Quality Assurance Activities for Enterprise Application Software Packages

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(Manuscript received July 10, 2007)

Fujitsu supplies the GLOVIA series of business software packages for various fields of enterprise service. These packages are for back-office business processing (such as accounting and production control), front-operational processing, and mobile processing. Each package provides the functions required for specific processing, and combining these packages enables global, systematic business activities. The quality assurance activities for these packages include those for product quality assurance, customer relations, in-contract support, post-contract support, and cost-performance. These five types of activities are unified as "Service quality" activities, since our most important policy is pursuing quality of service. General product quality is assured in ordinary quality assurance and improvement activities. Moreover, particularly important functions and points of product quality in each field of service are given special consideration and handled accordingly. For example, in April 2006 we conducted development process improvement activities to achieve CMMI level 3. This included in-company activities for an early improvement of operation quality. We also conducted activities to maintain high reliability, availability, and robustness necessary for providing customer service, and emphasized the verification of basic functional conditions. This paper introduces our product quality assurance activities for the GLOVIA/SUMMIT and GLOVIA-C accounting service packages, and the BC ContactPlus front-operational processing package. It also discusses the future direction of our quality assurance activities for these products.

1. Introduction

There has been a recent trend in the enterprise package product market toward unifying front-operational processing and back-office processing packages. In line with this trend, Fujitsu unified its front-operational and back-office processing packages into the GLOVIA series in April 2003. Then, to differentiate itself from competitors, Fujitsu spun off its mobile product division from the front-operational processing division in December 2003.

Our package product divisions function according to the quality policy of "Improving service quality" in all fields of the package business. Here, service quality includes the following five types of quality:

- Product quality: Assuring highly reliable products, and providing satisfactory functions and performance
- Customer relations quality: Assuring the provision and recommendation of useful information, and positive proposals for ideal situations
- In-contact support quality: Assuring quick responses and easy-to-understand answers
- Post-contact support quality: Assuring the retention of old-version maintenance and the supply of future versions
- Cost-performance quality: Assuring reasonable system price and installation/operation costs

Fujitsu is systematically engaged in a

balanced improvement of all these types of quality. This paper primarily introduces improvements made to product quality.

2. Outline of quality assurance activities

The main products of the GLOVIA series[1)] are as follows:

1) GLOVIA/SUMMIT and GLOVIA-C for accounting, personnel, and salary management
2) Products of glovia.com for production management
3) BC ContactPlus (also simply called BC) for contact center processing
4) Ubiquitous Service Exchange (USX) for mobile solutions

The products above were improved through related quality improvement activities prior to the unification of front-operational processing and back-office processing packages. After the unification of packages, quality improvement activities were conducted across product-related divisions in addition to the independent quality improvement activities mentioned above. Thus, quality control knowledge across products has been shared among related divisions, the pace of process improvement accelerated, and the level of product quality raised.

We acquired development process specifications through the activities above. We then compared these specifications with international de facto standards to correct any defects and faults relative to our specifications. We employed CMMI[note 1)] as a standard in making further improvements and enhancing standardization. As packages for enterprises, the GLOVIA series has quality-assurance factor for each processing targeted. Therefore, quality-assurance factor specific to the target processing must be satisfied in addition to general, common quality-assurance factor.

The following introduces the quality assurance activities for GLOVIA/SUMMIT, GLOVIA-C, and BC as representative products of this series.

3. Case of quality assurance activities for GLOVIA/SUMMIT and GLOVIA-C

GLOVIA-C V10 was released in June 2002, but quality problems requiring fundamental solutions were detected in the product. As a result, full-scale quality assurance activities for GLOVIA/SUMMIT and GLOVIA-C began in January 2003.

We temporarily suspended GLOVIA development work to implement a quality improvement project, and after three months succeeded in stabilizing the product at a fixed level. The results of improvement activities conducted during that period were then standardized. These standards have been used as the basic rules for current GLOVIA development. These standardization activities have continued to date, covering three periods: Change GLOVIA Plan 1 (CGP1), CGP2, and CGP3. Field quality after shipment is now used as the basic quality to set the scale of quality improvements. In this way, we conduct quality assurance activities by considering the improved quality of customer-site operations to be most important.

