Improving Quality through the Best Practices of Project Management in GSD Environment

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ABSRACT

Project management has become the prevailing method of dealing with changes in business corporations. Best practices are results of experiences and extensive practice of project management at all organizational levels. Best practices increase the probability of success if properly adhered to. This paper delineates the processes and procedures that have become project management best practices and how they can be adopted to improve quality in global software development environment.

Categories and Subject Descriptors
D.2.7.   [**Distribution,   Maintenance,   and Environment**]
General Terms
Management, Standardization, Performance.
Keywords
GSD, Software Project Management, Quality.

1. INTRODUCTION
Historically, projects were used to produce monumental feats like the massar children's discovery center, the anchorage museum and many others[10].Today, any set of activities that involves setting an objective, planning and setting machinery in motion to achieve that objective can be called a project [1]. Global software development; an array of activities used to develop software products with the developmental team spread across several nations or time zones is already becoming a norm among the developers of software due to the continuous innovation and development in technology across the globe [1][2].

A lot of processes, procedures and standards pertaining to quality in project management have evolved through the years; some of which have proven to be more successful than others.

This paper aims at presenting these best practices and approaches used today in project management, the opportunities garnered through the use of these practices and finally adopting these practices to improve quality in GSD environment.

2. STUDY BACKGROUND
2.1 Definition of Terms
1. Project: A project is any endeavor that occurs for a definite period of time, aimed at delivering something new and unique and is completed when the objectives have been met.
2. Project management: This involves the application of expertise, skill and procedures to meet the objectives of a project.
3. Quality: This is the extent to which the outcome of a project fulfills its requirements and specification.

4. Quality management: This consists of those activities that ensure that quality is achieved [1].

2.1 Why best practices?
A very good quality management system does not guarantee the development of a good product if the necessary processes and procedures are not utilized. Several setbacks can occur if best practices are not adhered to, examples are untimely delivery of software, unacceptable software product, disappointing user experience and so on [12] [9].

Best practices are those processes that have worked well at least once for some projects and are considered useful for other projects. These best practices are verified methodologies that lead to improved delivery of services, efficiency, customer collaboration and fulfillment   . A best practice gives an insight into the kinds of risk that may be encountered during the course of a project and helps to minimize those risks.

A best practice can become a guideline or standard and are meant to be purposeful, explicit and widespread such as the IEEE 802.11 standard for wireless LANs communication. They are mostly developed by professional bodies and are subject to understanding [11] [12]. Best practices in form of standards and guidelines are typically issued by professional organizations e.g. PMBOK (project management body of knowledge) issued by the project management institute (PMI) [2] [7].

2.3 Benefits of adhering to Project Management Best Practices.

A best practice in project management involves a coalition of the activities and categorizing them according to functions such as planning, implementation and measuring the progress and performance of the project work. Project management has become a widely accepted discipline because of the numerous benefits accrued through its use [11].

The benefits accrued to adhering project management best practices include but are not limited to;

- Best practices provide a platform that provides access to tools, procedures, templates, techniques that can be used on projects at any time.
- Best practices make the activities, prospects and communications among the team unified.
- Best practices enhance client/customer confidence through the generation of required results.
- Best practices promote better communication and process quality.

Table 4: Categories of issues affecting quality in
 GSD Environment. Source: [5][11][17][20]

- The use of best practices promotes a global approach to labor.
- The use of best practices enhances and eases monitoring and quality.
- The use of best practices gives a better position in the market.
- The use of best practices reduces the risk of implementation failure and gives a better position in the market.
- The use of best practices promotes better team cooperation and communication.
- The use of best practices leads to a drop in costs and schedule budgets.
- The use of best practices gives faster time to fulfill commitments and improvements. [11][17]

Since the results of a project are meant to be unique, this indicates that the same set of processes and procedures required for any project will be diverse. Best practices in project management contribute to the achievement of goals, so project managers are in the best position to determine the best methods that are appropriate for their project in various conditions. Project managers also need to put into consideration the cultural differences which appear in the different areas or countries involved in the GSD project [2][11].

