

# Ten Steps for Software Quality Rating Considering ISO/IEC

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## Abstract

In software rating area, it is necessary to apply a measurement reference model to evaluate the quality of software. The standard 25030 is an example of an evaluation system which is based on stakeholders' requirements. In this study, an attempt has been made to establish a model in which all implicit and explicit requirements of stakeholders, users and policy makers have been taken into account. In addition, AHP method has been followed to weigh the indicators used in the model. The results show applicability of the model to meet the requirements of Iranian users.

**Keywords:** Software Quality Evaluation, Software Rating, Content Based Software Packages, Software Evaluation Standard.

## 1. Introduction

In the area of software rating, those methods which are based on user's requirements are considered as the valuable methods by which better interaction between supply and sale sections is achievable. In order to rate the quality of the produced software, a quality evaluation method must be applied. Taking into account the inclusive view about the ability of software's functions it is impossible to evaluate the contents of software by using it, because the model is not able to evaluate the content. There are some other methods of software evaluation which is not based on user's opinion. Indeed, these methods are more scientific and they study and focus on standard features of a software function. Mentioned features are defined and demonstrated by acceptable references. In this issue, ISO can be mentioned as an example. Alizadeh et al. [1] offer different groups after extraction and localization of features of software evaluation. Beata et al. [3] and Kasunie [5] have worked on different kinds of measurements on this topic. It is to say, result of each production can be demonstrated in different ways. This can be accepted or rejected, can be calibrated, ranked or rated (that is done in this survey). Also, production and results can be grouped (without priority) or can

be ranked. Output of mentioned studies is ranking of software that is used by result of former studies.

Software according to primary aim of categories in four groups of educational, Encyclopedic, general and child and adolescent separately are used for evaluation.

In every category, separate general criteria like user interface (UI) and installation etc. are considered. Specific weight is defined for every feature in each software groups which are the results of AHP model on experts.

It can be mentioned that if the method of evaluation has been designed based on 25030 set [1-4], it would be accepted. Considering the standards mentioned above, this study attempts to extract a general model which is applicable for measuring the quality of software in ten steps.

In Section 2, we focus on identification of system requirements and stakeholder. Also these types of needs can be founded in two distinct formats. Models and criteria are included in Section 3. In this section, ISO and features of ISO is discussed. In mentioned parts, result of weighting and ways of computation of marks for each software are defined that the mark will be between Zero to one hundred (0-100). The last section is included the conclusion and tasks that can be done in the future.

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## 2. Requirements

In the **first stage**, the requirements of system are determined. This step is performed in five phases. The first and the second phases are dedicated to clarification of evaluation purposes and investigation of stakeholders respectively. The second phase also involves the assessment of users' requirements as the main stakeholders [5, 6]. Fig.1 shows the relation between stakeholders' requirements in the system.

Software quality evaluation with qualitative requirement has been defined as the evaluation purpose in the first step.

Through the **second step** the type of product for evaluation which is related to evaluation purpose is determined. The main part of evaluation process is to identify the products. This model considers media software as the product for evaluation purposes. Media software enhances the scientific and cultural awareness of users and entertains them simultaneously. They also have direct and indirect effects on psychological and cultural aspects of users.

### 2.1 Stakeholders

The **third step** is to identify the system's stakeholders. A stakeholder is a person who has the right to claim the system or to be shared in the system to fulfill their requirements and expectations. The requirements and expectation of stakeholders are different and can be classified in three general categories:

**Software producers:** This category either provides the contents which are used to influence the cultural, mental and psychological aspects of users or tries to entertain the audiences by providing some interesting contents and functions. To do so, some required tools or functions are designed.

**End users:** This category contains software's audiences whose requirements about the software contents or functions are fulfilled through using the software.

**Policy makers and supervisors:** This category contains governments and supervising institutes whose duty is to inspect the published digital contents or assessment of the digital publication sphere to investigate the situation of people, society and digital publishers. The obtained result will be applied in cultural, social, political or security areas.

It should be noted that in this study the scope of software qualitative requirements involves the requirements defined by the users and the policy makers. Once the stake holders has been determined in the **fourth step**, their requirements including society needs and expectations, known

limitation on the clients and final users requirements are taken into account. The user's requirements are classified into two classes: Implicit and explicit requirements.

