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REVIEW ARTICLE

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Productivity Enhancement Using GQM Using Goal-Question-Metric [GQM] Approach

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INTRODUCTION

Software services industry has become highly competitive in terms of value that can be delivered to client. Constant improvement to gain customer delight, be cost effective and predictive in delivery quality in inescapable. Speed, quality, cost are prime imperatives. There is one key to fulfilling the three imperatives, that is improving productivity. There is no one single way to achieving productivity. It would require attention to people, process and tools to achieve high productivity in all phases of development or service delivery.

IT Companies define goals and business objectives as a part of their corporate mission which are then cascaded to derive project goals and objectives. Customer's needs are also converted to certain objectives at the project level. Objective should be measurable. There are various metrics defined to measure objectives. Through an iterative process of measuring, monitoring and analyzing the metrics enables continuous improvement and reach higher maturity level in terms of delivery processes. Industry benchmarking could be used to set appropriate objectives and metrics

OBJECTIVE OF THIS PAPER

This paper focuses primarily on enhancing productivity for an IT organization by using an industry technique called the GQM technique. The technique involves setting a goal, ask the appropriate questions that would lead you towards the goal and for the questions identify the metrics that should be captured and tracked to meet the project goals and the metrics should generate actionable items on analysis. This approach would iteratively lead to a stable productivity metric and predictable quality of delivered project output

SCOPE

The scope of this paper is limited to measuring the productivity in the context of software development projects in IT service organization. This scope would address three areas: how to define productivity, how to measure it and how to improve or enhance it.

PRODUCTIVITY

Productivity can be simply defined as the ratio of the input in terms of effort to the desired output. The output is represented quantitatively as lines of code, number of function points or Units of work. The input is usually measured as the efforts in hours spent in creating the deliverable as per customer requirement'. Some of factors that would influence productivity are:

a) Right skills, talent(expertise) and resources

b) Appropriate development environment that is appropriate manual and automation tools

c) Improvement iteration based on metrics measurement, monitoring, customer feedback, analysis and action plan

d) Well defined, optimized, tailored, and institutionalized processes

e) Reliable estimation methodology for accurate effort calculation

f) Do-it-right-first-time. Minimize errors, efforts on review and rework

g) Sufficient testing coverage to meet defined quality goals

h) Low attrition levels compared to industry average

Overall productivity of a project is linked to various stages like requirement capture, design, code development, testing, review and rework.

What is GQM?

Goal Question Metrics (GQM) is an established continuous improvement methodology through identification of an issue that needs improvement, set of questions that characterizes the way the goal is to be assessed/achieved and set of measurements for each question that would answer the question in a quantitative manner. Question is the link that connects the business goal to the metrics and "feedback" in the form of answers to questions forms the reverse link. The essence of GQM model is to define the goals and the connected metrics with accuracy and precision.

The goals indicate the **conceptual** level of the GQM model, the questions represent the **operational** level and the metrics represent the **quantitative** level. Metrics analysis in the first iteration leads further to the following questions that impact the operational level.

The GQM method is a part of iterative planning and execution. This process is repeated to cyclically measure the metrics to ensure that it beats the benchmark or ensure minimal variance with it.

GQM FOR PRODUCTIVITY

Having set Productivity improvement as a goal, below is a set of questions and related metrics which would help in improvement of the goal.

Following table depicts GQM Representation of a development project in an outsourcing model:

Goal	Question	METRIC	UOM	FORMULA
Increase in Productivity	Are the shipments delayed due to poor productivity? Are there any complaints on the time factor?	Schedule Variance - Overall	%	[(Actual End Date - Planned End Date) / (Planned End Date - Planned Start Date + 1)] * 100
Increase in Productivity	Is there effort overrun in the project?	Effort Variance - Overall	%	[(Actual Effort - Planned Effort) / Planned Effort] * 100
Increase in Productivity	Is the defect density trend improving?	defect density	Defect / Size	Total number of defects / Total Size (in FP/ LOC/ Unit of work etc.)
Increase in Productivity	Is Requirement Elicitation and Harmonization done as per expectations of SMEs and Bas?	Requirement Stability Index	No Unit	(# of requirements descoped, added, modified/Total No of requirements * 100
Increase in Productivity	Is percentage of defects injected and detected in control?	Defect Density - Design Phase	Defect / Size	Total # of design defects / Design Size (in FP/ LOC/ # reports, etc.)
Increase in Productivity	Is there an efficient review system? Is review automated wherever possible?	Review Efficiency	%	No. of review defects / Effort spent in review
Increase in Productivity	Is the review effective? Is defect leakage reduced?	Review Effectiveness	%	No. of review defects / No. of total defects (review + test + post-shipment)
Increase in Productivity	Does the defect density decrease as the phase progresses?	defect density trend		No of defects in each phase /total no of defects
Increase in Productivity	Is there an improvement in the testing efficiency trend?	defect leakage	%	No. of defects identified in UAT subsequent to delivery from Test Factory / (No. of defects detected by Test Factory during execution + No. of defects identified in levels of testing subsequent to delivery from Test Factory) * 100
Increase in Productivity	Is the defect Unearthening trend improving?	Defect Unearthing Efficiency	%	[(Total Defects Unearthed) / (Total defats during testing+ defects after testing)] * 100
Increase in Productivity	Is the productivity as per company guideline / Customer specifications?	Productivity	Number	Effort in person hrs./FP or UOW or LOC
Increase in Productivity	Is COQ within limit as per management directive or organization mandate?	Cost Of Quality	%	Prevention Cost + Appraisal Cost + Failure Cost

SUMMARY:

However, mere GQM bear risks of too much of top-down approach and may result in a long list of metrics that could hinder make its industrial or corporate acceptance. The measurement framework may also not account for all perspectives as only the perspective of those defining the GQM tree are likely to be considered; rendering it unbalanced or incomplete. Too much theory or subjectivity could also be an obstacle in metrics collection and implementing feedback controls. To overcome the above issues with vanilla GQM, Extended-GQM (EGQM) approach provides an effective alternative. It recommends prioritization of goals and questions via organizational survey for acceptance and institutionalization of the approach. The prioritization is used to reduce the size of measurement framework and results in a GQM tree that is acceptable to all stakeholders. Categorization helps in grouping all relevant perspectives and subjective influencing factors, to keep the tree well balanced without trimming essential metrics. This paper too adheres to EGQM by prioritizing the sub-goals, categorizing the questions and metrics, and by considering the prominent perspectives in forming the GQM tree. This method has to be iteratively used at pre-defined intervals to gain better control over the processes that help achieve defined goals.

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