ON-TIME PRODUCT DELIVERY AS THE QUALITY GOAL FOR THE SOFTWARE ENGINEERING PROCESS

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Abstract

This paper is devoted to the verification of measurable quality goals established to fit both SEI CMM and ISO 9001:2000 standard requirements. On-time product delivery is defined as the company level quality objective. Definition of the goal is done implementing CMM Goal-Driven approach. A set of sub goals required to achieve the main quality goal is developed using the question-goal-metric (QGM) paradigm. Software development life cycle is analyzed, and appropriative quality indicators are determined. Practically accessible information for the selected quality management model is evaluated. A possibility of process trends recognition based on the actually collected data is analyzed. Examples of real software process trends regarding the quality goal achievement are presented. The area of applicability for the reviewed solution is discussed.

Key words: CMM, ISO 9001:2000, quality goals, measurements, software engineering processes

1. Introduction

Quality goals selection is one of the most important problems in quality system implementation from the management point of view. The most fundamental and difficult problem is providing measurable goals as a part of the company's strategy.

ISO 9001:2000 standard requires the following:

- The quality management system documentation shall include a) documented statement of a quality policy and quality objectives (Clause 4.2.1)
- The quality objectives shell be measurable and consistent with the quality policy (Clause 5.4.1)

For measurement activities to be cost effective, they must be designed and targeted to support the business goals of the organization and provide effective, economical information for decision making. One of the dangers in enterprises as complex software development and support is that there are potentially so many things to measure that we easily overwhelmed by opportunities.

Experience has taught that we must identify the critical factors that determine whether or not we will be successful in meeting our goals. These critical factors are often associated with issues. Issues, in turn, relate to risk that threaten our ability to meet goals. Goals and issues serve to identify and focus the measurements needed to quantify the status and performance of software processes.

Controlling a process means keeping the process within its normal (inherent) performance boundaries that is, making the process behave consistently. Variation must be stable so that results are predictable.

Main Software Indicator's users are shown on the Fig.1 below.

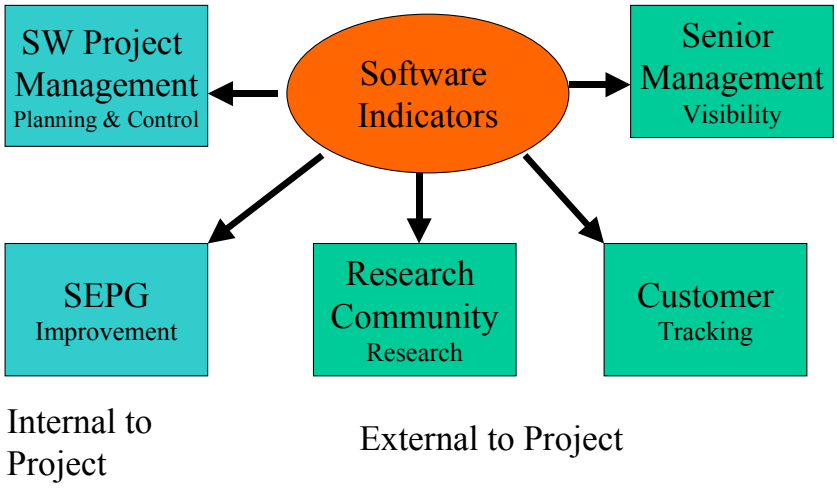

Fig. 1. *Software Measurements Users*

Benefits of SW Measurement Program:

- Better Planning, Control, and Monitoring of Projects
- Capability to Quantify Tradeoff Decisions
- Identification of Areas of Potential Process Improvement
- Objective Measure of Improvement Efforts

This paper investigates a possible correlation between specially selected indicators – internal project's milestones deviations and final product delivery date delay.

2. Notation

GA General Accessibility

QA Quality Assurance

G0 Concept's Milestone

G1 Project launch Milestone

G2 Code complete Milestone

G3 QA complete Milestone

G4 GA ready Milestone

3. Description of the research

The Fig. 2 presents the structure of a typical Research and Development (R&D) Organization running IT projects. The main goal (on-time product delivery) is common for the whole R&D organization, and each separate department must be supplied by a sub goal produced by a decomposition of the main one. The assumption for this research was made that a final product delivery date deviation is visibly related on the project internal milestones deviations.

Unfortunately, limited project statistics (about 20 relatively similar SW projects) collected by author did not give any opportunity to use a strict mathematical method.

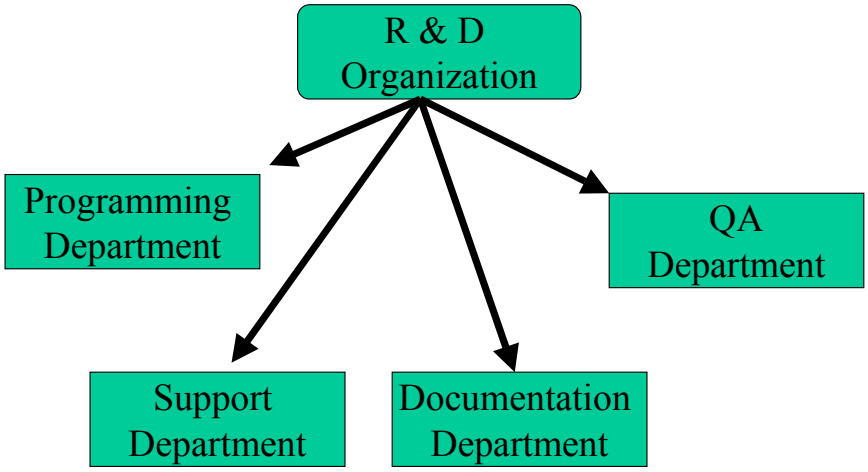

Fig. 2. *Research & Development Organization*

The indicator's selection process was done in compliance with the Goal-Question-Measure Paradigm proposed by Basili and Weiss:

