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A QUALITATIVE STUDY OF ANALYSIS IN SMALL AND MEDIUM-SIZED SOFTWARE ENTERPRISES

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Abstract

The empirical study presented in this paper aims to determine the degree of measurement and metrics use in small and medium-sized software development companies. Following a series of discussions with senior managers possessing over ten years of expertise, the different questions are formulated. Then, five small and medium-sized software companies in the neighborhood are asked these questions. The findings suggest that these firms are reluctant to use software measurement procedures. Additionally, companies only use evaluation and process improvement techniques like CMMI when they are mandated by their employment. Additionally, the report makes several suggestions to help resolve the issue.

Keywords: Small and Medium-Sized Enterprises, Process Enhancement, Software Evaluation and Metrics.

I. Introduction

A key factor in guaranteeing the caliber of software solutions is software metrics. However a lot of firms are hesitant to implement and employ sound metrics

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programs for a variety of reasons. Research indicates that small and medium-sized businesses create almost 70% of software products [1]. Within less than a decade, IEEE [3] defined figuring out as "the act or process of assigning a number or category to an entity to describe an attribute of that entity." IEEE defines a measurement standard as "a standard that describes the characteristics of evaluating a process of product" [2]. Software engineering has always had controversy over measurement and metrics, in contrast to other engineering fields that rely on fundamental physics concepts. Measurement in Software Engineering appears to be very sensitive to subjectivity. A single numerical number that may be understood as the extent to which a certain software process influences a particular attribute that impacts software quality is the result of software quality metrics [3], which are functions with software data as inputs. Additional qualities that are strongly associated with software metrics are correctness, interoperability, reusability, portability, integrity, efficiency, flexibility, maintainability, and testability.

It's a well-known fact that big businesses typically take the lead in pursuing quality goals, but small and medium-sized businesses (SMEs) may prioritize other priorities over quality, even when it's not stated clearly. When comparing the proportion of large to small businesses, particularly in the software industry, small and medium-sized businesses outnumber large firms in the production of software. For instance, in 2000, small businesses accounted for 77% of software companies in Germany [1]. Comparably, in 2001, 69% of software companies in Brazil were small businesses. The majority of software products were created by small and medium-sized software enterprises, according to the data. Therefore, it is important to treat small and medium-sized software companies fairly and not undervalue them. The following research query emerges: Do SMEs using metrics and other methods to ensure that their products meet quality standards? The following are the sub-questions: How much, if at all, are they using them if they (or some of them) are? (1) Do they use them for software inspection/review and testing reasons only, or do they use them for the whole software life cycle, from the requirements phase to the software deployment? (2)

2. Research Methodology:

The study's basic framework is depicted in Figure 1. The selection of the research topic was based on the requirement for an empirical investigation to tackle the real-world applications of the measurement/metric in software-related

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SMEs. Later, as the interview questions were being prepared and adjusted, we realized that addressing the research question with a sub-question would simplify it and improve the research's validity and reliability.

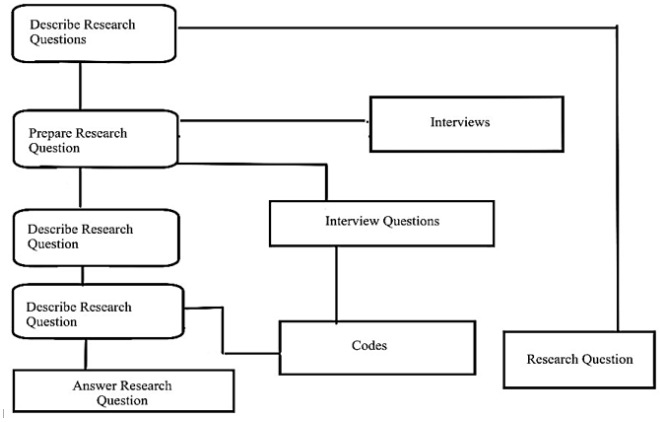

Figure 1: Presented Format for Researching

After reviewing the literature, we developed a preliminary set of study questions and made contact with medium-sized and small local software firms. After consulting with seasoned managers, the questions were decided upon.

The aligned semi-structured interview questions from as the foundation for stage two of the study. The interviewers' primary conversation topics were those aligned questions. Likewise, senior professionals in their respective professions served as the selection criterion for these interviewers, who came from various companies.

To develop, update, and validate our research, we also added to this data pool the analyses of semi-structured interviews and ranks that we obtain from the respondents (Figure 1). This method of conducting research aligns with Glaser's grounded theory [4], which is anchored in the idea that research is guided by the evidence gathered during the process. We chose keywords as codes to be utilized before moving on to the interview portions in order to analyze the respondents' open-ended comments. We were able to cluster quotes under related subjects more quickly because to those codes. According to these phases, the research methodology for this qualitative study involves interviews and partially grounded theory, with the aim of providing explanations rather than just facts.

1. Collection, Analysis and Interpretation of Results:

The questions that were developed following extensive talks with seasoned managers are listed in Table 1.

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Table 1: List of Question

Q. No	Question
1	How many people that focus in software are you hiring?
2	How many of those s/w experts have been employed by you for more than two years?
3	How much experience do your s/w professionals have on average, both at your organization and in the sector?
4	How many members of the core team are aware of the value and importance of software measures in achieving quality goals?
5	Which instruments and techniques do you use for achieving quality goals?
6	Does the business employ software measurement as a tool for operations?
7	Do you have any measuring criteria or frameworks in place for monitoring or evaluating the quality of your products?
8	Are you employing any widely accepted software development standards to meet quality goals and develop your company?
9	If you already follow to any of those principles, have they helped you in growing your business to the degree that you had hoped? If yes, in what ways?