3. THE NEED FOR QUALITY.

A software product that is not developed with quality at the forefront may experience incessant repairs and reworks that will incur extra costs. Poor quality in a software product can also result in design problems that may not be easy to discover, troubleshoot and resolve. The quality of a software product is the extent to which the software meets its specification .Quality can be viewed from several perspectives but the basic factor remains that the

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development of a software product with quality will enhance the achievement of developmental and business goals. A table of several views of quality is shown in Table 3. Quality has to do with a software product performing the right functions and also doing things right over a considerable amount of time.

Benefits of developing a product with high quality include; Low costs of maintenance, low time to market the product, development costs are lower and schedule overrun cost is also lower. [5] [11].

A GSD project delivered on schedule and within budget limits and does not meet its specification indicates that quality has not been achieved [3][11].That is why quality has to be planned, designed and built into, not inspected into a software product. To control quality is to monitor work results to ensure compliance with the set standards [1][8].

Views Of Quality	Meaning
Transcendental views	This has to do with some intangible and undefined features that delight users.
User views	This has to do with the product's fitness for purpose or use.
Manufacturing views	This has to do with conforming to internal and industry standards.
Product views	This focuses on internal characteristics of the product.
Value-based views	This has to do with the customer's eagerness to pay for the software product.

Table 3: views of quality Source: [2][6]

4. ADOPTING THE BEST PRACTICES IN QUALITY TO GSD ENVIRONMENT.

Projects undergone in GSD environment involves teams that are located in different countries or continents and may be working together for the first time coupled with cultural barriers [11]. To achieve quality in a software product, quality planning, quality assurance and control processes must be performed adequately. Planning quality involves developing a plan to meet the quality standards that are relevant to the software product being developed [9][12]. Quality assurance involves activities that are intended to ensure that the right processes and procedures are being followed and analysis of those processes for improvement and optimization. Quality control is to confirm that the required functionality of the software is being produced [9][5][12]. The tools used in these processes include;

1. Costing includes cost benefit analysis which evaluates the benefits against the cost of producing a software product. Cost of quality (COQ) is the amount required to develop a quality software product in conformance to the standards. [9][12].These processes are used in quality planning processes.

2. Quality charts and diagramming techniques comprise of a variety of diagrams and charts that are used in quality planning, assurance and control. They include run charts, Pareto charts, flowcharts, affinity diagrams and cause and effect diagram [6][12].

3. Design of experiment (DOE) determines the issues that can affect the outcome of the project in order to carefully deal with them accordingly. Basically used in planning [9][12].

4. Benchmarking: This is used to set out a reference point from the results of subsequent projects that are related to the present one. It is basically used in quality planning [9][12].

5. Quality metrics and checklists: A checklist is a

Categories Of Issues Affecting Quality	Examples
Cultural issues	Issues between parent organization and other teams.
Technical issues	Reliability, efficiency, maintainability, availability of the software product.
Communication issues	The absence of effective communication between the disperse teams, within each team and between teams and project manager.
Knowledge management issues	Lack of proper documentation, sharing of knowledge, no guarantee that the specified techniques and procedures are followed.
Configuration management issues	Lack of adequate planning, prioritizing of the needed changes, lack of proper change management, integrity of the software not properly maintained.
Software issues	Project and product issues, size, complexity, security of the software product. Consolidation of the software based on integration as a result evolution.

list of issues and activities to watch out for while metrics state what is going to be measured and how they will be measured. They are both utilized in quality assurance and control processes [9][12].

6. Quality management network: This involves the use of networking tools for timely dissemination of the necessary information about the quality processes. The use of teleconferencing, videoconferencing etc aids effective communication.

Though not all of these tools and processes must be utilized before quality is achieved and not all will be effective because of the dispersed teams that are experienced in GSD projects. Categories of issues affecting quality in GSD environment are shown in Table 4 [11]. To achieve quality in a GSD project, there are some critical success factors that must be met through the use of some of these stated tools. How these factors are realized in any given project depends on the organizational processes, the characteristics of the teams, the organizational structures, and the system to be built [7][11].