- First Step – Establish the Goals
- Second Step – Develop a list of Questions that are to be answered by the measurement program
- Final Step – Collect Measurement Date

The following selection criteria for indicators was used:

- The Indicator is used in SW Improvement process
- The Indicator is an existing measure
- The Indicator is easy to derive
- The Indicator could be used both as a status indicator and as a predictor of future statusAll known indicator's categories were reviewed during the selection process:

- Progress (with respect of its schedule commitments)
- Efforts (provides visibility into contribution)
- Cost (tracking of actual cost against estimated cost)
- Quality (audit, review results, defect prevention)

- Stability (requirements, size, process)
- Computer Resource Utilization
- Training

Progress as the Indicator we need for the research was defined because of calculation simplicity, clearness and real accessible data adequacy.

The following selection was done on the base of the previous consideration:

- Goal – Actual results and performance of the software project are tracked against documented and approved plans
- Question –Does the actual performance of the project indicate schedule slippage and the necessity of a re-planning effort?
- Measure – The deviation of the actual project progress from that planned

In this case the global company's Quality Policy Objective is the Product On-time Delivery. As internal sub goals the following project milestones are used - Concept's Milestone (G0), Project launch Milestone (G1), Code complete Milestone (G2), QA complete Milestone (G3), GA ready Milestone (G4). An example of such date analyses is shown on the Fig. 3 below. It is really visible that there are no direct connection between internal milestones deviation and final delivery date. This fact could be explained by practically unlimited opportunity to cut previously planned requirements implementation (e.g. testing requirements) to fit contractual delivery date.

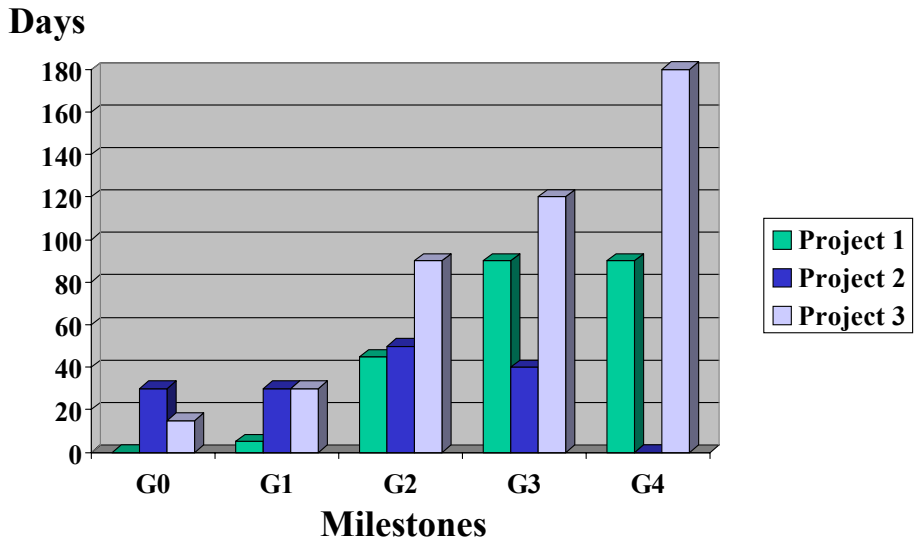

Fig. 4. *Example N 1- Milestones Delay (for 3 projects)*

Additional investigation was done to check the real processes maturity level for the organization by indirect indicator – distribution of the final delivery delay. The result is shown on the Fig. 5 as the Example N 2.

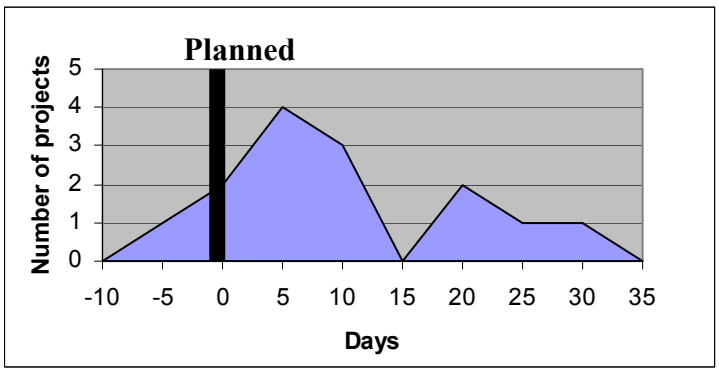

Fig. 5. *Example N 2 – Delivery Delay (for 14 completed projects)*

It is clearly visible that most of completed project are delayed. This fact proves the company's processes immaturity. The most likely we have CMM Level 1 case with ad hoc processes.

4. Conclusion

Taking into consideration all discussed fact we may state the following conclusion:

1. No visible correlation between internal milestones (G0-G3) deviations (progress) and final delivery deviation (G4)
2. Distribution of Delivery deviations for several projects may indicate the actual process maturity level (CMM Level 1 for the Example N 2).

Generally the research result may be evaluated as the negative one. This could be explained by poor statistics used by author - from one side, and by superiority of management pressure on development process during the last project phase – from the other side. In this case a common statistical approach does not work, but the declaration of "on-time delivery" as the quality goal remains very attractive and needs an additional investigation to find other control indicators different from the simple internal milestones deviation.

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