

Software Development with Quality Control

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Abstract — The article shows the accomplishment of quality management in software development. The concept of quality management includes all the activities that contribute to the establishment and execution of an accorded working process that results in customer's satisfaction. The software is a special product: it does not connected to material, it is not continuous, the process of its creation is development, it does not wear down. For production of these intellectual products it is more difficult to interpret and apply the principles of quality management. A possible method for the accomplishment of quality management is function analysis using a number that measures functionality (FP value).

I. INTRODUCTION

Importance of quality level of products as a factor that significantly effects on competitiveness on the market was discovered for the world by the Japanese example. World economy events of the past decade specifically - quasi followable in its elements - led to revaluation of the role of quality and strengthening of a tendency that stresses development of quality.

Multifunctional, market quality products in the individual countries are produced by well-organised companies. Their common feature that they use complete

quality management at the whole company. Application of complete quality management releases creativity of the employees, at their organisations it establishes effective cooperation and common company thinking. In the manufacturing process it eliminates unnecessary operations and administration, surplus stocks, thereby it provides the increase of effectiveness of production and decrease of costs. They have been continuously improving their technology through solution of quality improvement tasks, thereby providing quality production of their system, production of competitive, market quality products. Due to high-level quality work the product development cycles become shorter by one third, which results in further improvement of contest situation.

II. BASIC PRINCIPLE OF QUALITY MANAGEMENT SYSTEMS

The word “quality” is often used for characterisation of a product or service. If we wish to define quality in a generally useable way, we should include customers’ real requirements. Every company has the aim that the customer is satisfied with the supplied product or service. From the company’s point of view it is important that the requirements of functionality, costs and deadline are fulfilled and in accordance with the customers’ demands. (Figure1)

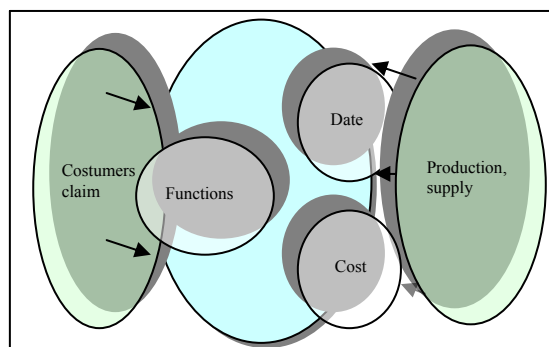


Fig. 1.

Quality, according to today’s modern interpretation is the result of expert decisions and all processes connected with the product from the purchase of raw material through manufacturing to sale or activity of customer service. Therefore in addition to designing - in the interest of quality -, accorded co-operation of all participants in the manufacturing process is required. There is a chance to achieve and save reliable quality only if information channels that provide effective co-

operation are established, the employees are motivated for quality work, all tasks are clearly outlined and all participants can see the results of their work.

Basic principle for modern quality assurance can be interpreted as follows: quality must be not only examined and checked but continuously established.

On quality assurance of a given product, technical and economic aspects must be also considered. Therefore it is matter-of-course that the quality assurance systems are effected by factors within the company and outside as well. It results from this that the selected or the best-evaluated systems are different from factory to factory and from institute to institute.

It can be regarded as a general rule that the following elements or circumstances are required.

- quality assurance system, structure and organisation for its execution,
- integration of basic organisational elements into system and their regulation,
- time and space order of various activity spheres,
- co-ordination of activities that serve for quality and economy,
- determination of suitability degrees of individual units to satisfy desirable requirements.

When defining quality, predominance of the following basic principles comes true:

- quality is the extent of fulfilment of the given specification and requirements,
- quality is not a single property or physical quantity but their common effect which are equally important in respect of quality,
- concept of quality can be applied for such products and activities that only partly satisfy to the specifications,
- any element of the product effects on the quality.

In our days the most companies check and examine their own products, some companies also perform reliability and other technical tests, many of them pay attention to the quality of components and basic materials received from suppliers, numerous companies deal with servicing of products as well. Quality management to provide suitability for market demands, however, are determined by a lot of factors. There are many quality activities that must be accorded in such a way that the result is a product of good quality for the market. It is expedient to regard to company's activity, human, machine, material and information activities as a system. In our days a company or factory must have a well-constructed system. This system determines, documents, accords and maintains those activities that are required in all areas of operation of the company or factory to provide proper activities for quality.

The technically designed and continuously managed quality system includes the following targets:

- determined quality policy
- all activities that are necessary to achieve this quality policy,
- according of the activity extended to the entire company,
- allocation of personal tasks, required to achieve quality,
- the necessary supplier-checking activities,
- effective flow, processing and checking of quality information,
- strong quality interest that extends to the whole company, quality motivation and training,
- effective positive improvement activity,
- continuous regulation of the system,
- temporary revision of system activities.

