

Software metrics are similar to the four functions of management Planning, Organization, Control, or Improvement

Bogale Teferedegne
bogalet90@gmail.com
CPU College
Software Engineering Department

Abstract

Software metrics is important and it is a measure of software characteristics which are measurable or countable. Moreover, software product and software development process attributes are measured by software metrics and could be managed by management functions. Software metrics are related to the four important phases of software development phases. Planning- metrics serve as a basis of cost estimating, training planning, resource planning, scheduling, and budgeting. Organizing -size and schedule metrics influence a project's organization. Controlling- metrics are used to status and track software development activities for compliance to plans. Improving. Metrics are used as a tool for process improvement and to identify where improvement efforts should be concentrated and measure the effects of process improvement efforts. Software metrics can be divided into three groups product metrics, process metrics, and project metrics. This paper reviews the similarity of software metrics to the four functions of management planning, organizing, control and improvement discovered by different researchers.

Terms: *Software metrics, product metrics, process metrics, and project metrics, four management functions, planning, organizing, control and improvement.*

Introduction

A number of researchers have been looking on the similarity of software metrics and the four management function. The history of the software metrics [1] it is almost as old as the history of software engineering and the major rationale for using metrics is to improve the software engineering decision making process from a managerial and technical perspective.

Shoaib stated that [2] software metrics are related to the four important phases of software development phases. Planning- metrics serve as a basis of cost estimating, training planning, resource planning, scheduling, and budgeting. Organizing -size and schedule metrics influence a project's organization. Controlling- metrics are used to status and track software development activities for compliance to plans. Improving. Metrics are used as a tool for process improvement and to identify where improvement efforts should be concentrated and measure the effects of process improvement efforts.

The four functions of management planning, organization, control, and improvement [3] are equivalent to software metrics and software metric is a measurable or countable measure of software characteristics. Utilize software metrics to measure performance, plan forthcoming work tasks, track productivity, and better control the production process throughout project management. Moreover, the software metrics can be used in combination with management functions to simplify the projects by designing more efficient procedures, making software maintenance plans, and keeping production teams informed about issues that need to be fixed. H.

Noor [4] focuses on the software measurements and the association of software metrics with four management functions. There are several metrics inside the software development cycle and are all connected to each other. The software metrics are linked to the four management functions: planning, organizing, controlling or improving. Software metrics are perfect for the teams of management because they provide a quick way to monitor, set targets and evaluate success. [5] underlines that, software metrics are valuable for many reasons such as: measuring software performance planning work iterations measuring productivity and different use cases. In the software development process, many metrics are correlated. Software metrics are similar to the four functions of management: Planning Organization Control & Improvement.

The IEEE standard for a software quality metrics methodology [6] explained that, the use of software metrics reduces subjectivity in the assessment and control of software quality by providing a quantitative basis for making decisions about software quality. However, the use of software metrics does not eliminate the need for human judgment in software assessments.

The use of software metrics within an organization or project is expected to have a beneficial effect by making software quality more visible. The software quality [7] concern as one of knowledge area in the SWEBOK moreover, in software engineering, recently, software metrics researchers have introduced new software metrics and validated metrics using theoretical and empirical techniques and software metrics have been used in decisions-making as well as in various management activities and more researchers are involved in empirical validations.

The software quality analysis and improvement enhanced by software metrics because it measures different aspects of software complexity. Well-designed metrics will help to the organization continuity and to improve its software products, processes, and services although maintaining a focus on what is important. [8] software metrics provide a mean of estimating the efforts needed for testing. Software metrics are often categorized into products and process metrics. Process metrics are known as management metrics and used to measure the properties of the process which is used to obtain the software. Process metrics include the cost metrics, efforts metrics, advancement metrics and reuse metrics. Process metrics help in predicting the size of final system & determining whether a project on running according to the schedule. Product metrics are also known as quality metrics and is used to measure the properties of the software. Product metrics includes product non reliability metrics, functionality metrics, performance metrics, usability metrics, cost metrics, size metrics, complexity metrics and style metrics. Products metrics help in improving the quality of different system component & comparisons between existing systems.

The software metrics [9] its association with the four functions of management: Planning, Organization, Control, or Improvement. The goal of tracking and analyzing software metrics is to determine the quality of the current product or process, improve that quality and predict the quality once the software development project is complete. Moreover the researcher describes the factors for software metrics include, Balanced scorecard, Bugs per line of code, CISQ automated quality characteristics measures, Code coverage, Cohesion, Comment density, Connascent software components, Constructive Cost Model, Coupling, Cyclomatic complexity (McCabe's complexity), DSQI (design structure quality index), Function Points and Automated Function Points, an Object Management Group standard, Halstead Complexity, Instruction path length, Maintainability index, Number of classes and interfaces, Number of lines of code, Number of lines of customer requirements, Program execution time, Program load time, Program size (binary), Weighted Micro Function Points and many others.

The relationship between software metrics and four management functions explained that [10] a metric is a measurement of the level that any attribute belongs to a system product or process and there are 4 functions related to software metrics Planning, Organizing, Controlling and Improving.

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Adrienne in his book illustrated that [11] managing quality projects involve specific deliverables or work products and these deliverables need to meet project objectives and performance standards. Managing quality is about quality planning, quality assurance, and quality control. Although any of the quality management techniques designed to make incremental improvement to work processes can be applied to a project work process, the character of a project (unique and relatively short in duration) makes small improvements less attractive on projects. On larger and more complex projects, a project controls team that focuses on both costs and schedule planning and controlling functions will assist the project management team in developing the plan and tracking progress against the plan. Part of the planning for controlling the quality of repetitive processes is to determine what the control limits are and how the process will be sampled.

Software metrics can also be defined as [12] the standard of measure for the estimation of quality, progress and health of the software testing effort. It can be divided into three groups: product metrics, process metrics, and project metrics. The product characteristics like size, features of the design, complexity, performance, level of quality, etc., is described using product metrics. In contrast, software development and maintenance are improved using process metrics. The project's characteristics and execution are described by project metrics whose examples include the count of software developers, cost, etc. Moreover, the quality of the ongoing process is identified, implementation of any improvements and prediction of quality of the software after the implementation phase is over is all done by using software metrics. Project managers and leads can review the decisions made during the project's development phase by using software metrics and then making plans to do the changes.

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