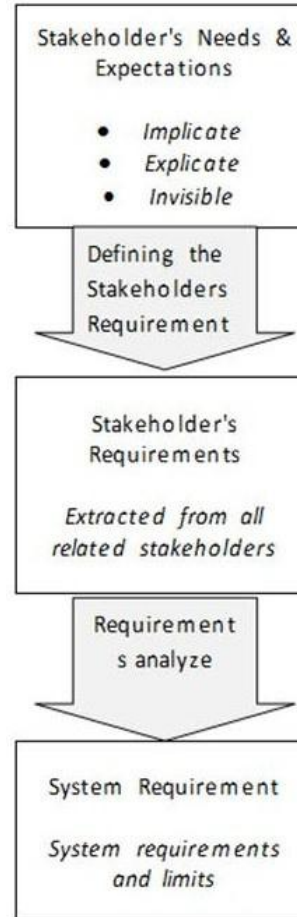


Figure1: Analysis of stakeholders' requirements

### 2.2 Explicit requirements

The explicit requirements are determined by the users. The fulfillment of this type of requirement leads to the better understanding of the users about the capability of the software that are applied by users. An end user follows two purposes and two basic elements when using software. In the other words, two basic requirements lead them to purchase software which is called explicit requirements. This type of requirement is related to the software **content** and operating certain **functions**. Some of available functions in media software are: media distribution function, training function, research function (offering research content, sound and video processing function, computational function).

### 2.3 Implicit requirements

They are expressed but are the real needs. Regarding to the research field of the media software producers and the judgment experts, the following implicit needs were determined for any software:

**1. Packaging appearance:** The user receives the media software product as an in sale package, so the appearance of the software packaging is considered as one of the user requirements. In fact, any media software can be considered as a “commercial off the shelf software product”.

**2. Internal consistency and installation:** Media software in its nature is software, therefore two basic factors must be considered when using it. It must fulfill the internal efficiency and consistency. In the other words, it has the characteristics of reliability, efficiency, maintainability and security without any failure and fault. These characteristics are necessary in order to install, perform, activate and delete a program as well as having appropriate software type and agreement to addresses.

**3. User interface:** It is observable and touchable part of software that user is dealt with directly and includes information channels that provide communication between user and computer. The user interface in media software is generally one of the two following types: choice interface and user graphical interface. Another implicit user need is user interface.

**4. Support:** Since the majority of the media software users are ordinary people, receiving supportive services is one of the requirements of the users. After determination of stake-holder’s needs, at the **fifth step** the system requirements are determined. A system often includes different elements with certain specifications and responds to the different purposes of the system. To operate, the system requirements must be transformed to the requirements of different elements in the system. The obtained result from the requirement definition process is called stakeholders requirement. In this step, for each of the elements defined in previous step (extracted from the user needs), the quality requirements are defined.

### 3. Model and Criteria

In this stage, the reference model and its criteria are designed and determined. Two characteristics have been determined based on clarified requirements: content and function. Regarding to the implied needs, the other four characteristics including software packaging, internal consistency, user interface and supportive services will be determined.

Software quality model is completed by determining criteria (attributes) for each of the

six previous characteristics (in three layers). In the **sixth step**, the criteria (attributes) were determined. Attribute is inherent characteristic of a species or object that can be determined quantitatively and qualitatively by human or automatic tools.

Attribute is divided in two groups: permanent attribute that exists in nature of things and acquired attribute of a system, process or product (such as product price, product owner). The acquired attribute is not the inherent qualitative attribute of a system, process or product.

Quantity determination and quality evaluation of a software product is performed by setting some criteria which are related to the quality attributes. In the **seventh step**, for each of the attributes, the quality characteristics and the criteria are determined in three layers. Using the criteria which were designed in previous step, the quality model is designed at the second step. Quality of a system is result of the constituent quality and the quality of software depends on its ability to meet implicit and explicit requirements under certain conditions.

