quality model, namely the IS quality instrument focused on usability and security-focused IS quality instrument

According to ISO, quality is "the totality of characteristics of an entity that depends on its ability to meet existing needs". The quality model is software that is a reference for measuring the quality of a product. The IS quality model consists of two characteristics, namely reusability and safety.

In Figure 2. there is a quality structure and quality factor IS quality instruments focused usability consisting of three levels, namely:

Level 1: Identify the instrument quality perspective of the model

Level 2: Quality categorization of the perspective of the instrument quality models

Level 3: Mapping of quality factors against the perspective of the model quality instruments

Identification of the instrument quality model perspective is the first level of the quality instrument IS focused usability structure is a perspective that contains quality. The second level of quality instruments IS focused usability structure, namely quality. There are five types of qualities contained by the quality instrument IS focused usability, namely understandability, learnability, operability, attractiveness, and usability compliance. The third level is the mapping of quality factors against the perspective of the model quality instruments namely the quality factors that become the requirements, considerations, and the nature of each quality instrument.

IS quality instruments focused on usability are the instruments found in the proposed IS quality model, which determine the usability behavior of an academic information system software that is *understandability, learnability, operability, attractiveness and usability compliance.* There is a relationship between usability and the quality of user experience [10].

1. *Understandability* is a quality instrument in the IS quality model that is user satisfaction when using academic information system software (AISS). This IS quality instrument will provide satisfaction in interacting if AISS fulfills Shneiderman's eight rules, namely [11]: consistency, fast key facilities, informative feedback, dialogue design that leads to closure, error prevention and error handling, reversal of easy actions , support for internal locus of control, and reduction of short-term memory load.

Table 3.
Quality of Understandability as Usability Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Understandability Quality	User satisfaction	The process of using and knowledge of the ability of the system to overcome the delay, the reliability of the software.
	Consistently obey the rules	The rules continue
	Make it easy for users	The tools used to help users
	Informative feedback	User Feedback
	Prevent and correct errors	Efforts are made to prevent and correct user errors
	Give support to users	Support for users facing difficulties and disabilities

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	Effective and efficient	Reduction of short-term memory load software

2. *Learnability* is an IS quality focused instrument that must be possessed by every AISS that is easy to learn and use. This is because users don't like to spend a lot of time learning how the system works.

Table 4. Quality of Learnability as Usability Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Learnabiliy Quality	Easy to understand	The ability of AISS is understood
	Easy to use	AISS capability is used
	Easy to learn	The ability of AISS is understood
	Does not require wasteful time in its use	The ability of AISS saves time in its use.

3. *Operability* is an IS usability-focused quality instrument that AISS must have. This is based on a software must design / develop systems that have high usability. Operability is a quality instrument created to overcome problems faced by users such as confusion when being in a content, requires a long time to learn the system, or users have a high level of difficulty when using software.

Table 5. Quality of Operability as Usability Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Operabiliy Quality	Check input validity	AISS ability to check valid data
	the ability to cancel user operations	The ability of AISS to cancel the function implemented by the user
	The ability to negotiate user operations	AISS ability to download implemented functions
	Ease of customization	The ease of function is customizable during operation
	Ability to monitor operating status	Status monitoring capability
	Operational consistency	Operations with inconsistent behavior
	Clarity of message	The message is implemented with a clear explanation
	Clarity of interface elements	Interface elements that have their own explanation
	Ability to recover operational errors	Implementation with user error tolerance

4. *Attractiveness* is a powerful, versatile design tool that helps solve problems that are currently plaguing the development of digital products, especially AISS. There are challenges in developing a product, that is, the user is elastic, the nature of the user is always changing and never satisfied. Therefore, a product has been completed, meaning that the word is not yet finished, because there is a next stage, which is the development of the finished product. To answer these challenges the IS quality model provides solutions to AISS products they are:

1. An interesting interaction, focused on the color attributes and graphic design
2. The user interface display can be adjusted.

Both of the above solutions offered answer the user's elastic nature which is often changing and never satisfied, namely designing the AISS interface as per the user's wishes and focusing on color and graphic design

Table 6. Quality of Attractiveness as Usability Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Attractiveness Quality	Interesting interaction	Color attributes and color design make interactions interesting
	User interface can	The elastic nature of the user

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	be adjusted	who changes frequently and is never satisfied is the reason that the interface design is tailored to the user's wishes.

