

# An Effective Source Code Review Process for Embedded Software

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**Abstract.** This paper discusses about the improvement of source code review process for embedded software development project, and also proposes an effective approach to source code review for embedded software. As the start point of the discussion, this paper firstly discusses the results of a survey we conducted of about 290 embedded software development projects in Japan from the viewpoint of quality. Next, this paper discusses the problems of current source code review process and the way for improvement of the process. In the discussion, we focus on quality characteristics in ISO/IEC9126 and apply this to our improved review process. That is, we propose a new review process which is based on selection of review target portion in the target source code and selection of the review check items. As for the selection of review check items, using the characteristics viewpoints in ISO/IEC9126, review check items are selected according to the target software features.

## 1 Introduction

Recently, various embedded systems have come into widespread use in everyday life. An embedded system is composed of various hardware devices and their control software. According to the technical evolution of hardware devices, the functional size of software embedded in this hardware has been increased. At the same time, the code size or the code complexity of this software is also increasing. These trends tend to lead to the increased incidence of serious trouble concerning the behavior of embedded systems resulting in serious trouble concerning system behavior, which in turn causes serious inconvenience in everyday life.

So, the problems for embedded software quality are very serious problems and the suitable solutions are required. In this paper, we focus on quality perspective of source code for embedded software and propose a way to improve source code review process based on software quality characteristics in ISO/IEC9126[1].

In this paper, section 2 discusses the features of embedded software development projects based on the results of a survey we conducted covering about 290 embedded software development project profiles in Japan. Following this discussion, section 3 summarizes problems concerning source code review process. In section 4, we propose a way to improve source code review process by Selective Review

Tech-nique(SRT). We have been developing SRT in order to solve problems concerning code review process and also in order to improve source code quality. Section 5 briefly introduces an experimental trial and its results.

## 2 Feature for Embedded Software

In this section, we confirm the factors which deeply impact on source code quality for embedded software, and discuss the problems concerning embedded software development based on the results of the survey.

### 2.1 Outline of the Survey

We conducted survey of embedded software development projects. The survey was conducted by corporation between Information technology Promotion Agency Japan and Ministry of Economy, Trade and Industry (METI). The survey was aimed at making clear the current status of embedded software development and their features. Target area of the survey was ranged about 15 domain segments from embedded software in home appliances to industrial control system (Table 1). In the survey, we distributed questionnaire sheets to about 400 organizations in above domain areas via mail-survey style, and got 290 valid responses. In the survey, we mainly focused on software engineering viewpoint in embedded software development. The questionnaire sheet include following four main topics – project overview, quality perspective, process perspective and project management perspective. There are about fifty questions in the questionnaire sheet. In this paper, we mainly discuss the quality perspective of embedded software development by using the survey results.

Table 1. Target domain area of the survey

1	Audio Visual system	9	Transportation system
2	Home appliances	10	Factory automation
3	Personal information system	11	Business facirities
4	Education systems	12	Medical system
5	Office automation system	13	Mesearment facirities
6	Business system	14	Other application system
7	Communication systems	15	Software development environment
8	Communication infrastructure system		

### 2.2 Quality for Embedded Software

Figure1 and Figure2 show analysis results of embedded software trouble based on the results of our survey. Figure 1 indicates that about 50 % of embedded software trouble is related to the software implementation phase. Though the trouble related to upper phase – requirements or design phase –accounts for about 40% trouble in the implementation phase is notable. As for a poor quality of the implementation phase of embedded software development, following two factors can be considered.