The following introduces the main quality assurance activities conducted during the CGP1, CGP2, and CGP3 periods.

3.1 Activities in CGP1 period

The CGP1 period is considered the earlier stage of these quality assurance activities and characterized by the following two points:

1) Strict compliance with quality assurance process specifications

The first point is that we reviewed the development process and standardized it again.

note 1) Capability Maturity Model Integration, a guideline for software process improvement and evaluation, developed by the Software Engineering Institute (SEI) of Carnegie Mellon University (CMU) in the USA.

The things to be done, considerations, and output data in each development process were documented as the "GLOVIA Quality Assurance Process Specifications." All personnel engaged in the development were obliged to strictly comply with these specifications. These specifications defined the conditions of necessary development work and products. Specifically, the specifications defined consensus building with external experts in the requirement definition process and external specification design process, and defined a mandatory contact source review in the programming process.

This reduced variations in quality among those responsible and the companies engaged in development.

2) Quantitative checking and quality evaluation

The second point is that we adopted quantitative methods of measuring and evaluating quality.

To determine the parameters used to quantitatively evaluate quality status, we managed various kinds of information, such as product information, the product version/level, and name of the product creator up to the source and definition information levels. GLOVIA was written in various development languages (e.g., C language, Java, VB) and developed with various tools and middleware including ListCreator. For all these languages, tools, and middleware, we defined the method of converting the development step count into the standard development step count so as to understand the failure rate in units of source modules.

In order to enhance quality measurement, we also decided to conduct quality evaluation and analysis after shipment, as well as during development. In this way, we can strictly monitor quality during operation at the customer's site. During development, we measure the source-review execution time and failure count in a unit test process, as well as the test count and failure count in a system integration test process. This enables us to estimate final quality by considering the failure detection status and failure remaining status relative to the progress of development.

After product shipment, we measure the failure count and failure rate by product, version/level, and creator. Since we can identify a part having a high failure rate, problems in that part can be promptly and properly handled, or otherwise addressed.

3.2 Activities in CGP2 period

The CGP2 period is considered the established, independent period that includes targets needed to set quality assurance activities and create an organization for continuing independent improvement activities.

We considered the difficulty of continuation rather than mere definition. We attempted to honestly conform to the GLOVIA Quality Assurance Process Specifications. Moreover, we achieved CMMI level 3 as a concrete action for independent improvement activities. In other words, we analyzed the current process according to the typical process defined in each process area specified in CMMI. In this way, we attempted to detect and improve the weak points in past processes from a standard viewpoint.

We applied CMMI to the organization process and risk management process, and found process definitions to be ambiguous. Then we corrected and applied the processes to actual processing. In the requirement definition process and basic design process, we enhanced the review conducted in cooperation with SEs and salespersons experienced in a given field, and who could deeply understand customer requests. As a result, the field requirements were concretely determined by conducting a retrospective review in the subsequent process. This is how we achieved CMMI level 3.