3. Observations:

Our general observation is consistent with that reported in [5], which is that many small and medium-sized businesses reluctant to implement effective metrics programs. Even worse, the majority of them were unaware of some often utilized resources that may be found in the literature in this respect. Since SMEs have to contend with tight deadlines all the time, measurement appears to be given less importance. The encouraging thing was that several businesses appeared to be interested in measuring. But completing tasks by the deadline was the main priority.

4. Results:

Remembering our survey of conversations on the lack of agreement on software measures, we projected that the industry would be reluctant to employ metrics. Controversial and arbitrary suggestions for productivity measures make this more difficult. Similarly, it is believed that one of the most crucial tasks for software systems is maintenance; yet, system-specific and subjective answers are obtained through indirect measurements [6]. Measurements of error-failure are crucial because of dependability as well [7].Another measure is to evaluate the development team in addition to these. Popular worldwide standards (CMMI, ISO9001, and ISO9000-3) are frequent requirements to maintain quality levels in software firms, and they go hand in hand with metrics and measures. The overall findings are displayed below:

1. Economics

Small businesses don't use measurement techniques unless they have some sort of financial benefit.

2. Long Term Activity

SME's believe that measuring is a long-term process with no relevance or urgency.

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3. Developers' unawareness of measurement tools and practices

What and how to measure seems to be a major source of confusion for developers. Since they see metrics programs as instruments for evaluating their own performance, developers in SMEs feel intimidated by their implementation. Most developers are ignorant of the tools that are commonly mentioned and accessible in the literature.

4. Time Pressure

Developers working for SMEs are frequently faced with intense time constraints. SMEs typically declare unrealistic timetables in an attempt to win over contacts and gain money, which puts a lot of strain on the developers.

5. Lack of experienced Personnel

Due to the low pay offered, SMEs struggle to attract and retain competent individuals. After gaining some experience, developers appear to be more likely to move to larger organizations in the aim of advancing their careers.

6. Recommendations:

Our survey of SMEs' measuring practices for achieving software product quality goals is presented in this report. Our survey reveals that most SMEs do not invest as much care as is recommended in the literature, despite the fact that increasing software quality appears to be a top priority in the sector. This study also raises some interesting questions about the consequences of a lack of agreement on software measurements and the consequent resistance to using metrics in the software sector. However, if quality targets are neglected, there is a chance that low-quality software will be produced; this can have serious repercussions, including project rejection and damage to the software company's reputation, which is crucial for any developing business over the long run. Adopting an idea in a corporation appears to have the potential to decrease short-term earnings and/or increase project budgets when it comes to metrics and measurement. Our research, however, lends credence to the idea that SMEs should not only include measurement and metrics in their software development program but also acknowledge this practice. Software quality concerns extend beyond the use of measurement techniques; for instance, the literature often gives credit for the quality of applied algorithms and program code, even when it goes into greater technical detail.

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7. Conclusions and Future Work:

As we discuss in Section 2, SMEs find it difficult to adopt metrics and measurements. Therefore, holding such businesses accountable for not acting in this way would not advance a solution and would undermine the recommendation. Instead, suggesting a method for implementing metric/measurement applications can inspire SMEs to get interested in this field. A framework combining IT, project management, and economics may be able to provide a long-term, methodical approach for introducing the concept of metrics and measurement within SMEs.

One typical drawback is that our interviews were done locally. This restriction, nevertheless, does not pose a significant obstacle because the companies offer a wider range of interests. Another is that we only interviewed one representative from each company. We do not anticipate a significant diversity of information within a company because most SMEs have a small workforce. A more targeted questionnaire may be created to find out how much the staff members know about metrics and measurements, but including information on the staff members' degrees and course offerings could also broaden the results.

The project requirements were not examined in this study in order to analyze the specifics of the outcomes. We are aware that a large number of businesses in the sector are engaged in providing custom information systems. We have, however, left this problem out of our investigation. This restriction allows for related research on project-based investigation in SMEs to be conducted in the future. According to the current survey, some businesses may not adhere to internationally recognized standards and qualifications even though they have obtained them. As we've seen, standards are only appropriate for use as labels. Future research aimed at identifying more specific justifications for postponing the acquisition of these standards is possible.

References

1. Wangenheim, C. G. v., T. Punter, and A. Anacleto. Software Measurement for Small and Medium Enterprices - A Brazilian-German view on extending the GQM method.in 7th International Conference on Empirical Assessment on Software Engineering (EASE) 2003, Keele, UK
2. IEEE, IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries - 610. 1990: IEEE 217

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3. IEEE, IEEE Standard for a Software Quality Metrics Methodology, in IEEE Std 1061-1998. 1998. document number
4. Glaser, B. G. and A. L. Strauss, the Discovery of Grounded Theory. 1967: Aldine de Gruyter. xiv, 271
5. Berander, P. and P. Jönsson. A Goal Question Metric- based Approach for Efficient Measurement Framework Definition.in ISESE '06: Proceedings of the 2006 ACM/IEEE international symposium on Empirical software engineering. 2006. Rio de Janeiro, Brazil
6. Du, J., X. Yang, and Z. Wang. Effective Runtime Scalability Metric to Measure Productivity in High Performance Computing Systems. In Conference on Computing Frontiers. 2008. Ischia, Italy.
7. Musa, J. D. The Use of Software Reliability Measures in Project Management.in Computer Software and Applications Conference, 1978. COMPSAC '78. The IEEE Computer Society's Second International. 1978.