Quality management therefore is accomplished through the activities of quality designing, quality regulation, quality assurance and quality development. (Figure 2)

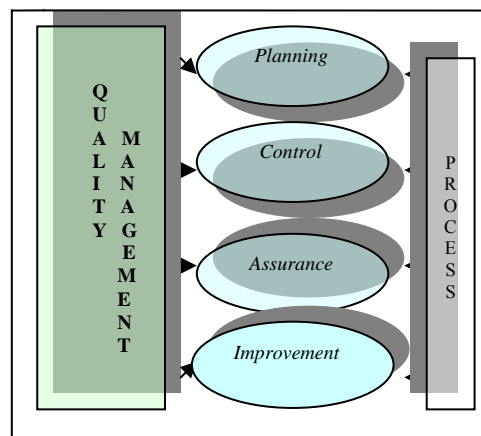


Fig. 2.

III. QUALITY DEVELOPMENT IN CASE OF SOFTWARE

Properties of some software as a product in fact are properties that are typical not for a product but for some service. The quality of software is determined by the designing phase, the development of the product during designing is hardly apprehensible, any changes made on the software and their effects can not be calculated in advance. Therefore in the practice for quality development such methods are used by which it will be possible to determine software productivity or complexity. The Function Point method is based on this principle, i.e. a procedure that aims at the determination of the number that measures product functionality. This method is used differently at designing of various levels, thus for example:

- At new designs (here we talk about some completely new software not developed by the company)
- At upgrading (here we talk already about further development of some previously developed software)

Process of determination of the Function Point value is shown on figure 4. The determined measuring number (FP value) serves, for example, as a basis for a later cost-estimation.

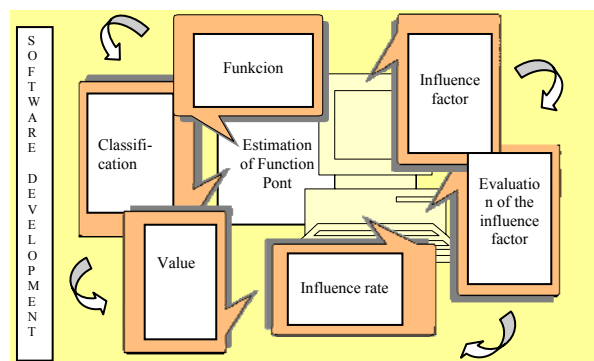


Figure 4
Determination of functionality measurement number
(FP value)

Process of this method can be divided to two main sections: for determination of unweighted and weighted values, within which three smaller sections can be found. The first section specifies the determination of the unweighted FP value, and the second section gives the extent of weighing by empiric values. On determination of the unweighted FP value, the properties of the data file, the function and other special circumstances are considered. The data file can be internal or external, and their amount, complexity and structure are evaluated using this method. Functions are divided to input, output and query functions. These are divided to elementary function types (the smallest function that can be interpreted by the user). Special circumstances include all such parts that differ from usual, but the customer insists on them.

Before beginning the calculation, data files and functions must be collected and evaluated. The evaluation is performed by observing of the above aspects according to figure 5.

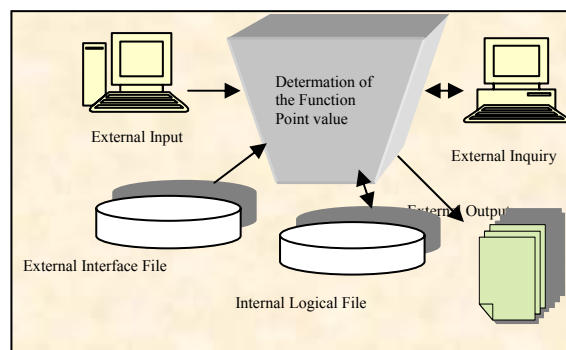


Figure 5
Factors that effect on the determination of the unweighted measuring number

The scores that were collected from the software are recorded in tables and thus a summary is made. Using values of internal logic files and external interface files the data files are evaluated. The summary of the collected scores gives the unweighted FP value.

When determining weighted FP values, general system features are taken into calculation. Such are, for example: specification of data, processing, performance, capacities, proportion of transactions, on-line data entry, on-line data status, complex processing, reusability, complexity of installation, complexity of running, observing of changes.

Scores that were given on these system parameters are collected. The thus received weighing values are recorded then multiplied by the above calculated FP value. Thereby the weighted FP value will be available and can be used to develop the quality of the software. At the beginning of the development task a detailed

worked-out system plan is required. The system plan includes the suggested solution as well as the conditions and requirements that are necessary to perform the task. Its preparation must be the result of close co-operation between the customer and supplier. The system plan is connected to the individual elements of the quality management system.