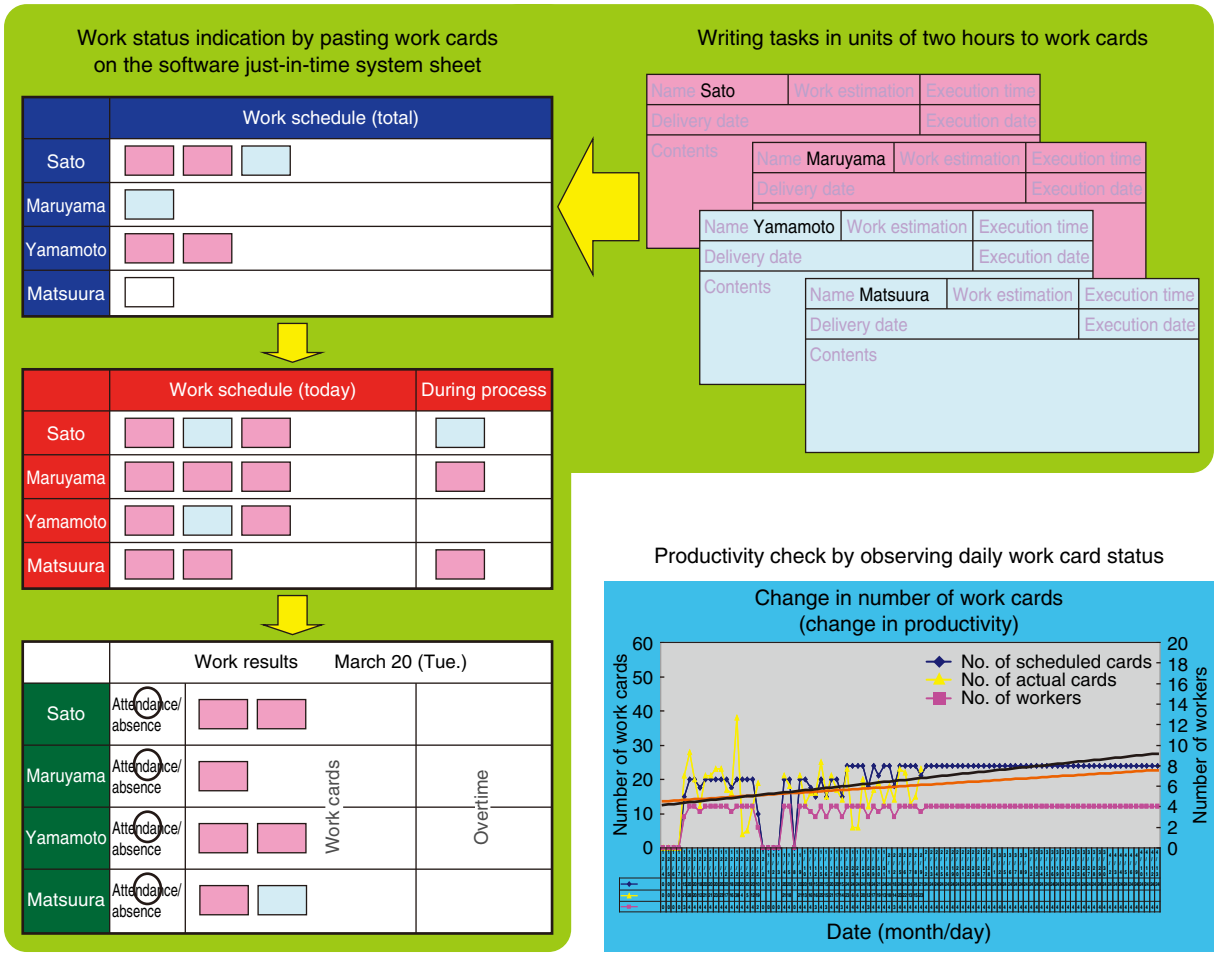

Figure 1
Example of KAIZEN system (software just-in-time system).

3.3 Activities in CGP3 period (current activities)

The CGP3 period is considered the growing, progressive period that also includes targets in order to pursue improved productivity.

In the CGP1 and CGP2 periods, high quality was assured by adding to insufficient processes. As a result, setting the quality assurance activities and continuing independent improvement activities were realized at a certain level. We are now challenging a new stage: "Assuring higher quality by improving productivity." For this purpose, all Fujitsu employees and those of affiliated companies engaged in development are obliged to submit monthly work reports. Given the visualization of production activities, the status of field activities can be roughly analyzed.

Daily work, on the other hand, is managed through visualization using the KAIZEN system (software just-in-time system) shown in **Figure 1**. All tasks are divided into smaller work units (single tasks) taking up to two hours to complete. The work range assigned to each worker is clarified at the daily scrum meeting. Each team understands the contents of work in order to adjust and handle problems. Since productivity is checked in real time, problems can be solved quickly, thereby improving both productivity and quality concurrently. The KPT techniques[note 2)] are used to solve problems, and a team may also

note 2) Continuous improvement techniques viewed from three points: Keep, Problem, and Try.

employ the "Retrospective review" technique for this purpose. Shortly after these activities began, good results were achieved in the early stages. We also plan to apply these activities to various products other than the GLOVIA series.

4. Case of quality assurance activities for BC

BC is a front-operational-processing support package.

