Product Quality Monitoring Software Based on Usability for Manufacturing Enterprise

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Abstract. This paper has discussed the software usability of product quality monitoring software. In the past, software usability is not considered seriously only to take care of implementation. Otherwise, in this paper, the metrics of software usability is put forward briefly, and the usability of product quality monitoring software is investigated deeply, including: correctness usability, UI usability, IO usability, and operation usability. At the same time, how to achieve these goals in product quality monitoring software is discussed for programming with visual c. Then, this paper has also introduced the general development of product quality monitoring software based on software usability for popular architecture of manufacturing enterprise.

Introduction

Product quality is a forever requirement for product manufacturing and production, and the state of product quality will determine the development and life of manufacturing enterprise. Product quality monitoring is the main measure for assuring product quality and avoiding waste. At present, product quality monitoring based on control chart is the main tool for manufacturing enterprise [1, 2]. Execution of product quality monitoring in manufacturing enterprise should be step by step according to actual state of manufacturing enterprise. Execution procedure of quality monitoring software in manufacturing enterprise is illustrated in figure 1.

![Execution of quality monitoring software in manufacturing enterprise.](image)

Usability of Quality Monitoring Software

In recent years, the demand of software usability has increased exceptionally with more and more organizations starting to take usability seriously. For software developing and evaluation, usability is a very important index and key component in the overall quality of a software product.
**Definition of Software Usability [3-5]**

Many kinds of definition of usability have been given so far. Dillon, A. (2001) has given an initial concept that Usability is a measure of interface quality that refers to the effectiveness, efficiency and satisfaction with which users can perform tasks with a tool [3]. But it is only a definition referring to UI (User Interface). Xavier Ferré etc., in 2001, present that usability relates to how the system interacts with the user, and it includes five basic attributes: learnability, efficiency, user retention over time, error rate, and satisfaction [4]. However, usability is not just the appearance of interaction. S K Dubey etc. considered that “usability can be understood as the degree to which software is usable by specified users with ease and comfort” in 2012 [5].

ISO 9241-II:1998 has defined that usability is the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use. At the same time, ISO/IEC 9126-I:2000 also give another definition that usability is the capability of the software product to be understood, learned, used and attractive to the user when used under specified conditions.

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Now, we can give a summary definition for software usability as that software usability is the extent to which a product can be used by specified users to achieve specified goals with understandability, effectiveness, efficiency and satisfaction under specified conditions. In this definition, easy to understand has been strengthened.
Main Aspects of Software Usability [6, 7]

According to the definition above, we can give a metrics of software usability. Considering development process of software and inner linking of computer software technology, for using of software, software usability should include five aspects: correctness aspect, UI aspect, IO aspect, operation aspect and support aspect. For software testing, necessary comment for programming should be given to improve understandability in procedure of software testing. Detail metrics of software usability is shown in figure 2.

Distinguished Implementation of Usability in Product Quality Monitoring Software [8, 9]

According to usability requirement, a lot of measures have been applied to improve the thinking of people-centered in product quality monitoring software.

Data Input in Product Quality Monitoring Software. Data input is a very important aspect for implement software usability. In product quality monitoring software, the core working is getting Shewhart chart using quality inspection data, therein, gathering of inspection data or inputting of inspection data is the first requirement to programming. In order to fulfill this requirement, many consideration and improvement are taken:

According to the state, initializing default data on UI. For example, if you have chosen a tree-item with right key of mouse at left category, the UI can give you consistent default values. It has been illustrated in figure 3.

![Figure 3. Initializing default data on UI.](image)

According to respective functional layer or technique level, desirable functional implementation is given on UI. For example, there are three kinds of inputting mode including input of hardware inspection data, manual input with NOTEPAD, and input data directly in form. The UI of this software has given these arrangements perfectly.

Data Output in Product Quality Monitoring Software. Data output is another very important aspect for implement software usability. In product quality monitoring software, the monthly report is a meaningful working that quality director and engineers get respective quality state of below divisions for every month. Product quality monitoring software has given a clear and brief sheet of report data in monthly and yearly report.

Usability of Operating Procedure. After the operating of data processing, the operation result can be sure at once including directly display in UI as quickly as possible. For example, when you delete data of division of weld, UI will display operation result at once.

Usability of Information Prompt. Information prompt is very important especially for initial users. In order to avoid mistake or correct miss operation, information prompt should be given as clearly as possible. For example, the code rule of inspection data will appear clearly and completely when user inputs inspection data, shown if figure 4.
General Developing of Quality Monitoring Software Based on Usability

Function Analysis of Quality Monitoring Software [10, 14]. Function of quality monitoring software can be divided into eight parts shown in figure 5, focused function mainly including monitoring data disposing and monitoring chart output. According to user state and data delivering of manufacturing enterprise, monitoring data disposing has given three modes including digital tester mode, form mode and Notepad mode. This arrangement can fulfill all kinds of using requirement, which digital tester mode is fitted to digitalization acquisition of inspection data, and form mode is suited to manual inputting of quality, and Notepad mode can be applied to existed data being saved and for transformed data from other software. In addition, monitoring chart output has given eight types to fulfill various requirements of workshops.

![Diagram of Quality Monitoring Software Functions](image)

**Figure 5. Main functions of quality monitoring software.**

Key Flow Diagram of Quality Monitoring Software [15, 16]. Because key points of this monitoring software are input of inspection data and output of quality monitoring chart, the gathering of inspection data and drawing of quality monitoring chart is the keynote of program flow. The program flow diagram for the gathering of inspection data and drawing of quality monitoring chart has been deeply investigated and it is reused in other part repeatedly. This program flow diagram is shown in figure 6.

Computer Achievement of Quality Monitoring Software [10, 11]. Visual c is used to program this monitoring software, and the user interface of monitoring software is shown in figure 7. In this achieved interface, in order to check every batch data at any time, user can watch the inspection data through category tree. At the same time, user can view monitoring chart of every batch of inspection data by left category tree with right key of mouse. This layout of UI has improved the usability of product quality monitoring software.

Conclusions

In this paper, the usability of product quality monitoring software is deeply discussed. Generally, for software usability, it should take UI usability as basis, and take IO usability as key point, and take operation usability as body, and take information prompt as focal appearance.
Product quality monitoring software is developed based on usability for general architecture of manufacturing enterprises, and the application of this software will greatly improve the monitoring level of product quality while more and more advanced technology is applied in manufacturing enterprise.

References