5. *Usability compliance* is a quality that is defined as the degree of ability of a software to help users complete a task. The success of a system to help users complete a task is determined by a combination of three words "use"[12] which all must be correct, namely:

1. Useful: a system that functions as desired by its users

2.Usable: the system is easy to operate

3.Used: a system that motivates users to use it, is interesting, fun, and so on.

Table 7. Quality of Usability Compliance as Usability Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Usability Compliance	Learnability	AISS must be easy to learn and use
	Efisiensi	Ways that AISS can do to support users in carrying out their work
	Memorability	The ability of an AISS is remembered even if for a certain period of time it is not used
	Error and security	The ability of an AISS to protect users from unwanted conditions and situations.
	Satisfaction	The ability of AISS gives satisfaction to the user with the convenience it has

4.3 Quality Structure and Quality Factor of Security-Focused IS Quality Instrument

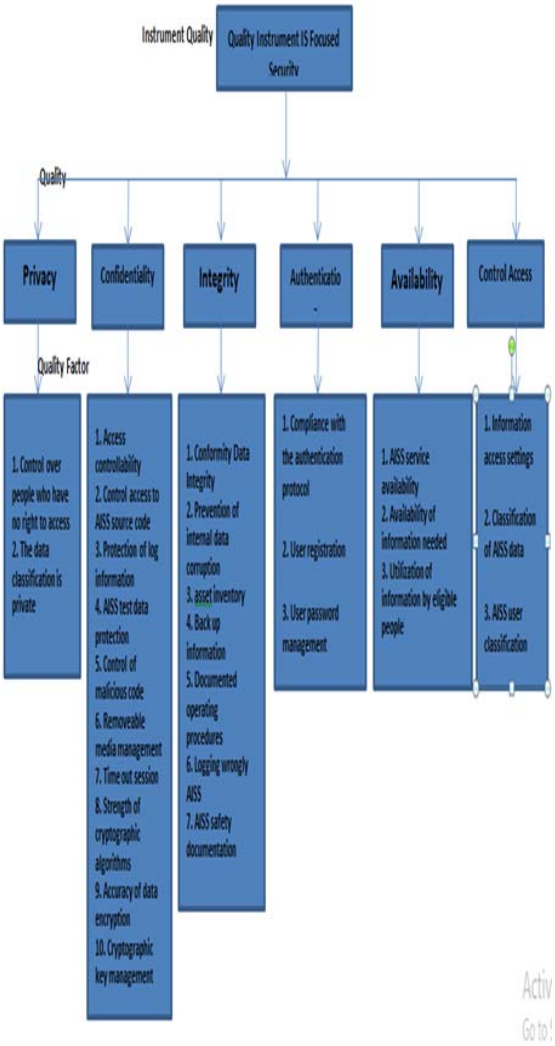

Figure. 3 Quality Structure and Quality Factor of Security-Focused IS Quality Instrument

In Figure 3. there is a quality structure and security-focused quality factor IS quality instrument consisting of three levels, namely:

Level 1: Identify the instrument quality perspective of the model

Level 2: Quality categorization of the perspective of the instrument quality models

Level 3: Mapping of quality factors against the perspective of the model quality instruments. Identification of the instrument quality model perspective is the first level of the quality instrument IS focused security structure is a perspective that contains quality. The second level of the IS instrument focused structure of quality security is quality. There are 6 types of quality contained by IS focused security instrument quality,

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namely privacy, confidentiality, integrity, authentication, availability, and control access. The third level is the mapping of quality factors to the perspective of the model quality instruments namely the quality factors that become the requirements, considerations, and the nature of each quality instrument.

4.3.1 Security-Focused IS Quality Instrument

Safety-focused IS quality instruments are the instruments contained in the proposed IS quality model, which determine the security behavior of an academic information system software that is *privacy, confidentiality, integrity, authentication, availability and control access.*

1. *Privacy*, is an effort to safeguard information from people who are not entitled to access and lead to AISS data that is private.

Table 8. Privacy as Security-Focused IS Quality Instrument in Academic Information System Software (AISS)

	Factor Quality	Description
Privacy	Control over people who have no right to access	Efforts are made to safeguard information from people who are not entitled to access.
	Data classification is private.	Classifying towards private data.