BC is characterized as being equipped with frequently used contact-center service functions (i.e., customer consultation, help-desk, campaign functions) and providing a mechanism for flexibly connecting the service functions specific to a target field (e.g., telephone banking, order acceptance functions). Today BC is widely used in various fields of industry including banking, insurance, Japanese-style, defined contribution pensions (Japanese-style 401k), communications, and the production of consumer goods and chemicals. Not long ago, we supported the replacement of a large-scale contact center of a major national bank, and were highly evaluated as "largely contributing to short-term construction and improved reliability."

The following describes the main quality assurance activities being implemented through the development of BC.

1) Utilizing CMMI (activities in cooperation with various stakeholders)

We are conducting quality assurance activities according to guidelines established by adding package-specific needs to CMMI as the base.

We emphasize one particular practice of CMMI: "Identifying and involving direct stakeholders." This entails involving those who verify quality and processes from objective standpoints, and those possessing technical knowledge about the service, design, and security as stakeholders in development in order to enhance total quality. For instance, such stakeholders would include a customer appointed as a model user to develop a new function, and a technical section of Fujitsu entrusted with such technical services as design, high-speed retrieval design, security verification, and manual verification. By involving the people or sections knowledgeable about Fujitsu's customer base and high-level technology, we can pursue the improvement of various types of quality requested for package services.

2) Improving connectivity and operability

A contact center is an enterprise's face or contact point as viewed by customers. Various types of quality are requested of a contact center. However, connectivity (secured connection to the customer's telephone) and operability (quick response to customers) are especially important when compared to other types of quality. We applied our ingenuity in various ways to realize connectivity and operability. Typical examples would be the fusion of service involving the telephone base and screen applications, and the system-level separation of both.

In ordinary operation, the operator's telephone operation can consequently be linked with a screen application for improved operability. Should failure occur, such as the server system going down, the customer's monitor screen cannot be used, but high connectivity is maintained through continuous telephone communication with the customer. In this way, we attempt to assure quality by considering the service characteristics in development and verification steps.

3) Implementing in-company practices

BC is now being used at the general inquiry centers of products and services (i.e., Fujitsu Contact Line and Customer Relations Center), and in outbound services for sales support. This contributes to Fujitsu's VOC activities[note 3)] and the pioneering of new technical consultations for customers. Collecting demands from these centers in a stationary manner helps enhance BC functioning. The authors have utilized BC to accept inquiries and demands from BC users

note 3) Voice Of Customer activities.

