Institute of Computer Science
Vikram University, Ujjain (M.P.)

SOFTWARE ENGINEERING

M.Sc. Computer Science

BY
Mr. Shekhar Disawal

MSCS 404 E1: Software Engineering

SOFTWARE METRICS AND MEASUREMENT

To achieve accurate schedule and cost estimate, better quality products, and higher productivity an effective software management is required, which in-turn can be attained through use of software metrics. A metric is a derived unit of measurement that cannot be directly observed, but is created by combining or relating two or more measures.

Software Measurement

To assess the quality of the engineered product or system and to better understand the models that are created, some measures are used. These measures are collected throughout the software development life cycle with an intention to improve the software **process** on a continuous basis. Measurement helps in estimation, quality control, productivity assessment, and project control throughout a software **project**. Also, measurement is used by software engineers to gain insight into the design and development of the work **products**. In addition, measurement assists in strategic decision-making as a project proceeds.

Software measurements are of two categories namely, direct measures and indirect measures. **Direct measures** include software processes like cost and effort applied and product like lines of code produced, execution speed, and other defects that have been reported. **Indirect measures** include products like functionality, quality, complexity, reliability, maintainability, and much more.

Generally, software measurement is considered as a management tool, which if conducted in an effective manner helps project manager and the entire software team to take decisions that lead to successful completion of the project. Measurement process is characterised by a set of five activities, which are listed below:

• **Formulation:** Performs measurement and develops appropriate metrics for software under consideration.

• **Collection:** Collects data to derive the formulated metrics.

• **Analysis:** Calculates metrics and use mathematical tools.

• **Interpretation:** Analyses the metrics to attain insight into the quality of representation.

• **Feedback:** Communicates recommendation derived from product metrics to the software team.

Note that collection and analysis activities drive the measurement process. In order to perform these activities effectively, it is recommended to automate data collection and analysis, establish guidelines and recommendations for each metric, and use statistical techniques to interrelate external quality features and internal product attributes.

MSCS 404 E1: Software Engineering

Software Metrics

Once measures are collected, they are converted into metrics for use. IEEE defines metric as "*a quantitative measure of the degree to which a system, component, or process possesses a given attribute.*" The goal of software metrics is to identify and control essential parameters that affect software development. The other objectives of using software metrics are listed below:

• Measure the size of the software quantitatively.

• Assess the level of complexity involved.

• Assess the strength of the module by measuring coupling.

• Assess the testing techniques.

• Specify when to stop testing.

• Determine the date of release of the software.

• Estimate cost of resources and project schedule.

Note that to achieve these objectives, software metrics are applied to different projects for a long period of time to obtain *indicators*. Software metrics help project managers to gain an insight into the efficacy of the software process, project, and product. This is possible by collecting quality and productivity data and then analysing and comparing these data with past averages in order to know whether quality improvements have occurred or not.

Also, when metrics are applied in a consistent manner, it helps in project planning and project management activity. For example, schedule-based resource allocation can be effectively enhanced with the help of metrics.

****

Institute of Computer Science, Vikram University, Ujjain
BY Shekhar Disawal

Institute of Computer Science, Vikram University, Ujjain
BY Shekhar Disawal