Quality in Use -Issues and proposal-

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Abstract—**In ISO/IEC 25010, Quality in Use is mainly focused to the use of operators who interact with product and system directly. However, as workstyle using ICT (Information Communication Technology) has been changed, object of quality in use are also changed to not only direct users with simple direct interaction but also many stakeholders and society which are influence on indirectly by someone use the product, system and service. This paper proposes a Quality in Use model which corresponds to stakeholder needs. As for stakeholder, we classified four groups, that is -Operator of system and/or software, -Organization which has responsibility for system and/or software management, -Customer using system and/or software, -Society which exists system and/or software. As for stakeholder needs, we prepare "usefulness", "managerial stability", dependability" and "Acceptability". To show the relationship among them, we proposed a new Quality in Use model.** *(Abstract)*

Keywords- usability, software engineer, quality in use (key words)

I. INTRODUCTION

Importance of usability has been considered in not only ergonomics area but also software engineering area[1]. Quality model in SQuaRE (System and software Quality Requirement and Evaluation) series which are dealt with in ISO/IEC JTC1SC7 defined effectiveness, efficiency, satisfaction freedom from risk and context coverage as elements of "Quality in Use"[2]. Figure 1 shows the Quality in Use model defined in ISO/IEC 25010.
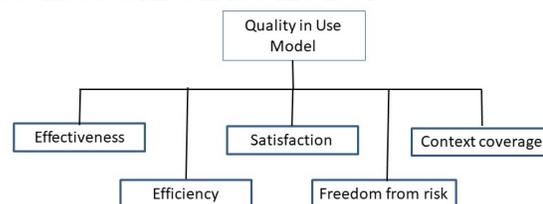

Figure 1. Quality in Use model defined in ISO/IEC 25010 [2]

In this figure, three quality characteristics (effectiveness, efficiency, satisfaction) are same as usability elements defined in ergonomics standard ISO 9241-11: 2018[3]. About freedom from risk and context coverage, though influence on economy and health is described in the definition, there is no concrete contents. From this, context of use is mainly focused on interaction directly.

Recently, as workstyle using ICT (Information Communication Technology) has been changed, object of quality in use shall be not only simple direct interaction but also many stakeholders and society which are influence on indirectly by someone use the product, system and service. That is, ICT users are not only direct users who interacts system and product directly but also indirect user who use output obtained by using ICT.
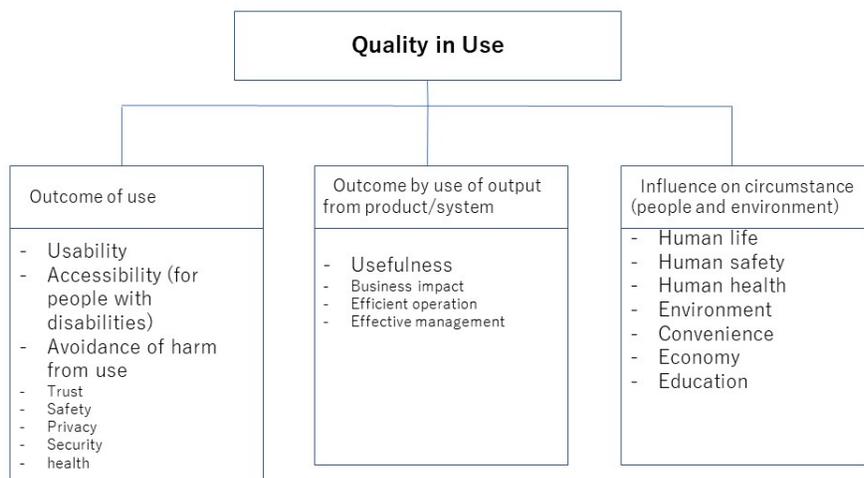

Figure 2. Proposal model of Quality in Use[4]

II. FUTURE QUALITY IN USE CONCEPT

Direct user means a user who interacts with product, system or service directly. For example, ATM users in banking system, customers for electric commerce system. On the other hand, there are the other kinds of users, they are indirect users of other stakeholders. They usually use an output of products or system. For example, in case of self-driving car (level four or low), a driver is one of direct user and operators of traffic infrastructure are kinds of secondary user. As for pedestrians, they are indirect users. Figure 2 shows the proposal concept of quality in use include other stakeholders[4].

III. PROPOSAL OF QUALITY IN USE

As system and software products are widely used in our life, use of them is influence on not only their direct uses but also organizations and society.

It is responsibility for society of the manufacturer to be controllable these influence as much as possible.

From this, quality is regarded influence on stakeholders by using. The purpose of quality in use is that manufacturers and managers are able to enforce to "use" for improvement of quality by measuring and evaluating.[5]

The objectives which are influenced by use of system and software in not only their direct users but also indirect users included various kinds of stakeholders. Contents of influence (quality characteristics) are different by the difference of objects. From this, we classify these objects into four groups shown below and quality in use model for each group is defined.

-Operator of system and/or software
-Organization which has responsibility for system and/or software management
-Customer using system and/or software
-Society which exists system and/or software

The reason why groups are four is to be able to explain almost situation by these four groups, i.e. stakeholders.

