

# **Experiences in Using the Goal/Question/Metric Paradigm**

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## **Abstract**

Tokheim, a company that provides products and services for the retail petroleum market, applies the Goal/Question/Metric paradigm to support their software development projects in their central development site in the Netherlands since 1994. Many experiences have been gathered during these projects. Experiences includes knowledge on software development topics, but also on practical GQM application in industry.

The presentation will address a selection of experiences, lessons learned and measurement examples collected during the past years.

## **GQM experiences published in a book**

These experiences have also been published recently in the McGraw-Hill book: 'The Goal/Question/Metric method: A practical guide for quality improvement of software development' by Rini van Solingen and Egon Berghout. ISBN 0-07-709553-7.

This book contains practical procedures for GQM application in industry and consists for over 50% of practical results and documents from GQM application in four Tokheim projects.

## **Foreword by Professor Victor R. Basili to the GQM book**

The original ideas for the Goal Question Metric Paradigm came from the need to solve a practical problem back in the late 1970s. How do you decide what you need to measure in order to achieve your goals? We (Dr. David Weiss and I) faced the problem when trying to understand the types of changes (modifications and defects) being made to a set of flight dynamics projects at NASA Goddard Space Flight Center. Was there a pattern to the changes? If we understood them could we anticipate them and possibly improve the development processes to deal with them? At the same time, we were trying to use change data to evaluate the effects of applying the Software Cost Reduction methodology on the A-7 project requirements document at the Naval Research Laboratory.

Writing goals allowed us to focus on the important issues. Defining questions allowed us to make the goals more specific and suggested the metrics that were relevant to the goals. The resulting GQM lattice allowed us to see the full relationship between goals and metrics, determine what goals and metrics were missing or inconsistent, and provide a context for interpreting the data after it was collected. It permitted us to maximize the set of goals for a particular data set and minimize the data required by recognizing where one metric could be substituted for another.

The process established the way we did measurement in the Software Engineering Laboratory at Goddard Space Flight Center, and has evolved over time, based upon use. Expansion involved the application to other areas of measurement (such as effort, schedule, process conformance), the development of the goal templates, the development of support processes, the formalization of the questions into models, and the embedding of measurement in an evolutionary feedback loop, the Quality Improvement Process and the Experience Factory Organization. Professor Dieter Rombach was a major contributor to this expansion.

The GQM paradigm represents a practical approach for bounding the measurement problem. It provides an organization with a great deal of flexibility, allowing it to focus its measurement program on its own particular needs and culture. It is based upon two basic assumptions (1) that a measurement program should not be ‘metrics-based’ but ‘goal-based’ and (2) that the definition of goals and measures need to be tailored to the individual organization. However, these assumptions make the process more difficult than just offering people a “collection of metrics” or a standard predefined set of goals and metrics. It requires that the organization make explicit its own goals and processes.

In this book, Rini van Solingen and Egon Berghout provide the reader with an excellent and comprehensive synthesis of the GQM concepts, packaged with the support necessary for building an effective measurement program. It provides more than the GQM, but describes it in the philosophy of the Quality Improvement Paradigm and the Experience Factory Organization. Based upon experience, they have organized the approach in a step-by-step set of procedures, offering experience-based heuristics that I recognize as effective. They have captured the best ideas and offer them in a straightforward manner. In reading this book, I found myself constantly nodding in agreement, finding many ideas I had not articulated as well. They offer several examples that can be used as templates for those who wish to have a standard set of goals and metrics as an initial iteration.

If you work on a measurement program, you should keep this book with you as the definitive reference for ideas and procedures.

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## **About the presenter**

Rini van Solingen (M.Sc.) has been working as a senior software quality engineer at Tokheim and as a research fellow at Eindhoven University of Technology, since 1994. During this period he worked on all Tokheim GQM projects and performed research on software process improvement and measurement. He has published over 50 publications in international journals and conference proceedings. He is a member of the IEEE Computer society and is an active reviewer for IEEE Software.