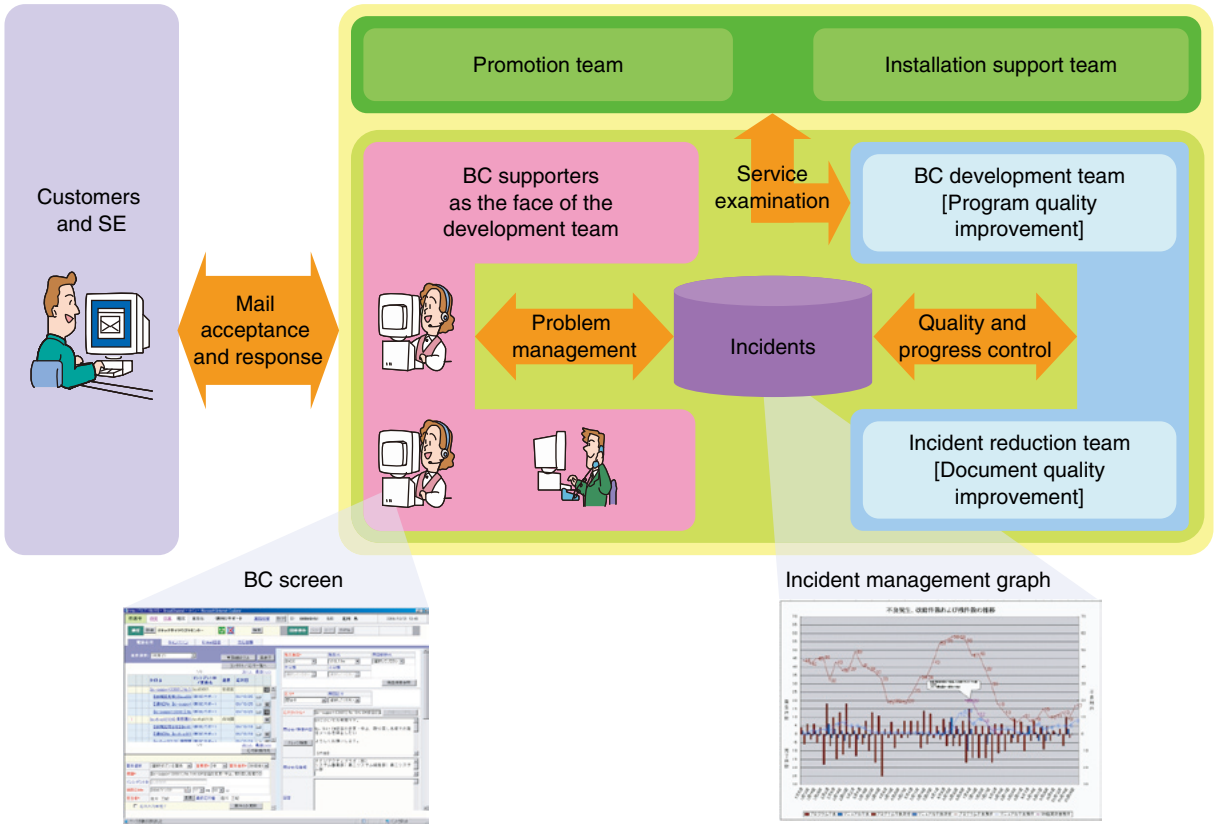

Figure 2
BC support processing by using BC.

and SEs in charge of BC, and respond to such inquiries and demands. In concrete terms, we use BC to manage the handling status of inquiries/demands, escalation, incident-list output, and inclination analysis (**Figure 2**).

The product suppliers also use the products to rapidly find points of operability improvement with the awareness of a major player, and increase the speed of improvement. Through these activities, the quality of BC has been enhanced from the standpoint of actual operation, and new needs not identifiable in deskwork or from interviews have been found in order to develop more enhanced packages (**Figure 3**). We established the technical knowledge, assets, and human resources that can explain these services as solutions. Based on these results, we can propose new values to customers.

5. General status and future direction

This section discusses the general status and future direction of quality improvement activities.

5.1 General status of organized quality improvement activities

The previous sections mainly introduced GLOVIA/SUMMIT, GLOVIA-C, and BC ContactPlus in the descriptions of quality improvement activities for the GLOVIA series. For these product groups, we fixed the development process acquired in the action to achieve CMMI level 3, and then began new activities for further improvements. We are also taking measures for the products of glovia.com, such as dispatching engineers from Japan to Glovia International, Inc. (GII), Fujitsu's wholly owned