When "quality in Use" is considered, it is necessary to clarify which group is focused because quality models for use of system and product are different by the difference of objects described above.

In this paper, "Quality in Use" is defined as follows:

Quality in Use is that degree to the system satisfied the stakeholder needs related to use when operator uses the system and software.

Figure 3 show the quality in use models for four groups.

In this figure, each box about quality in use, that is, "quality in use for responsible organization, people", "quality in use for operators", "quality in use for customers" and "quality in use for society" is object group of quality in use, respectively. Below four boxes describes influence by use.

In this, "quality in use for operators" is correspond to the original quality in use model. As this model mainly focuses on direct user, we consider that elements of usability defined in ISO9241-11:2018 should be adopted as quality characteristics in this model. Quality characteristics for the other three objects shall be defined by terms which represented each influence suitably.

In ISO/IEC25010, the quality of a system is defined that the degree to which the system satisfies the stated and implied needs of its various stakeholders, and thus provides value. Refer to figure 2., stakeholder needs for quality in use can be divided following four items; they are "usefulness", "managerial stability", dependability" and "Acceptability". The relationship between stakeholders and stakeholder needs are shown in figure 4. This figure is proposed quality in use model.
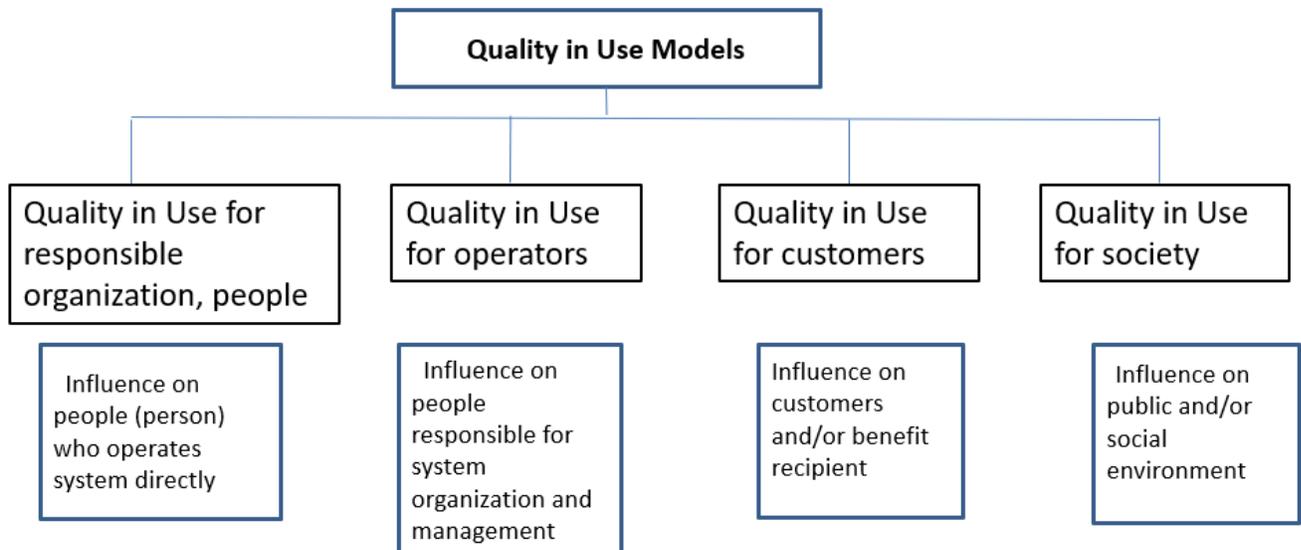

Figure 3. Quality in use models for four target groups

Figure 4 table:

Quality in Use characteristics	Quality in Use subcharacteristics	Quality in Use for Responsible organization	Quality in Use for Operators	Quality in Use for Customers	Quality in Use for Society
Usefulness	Usability / Accessibility / Adaptability / Utility	X Accomplish, consensus	X Effectiveness - Efficiency - Satisfaction	X Effectiveness - Satisfaction - performance	
Managerial stability	Business or mission suitability / Utility	X - Cost and Benefit - Man-hour for management - Man-hour for operation - Stock price, - Advantage			X - Tax revenue - convenience - Stock Price Index - Employ People
Dependability	Freedom from unacceptable risk / Avoidance of harm from use / Environmental and social risk reducibility	X Reliability, accountability, safety, privacy, security, availability, condifentiality, maintainability	X Health, safety, privacy, self-authority , reliability	X Health, safety, privacy, self-authority, reliability	X - Atmospheric temperature - Amount of COx exhaust - Noise - Water quality - The number of accidents or matters - -Damage cost - -crime
Acceptability	Receptibility	X Trust, transparency, brand image, identification, Royality, traceability, service suppot, no previous conviction	X Trust, transparency, ethics, good tools, good manuals, good training	X Trust, transparency, ethics	X Compliance, trust, transparency, ethics, fairtrade, consideration to nature

Figure 4. The relationship among Quality in Use characteristics, subcharacteristics quality property and stakeholder needs

IV. FUTURE THEME

Currently, we prepare some example to proposed quality in use model. Applying these examples to this model, we will verify the validity of this model. Pp4

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