Quality of the model is a set of defined attributes along with their relationship that provides a framework to determine quality requirements for evaluation purposes. Quality model is used as a framework to grantee the conformity of all the quality aspects with internal aspect and also the user view point. In regard to the extracted requirements at the pervious step, the following quality model has been extracted and in every basic quality attribute, the secondary attributes have been defined. In this model, two aspects of quality are defined:

- Internal software quality: it contains software package, internal consistency, user interface, content, function and support.
- Quality in use: the user’s ideas are obtained about software components.

Defined quality attributes cover all the quality aspects for majority of the media software products, so it can be used to assure the complete coverage of quality. The next step is to design quality model, for determination of the weight for each characteristic and criterion. One of the basic problems arises during the weighing process is how to determine some major differences between different media software based on their importance. For example, in children software because of the necessity of attractiveness in software appearance, the experts consider user interface as the most important aspect while in an encyclopedia software, the main characteristic is content of the software.

Therefore, at the next step (the **eighth step**), all of software packages have been determined. Thus considering the field under study as well as

expert's opinion, the following general types related to content based software were defined: Encyclopedia software, Training software, Children software, General software and Functional software.

#### 4. Weighting and Rating

The last stage in designing the model is to weigh and rate the levels. AHP method was followed in weighing process to determine the weights of characteristics and criteria (applicable for any software). Finally to determine rating levels based on the designed quality measurement, the quality of the software measured based on a population sample and the rating level was determined. In the **ninth step**, the weights of criteria were determined following AHP method. This process is one of the famous multi criteria decision making methods. This method can be used to make decision considering some competitive options and decision criteria. The criteria can be qualitative and quantitative. The problem is solved by forming a hierarchical form. So, the first step is to form a decision tree composed of three levels. The first level of the tree represents the purpose of decision maker and the last level represents competitive alternatives which are compared to each other. The objective is to obtain the weights based on the relative importance of available alternatives. The intermediate level of the tree is the most important level representing some criteria by which competitive alternatives are compared to each other. Table 1, shows the main six criteria and the related weights for four types of software.

Table 1: The weighting factors for characteristics of different software using AHP method

	Encyclopedic	Training	Children	General
Packaging	%3.5	%4.5	%13.5	%11.6
Internal Consistency	%9.5	%7.5	%7.8	%15.9
User Interface	%14.3	%18.7	%31.6	%11.1
Function	%14.1	%32.5	%18.9	%22.5
Content	%53.1	%28.2	%25.3	%34.8
Supportive service	%5.5	%8.6	%5.6	%9.4
Total	%100	%100	%100	%100

This level includes several layers. AHP process requires pair wise comparisons based on a tilde. In this regard, "Expert Choice" software was applied during the following steps:

**Tenth step** Determine rating level through following three processes (Table 2):

**1:** Software quality evaluation based on the quality model was used for 190 software and the results obtained.

**2:** The results transferred to some people who were familiar with evaluation of software process completely without any past knowledge about the software. They were asked to classify the transferred results.

**3:** Finally the list of the classification in the second step was compared to the values obtained at the first step. The maximum and minimum values were determined and all the values were normalized.

The rating shown in Table 2 was based on the user requirements. There are other two stars named "exportable" and "certain innovation and intelligence" which are complementary stars (not mentioned in Table 2) with the purpose of improvement in the quality level of products.

Table 2: Range of scores corresponding to each star

Number of stars	Scores obtained
No star	$0 \leq \alpha < 30$
One Star	$30 \leq \alpha < 50$
Two star	$50 \leq \alpha < 70$
Three star	$70 \leq \alpha \leq 100$

#### 5. Conclusion and future works

In this paper, a quality evaluation model was offered considering the standard 25030 and based on the internal quality of software and quality in use. A standard method was derived from standard 25030 to design the model. Also, this model is derived from media software constituents regarding the cultural requirements of users from media software. Moreover, a scientific method is offered to measure the quality of content in measurement reference model and define quality characteristics by which all quality aspects for most of the media software are covered. Therefore the application of the model can highly assure the complete coverage of quality. In future researches, the weighting of third and fourth functions can also be taken into account in order to decrease the effect of personal judgments and to consider more quantitative criteria.

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