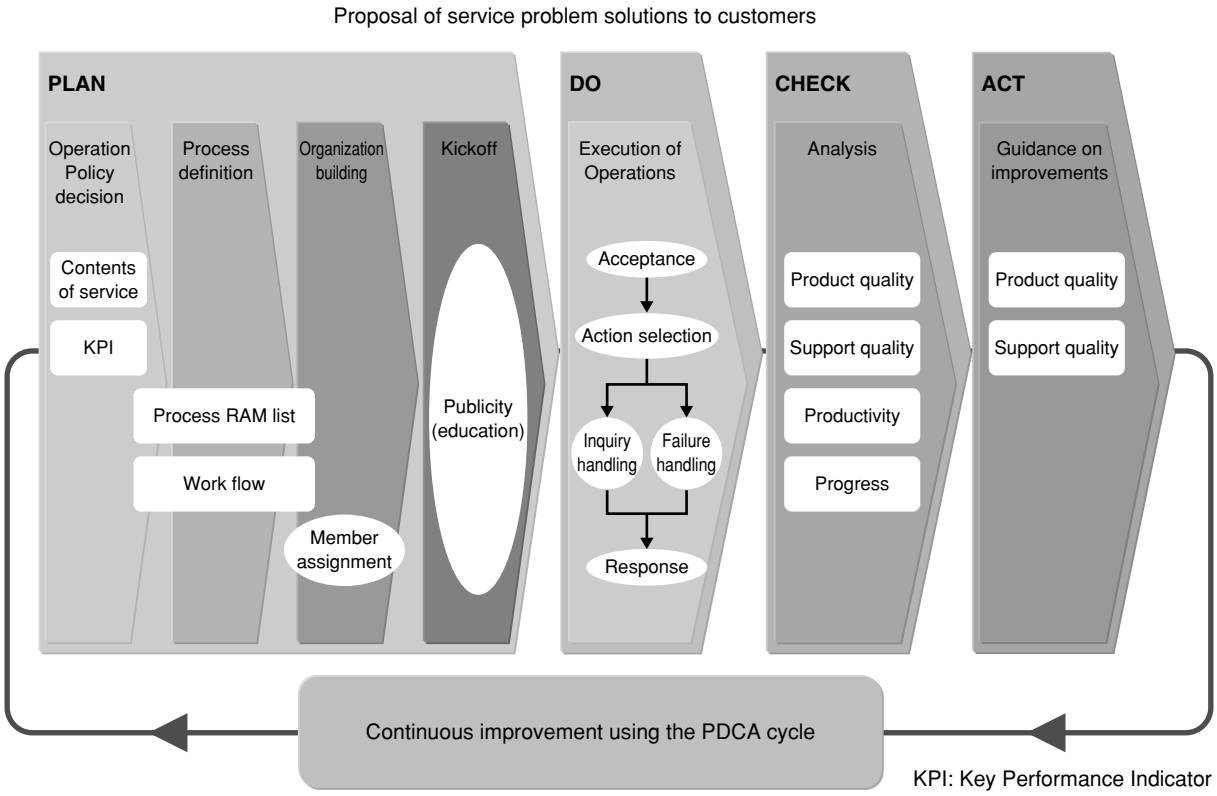

Figure 3
Execution cycle of BC support.

subsidiary in the USA. Consequently, the results of quality assurance activities conducted in Japan are also being utilized overseas.

Independent quality assurance activities appropriate for the characteristics of other products have also been conducted. However, some problems must be addressed, such as reducing lead time by sharing the resources and processes among common quality assurance activities.

5.2 Direction

In 2007, we will begin the following two types of actions:

1) Start of new quality assurance activities

Some products have been subjected to recent management techniques relative to "the recent demand for shorter-period development", "support of a new paradigm for supplying the functions represented by Web 2.0 and SOA", "applying more appropriate quality control and improvement techniques by considering recent software developments and management techniques typified by agile-type techniques", and the "software just-in-time system". These management techniques will be applied to products of the GLOVIA series.

2) Cooperative implementation of support quality improvement activities

The quality improvement activities for the GLOVIA series have been mainly conducted to improve software quality. At the same time, improvement activities have been conducted for support processing to shorten response time.

We will examine the concrete activities in 2007 and later for a comprehensive improvement of quality based on functional and nonfunctional factors by effectively unifying the improvement

activities described above.

For example, the in-contact support department will conduct operation confirmation tests during an intermediate step of software development, and document information about the status of customer operations and conditions. Then, the development division will conduct sampling tests according to these documents.

6. Conclusion

The quality assurance activities conducted for the GLOVIA series have been steadily continued based on the policy of "thoroughly pursuing improved service quality of supplied software packages from the viewpoint of customers". In the future, we also intend to enhance social profitability and creativity in addition to this policy, and upgrade our quality assurance activities for providing better services to customers.

Reference

1) Fujitsu: GLOVIA homepage. (in Japanese). *http://glovia.fujitsu.com/*

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Mr. Taneike joined Fujitsu upon switching careers in 1997. He has mainly helped develop a sales management system for the distribution industry, a financial management system, and an employee management system based on his previous professional experience. He has been consistently engaged in development of the GLOVIA series of software packages after joining Fujitsu. Since 2007, he has been engaged in development of the "GLOVIA Business Activity Recorder" as part of the base development of next-generation ERP products.

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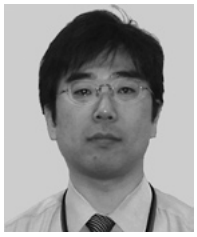

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