2. *Confidentiality*, is an effort to safeguard information by providing AISS data to other parties for certain purposes and is only allowed for that particular purpose.

Table 9. Confidentiality as Security-Focused IS Quality Instrument in Academic Information System Software (AISS)

	Factor Quality	Description
Confidentiality	Access control	AISS access control is under user control
	Control access to AISS source code	Restrict users to access information using the AISS source code
	Log information protection	Protect information against unauthorized access from an attacker.
	AISS test data protection	Protect AISS test results
	Control of malicious code	Limiting codes of unknown functions and benefits which can be active at any time and cause harm to AISS.
	Removeable media management	The process of setting up removeable media is computer storage media designed to be inserted and removed from AISS
	Time out session	The time taken by the user is logged in but with no activity at all, as a result the user is logged out automatically.
	The power of cryptographc algorithms	The functions of cryptographic algorithms are encryption, description and keys. This algorithm functions to hide information from people who are not entitled to the information.
	Data Encryption Acuracy	Safeguarding the data sent to maintain confidentiality, where the plaintext (original message) is changed into codes that are not understood.
	Cryptographic key management	The process of regulating data security by private key and public key when doing encryption and decryption.

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3. *Integrity* is a quality that emphasizes that information must not be changed without the permission of the owner of the information. The information received must be exactly the same as when the information was uploaded into AISS.

Table 10. Integrity as Security-Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Integrity	Conformity of data integrity	The information or data received must be as exact and the same as when the information or data was sent.
	Prevention of internal data corruption	Actions that prevent damage or loss of data
	Asset inventory	Management of data and information to avoid damage or loss caused by viruses, Trojans, or other users who change information without permission.
	Back up information	The process of backing up data by copying or archiving computer data so that the data can be reused if there is damage or loss.
	Documented operating procedures	AISS operating procedures are created, documented, implemented and maintained
	Logging is wrong AISS	Incorrect reports or records that occur on AISS are caused by viruses, Trojan horses and hackers.
	AISS safety documentation	The process of collecting, selecting, processing and storing information and data from AISS as a security procedure.

4. *Authentication,* is a way to state that the information is truly genuine, the person accessing or providing information is really the person in question, or the server that we are contacting is really the original server. This instrument uses the password method to connect to the server and get AISS services.

	Quality Factor	Description
Authentication	Authentication protocol compliance	The process of confirmation of identity as a procedure for approval of accessing or providing information to those who are entitled.
	User registration	User registration before AISS
	User password management	User password managed after user registration
	Access rights management	The process of managing rights connected to the server and get AISS services
	Restricted access to information	Access control procedures for those entitled to access information.

5. *Availability*, This quality instrument is related to conditions where data and information are ready to be used when needed. AISS data and information are stored on the server so that they are ready to be used and utilized by people entitled to it.

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Table 12. Availability as Security-Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Availability	AISS service availability	Conditions where AISS services are ready to be used when needed
	Availability of information needed	Conditions where information is ready to be used when needed
	Utilization of information by eligible people	Conditions where information is only ready to be used and utilized by people entitled to it

6. *Control access*, is a way to manage information access, every data and user who is in AISS is classified. The access mechanism for this quality instrument uses the user id/password method for each AISS.

Table 13. Control Access as Security-Focused IS Quality Instrument in Academic Information System Software (AISS)

	Quality Factor	Description
Control access	Information access settings	The method used to limit access to information as needed
	AISS data classification	Data settings from the right to access
	AISS user classification	User settings based on the level of needs.

The proposed perspective of IS quality model consists of two quality instruments namely Usability-Focused IS Quality Instrument and Security-Focused IS Quality Instrument.

Usability-Focused IS Quality Instrument have 5 quality instruments namely *understandability, learnability, operability, attractiveness* and *usability compliance.* From usability behavior we get quality factors that become requirements and considerations of Usability-Focused IS Quality Instrument and IS Quality Model instrument.