The aim of information system to be established is to help for the employees that take part in the sales process, to support the use and maintenance of data of the products that are distributed by the customer and to allow better registration and query of data connected to the contracts. (Figure 6)

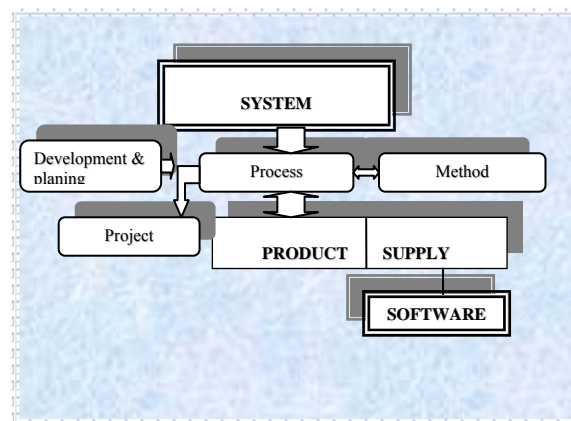


Figure 6
Connection chain of quality activities

The two most current areas of application of results of the Function Point method during quality development is cost-estimation and measurement of software complexity. It has the advantage for both applications that the method is objective and exact. The achieved results are reproducible and comparable with the software made for the same task of another company. Its these advantageous properties justify its wider and wider spread in the quality development practice of software producers of the world.

IV. APPLICATION OF THE FUNCTION POINT METHOD

To be able to apply the Function Point method at the beginning of a development project, a detailed worked-out system design is required. The system design includes the suggested solution and the conditions and requirements that are

necessary in respect of the project to be implemented. Its preparation must be the result of a close co-operation between the customer and the provider.

For the application of this method we demonstrate a sales support system. In this case the target of the system design, that is of the document is to describe for the customer the details of expected features of informatics system that supports the customers sales process, the software users and to outline the integration of the software in the sales process.

Based on a survey of demands of employees in the sales branch, an informatics system must have been specified that supports the work of those who perform transactions, technical designs and administration, makes them more effective and where possible, resolves automation as well. It stores the parameters required to sale all products distributed by the customer and the data of offers and contracts in a central database. Users may use this database at conducting of sales projects, central recording and updating of main parameters of offers and contracts and during various inquiries without using special programs, simply by an Internet browser from any PC. From the product file in the central database, price lists can be created to the offers, or preparation of individual items for the order.

The target of the informatics system to be implemented is to help the colleagues who perform tasks in the sales process, to support the use and maintenance of data for the products distributed by the customer; beyond this, better administration and possibility of inquiry are expected.

Better management of product database:

A condition for the realisation of orders is that the product to be ordered is included in the items master file. Here, however, not all distributed products take place, therefore the master file must be updated before the order. Because of occasional updating, however, it is necessary to check every offer, that is, whether the items included in the contract are contained in the items master file as well, and whether their all parameters all known. This checking, however, is time-consuming and sometimes even fails. The task is to develop the management of data of distributed products.

Starting out from this, the task to be solved is:

- In the items master file only products waiting for orders or being under orders should be included, the data of other distributed products must be in the product data base;
- Product parameters should be inquired from one place, faster and more conveniently;
- A centrally managed database is required but it should remain easily handled and inquired.

The results of the Function Point method can be used in various ways. The most frequent two uses of these are expenditure estimating and software complexity measurement, and within the latter, follow of changes. Both uses have the advantage that the method is objective and exact. The received results are reproducible, that is, the result of examination will be always similar, any number of times it will be repeated. Another advantage that it is comparable with software made for the same task by other company.

When using this method, you receive an index number. Thus software complexity can be determined.

Its advantages also derive from this.

- After determination of the FP value – without specifying any diagrams it can be used to determine software complexity.
- Software changes can be continuously followed during development. Changes of customer's demands – as time goes – change software complexity that can be smaller or bigger compared to the first version. Therefore the follow of different versions is also possible by its use.
- Value of software complexity can be important also from the point of view of the customer. Using it he/she may compare offers received from different places.
- As the method is standardized and value determinations are regulated internationally, so software made on any site of the world can be compared with each other.

Disadvantage:

For the determination of the Function Point value, at the beginning of the development usually there is not enough information, so the expected complexity can not be established exactly, only estimated.

Using analyses performed on previous FP projects, however, a more precise estimate can be reached. So yet before beginning of the development you can better plan concerning undertaken tasks.

With this application the target is preliminary determination of material and intellectual inputs required for the production of the software demanded by the customer. That is, determination of man-months required for performing of the task.

Its advantage:

- Using it, a company may estimate the human resource of projects in advance. A condition for this is, however, that the FP number and the empiric diagram, typical for the company, exists.

Disadvantage:

- Estimates are based on empiric values that are determined from the above-mentioned diagram.
- For the exactness of the estimate, a precise take-up of the diagram is required. It involves data collection. However, data frequently change. This is affected by continuous improvement of software tools used at the company and of the applied technology. As developers environment quickly changes at the company, so the diagram would also continuously change and it should be taken up again.

V. SUMMARY

The Function Point method is one of the theoretical methods that are continuously and increasingly moving into everyday use. It is proved among others by the fact that larger developing tools (e.g. Oracle/Designer 2000) also integrate it into their set of features. For practical use of the method there will be an increased market demand, and its use represents some advantage for the user in several aspects.

VI. REFERENCES

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