Implementation of *IS Quality Model* in an academic information system using the botton up model. Where the quality factors of Usability-Focused IS quality instruments are provides requirements and considerations for obtaining a quality factor. This quality factor becomes Usability-Focused IS Quality Instrument which is a quality of *IS Quality Model.*

An academic information system must have 6 qualities, namely privacy, confidentiality, integrity, authentication, availability, and control access. The six qualities each have different quality factors such as those in the Quality Structure and Quality Factors, Security-Focused IS Quality Instrument especially at the third level. **To analyze an academic information system using Security-Focused IS Quality Instruments, it implements an up-down model.** Where is the Quality Structure and Instrument Quality Factors, Security-Focused IS Quality Instrument is implemented from the top down where an academic information system is required to have quality factors of each quality contained in Security-Focused IS Quality Instrument.

Quality factors, from Security-Focused IS Quality Instrument, they are:

• Privacy quality consists of 2 quality factors, namely Control over people who are not entitled to access and classification of data is private

• Quality Confidentiality consists of 10 quality factors, namely Accessibility control, Access control of AISS source code, Protection of log information, Protection of AISS test data, Control of malicious code, Removeable media management, Session time out, Strength of cryptographic algorithms, Accuracy of data encryption and Management cryptographic key

• Quality Integrity consists of 7 quality factors namely suitability of data integrity, prevention of internal data corruption, asset inventory, information back up, documented operating procedures, AISS mistaken logging, and AISS security documentation.

• Authentication Quality consists of 5 quality factors, namely conformity of authentication protocol, user registration, management of user passwords, management of access rights and restrictions on access to information

• Quality Availability consists of 3 quality factors, namely the availability of AISS services, the availability of information needed, and the utilization of information by eligible people

• Quality control access consists of 3 quality factors, namely: 1. Information access settings, AISS data classification, and AISS user classification.

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5. CONCLUSIONS

Academic information system software currently available does not fully apply the quality model as its system instrument. Quality instruments are needed as a determinant of the quality of academic information system software. ***IS quality model is a conceptual quality instrument model that implements and focuses the standardization of usability and security behavior on a website-based academic information system. IS quality model will provide quality assurance for a software that has a comprehensive quality factor that is easy to learn and use, providing satisfaction in interacting, a high level of reliability, safety, and the availability of information.***

IS quality model consists of two quality instrumens namely Usability-Focused IS Quality Instrument and Security-Focused IS Focused Quality Security Instrument. Usability-Focused IS Quality Instrument have 5 quality instruments namely understandability, learnability, operability, attractiveness and usability compliance, and Security-Focused IS Quality Instrument consists of 6 instruments they are privacy, confidentiality, integrity, authentication, availability, and control access. The best method describes the proposed IS Quality Model is **Quality Structure and Quality Factors, IS Quality Model, and Quality Model Questionnaire**

Implementing IS Quality Model focuses precisely on standardization of usability behavior on Usability-Focused IS Quality Instrument on an academic information system using the botton up model. Where are the quality factors, Usability-Focused IS Quality Instrument is provide requirements and considerations of getting a quality factor. The quality factor obtained becomes quality on Usability-Focused IS Quality Instrument none other is the quality of IS Quality Model itself.

Using Up-Down model is a method of Analyzing an academic information system using quality structure and quality factor of Security-Focused IS Quality Instrument. Implemented from top to down where an academic information system must have the quality factors of each quality it's contained in Security-Focused IS Quality Instrument.

Quality factors of Security-Focused IS Quality Instrument, they are

• Privacy quality consists of 2 quality factors, namely Control over people who are not entitled to access and classification of data is private

• Quality Confidentiality consists of 10 quality factors, namely Accessibility control, Access control of AISS source code, Protection of log information, Protection of AISS test data, Control of malicious code, Removeable media management, Session time out, Strength of cryptographic algorithms, Accuracy of data encryption and Management cryptographic key

• Quality Integrity consists of 7 quality factors namely suitability of data integrity, prevention of internal data corruption, asset inventory, information back up, documented operating procedures, AISS mistaken logging, and AISS security documentation.

• Authentication Quality consists of 5 quality factors, namely conformity of authentication protocol, user registration, management of user passwords, management of access rights and restrictions on access to information

• Quality Availability consists of 3 quality factors, namely the availability of AISS services, the availability of information needed, and the utilization of information by eligible people

• Quality control access consists of 3 quality factors, namely: 1. Information access settings, AISS data classification, and AISS user classification.

IS Quality Model consists of two quality instruments they are Usability-Focused IS Quality Instrument and Security-Focused IS Quality Instrument. Both of them can be implemented as a Quality Model in all information system, especially an academic information system.

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