The following are proven methods that are being used to improve quality in GSD project environment;

- **Curtailing ambiguity and maximizing stability:** Ambiguity left to persist in GSD projects leads to assumptions that can manifest into problems and may lead to re-planning, re-designing or rework. The team involved must understand what the project entails, the processes should be clearly defined and requirements should be explicitly stated and modeled [3] [8][11]. There is need for excellent requirements engineering and architecture to make sure requirements specification and design are stable before embarking on the development phase. This is one of the reasons planning takes more than half of the total time allotted to a project. Quality charts and diagrams should be utilized to organize thoughts and facts and also to examine the drivers and resistors of a decision [8][6].

- **Active risk management**: The essence of an active risk management is to identify risks early in the software development and to make plans and decide on actions to mitigate such risks. Risks could be opportunities or a threat to the software development so some risks can be exploited or enhanced.[12][7]

- **Management of stakeholder expectations**: Managing stakeholder expectations and conflicts is an integral and important aspect

of GSD because if not properly handled, the acceptability of the software product will be jeopardized.[15]

- **Reporting & Measurements**: Observations, concerns, risks and statistics about quality and other pertinent issues that can affect the software development should quickly be reported to the person in charge for proper and timely action.[8][13]

- **Understanding dependencies and facilitating coordination:** The work breakdown structure in a GSD environment should be constructed in a way that reduces the dependencies between the disperse teams. By doing so, it will be possible for each team to develop their module with minimal reliance on other project teams. The software development can be easily monitored and controlled. The kinds of coordination needed among the various teams are different and this in turn affects the outcome of coordinating these teams. Coordination should be channeled towards the client and to the software developers respectively. [11].

- **Change control**: The constitution of a change control board (CCB) that will be responsible for accepting or rejecting any intending changes to the software product. The change control board usually consists of various stakeholders of the project.[20][5]

- **Balance flexibility and rigidity:** The development of the software should be flexible enough to contain differences in backgrounds, processes, skills, experience, cultures and domain knowledge that are found in remote teams. It must be rigid enough to ensure that certain aspects of the project are well defined and processes are followed. Quality assurance and control processes should be employed to clarify whether requirements are achieved, processes are being followed; integration and test procedures are appropriate, etc. This is necessary to monitor progress and to ensure that deadlines are met in order to guarantee quality. [10][11].

- **Incremental verification and validation:** To ensure that the required quality of the project is being achieved, software verification and validation should be done in phases to ascertain conformance to requirements. Quality metrics and checklists make sure that the stated goals are being met and also checkouts issues that can cause a halt to the development of the software product [11].

- **Inspection and Delivery strategy:** It is usually better to engage in manual inspections at early stages rather than waiting till the product is developed and engaging in testing. This brings about efficient use of the available resources. There should be a follow up period so that fault discovered can be resolved even though the software product has been accepted previously. This is like a form of warranty and is mostly used for customized software development. [4][10][16].

- **Defect prevention process**: This includes constitution of an action team (personnel from the various disperse teams) that is responsible for screening, prioritizing and implementing suggested actions from the change control board.

- **Earned value management (EVM):** This is a project management practice that uses time, cost and technical accomplishment to reduce the risk on a project work. It functions on the fact that at any point in time during the project, there are three representations to the status of the project; Planned value (PV) which is a scheduled project work that must be completed under a given period of time and the cost of the project work, Earned Value (EV) is the actual value of the project work accomplished in terms of cost and Actual cost (AC) which is the total amount spent on the finished work or to a point in the project work.

- **Total Quality Management (TQM):** This is a style of management that is aimed at achieving long-term success by linking quality with customer satisfaction. It creates a culture where all personnel participate in the improvement of processes, products and services. Six sigma strategies (define measure, analyze, improve and control) focus on achieving stringent quality levels to obtain total customer satisfaction. Cycle time reduction and participative management are key initiatives of this strategy.

- **Process Improvement**: Process improvement techniques focus on ways to mold existing processes into better and efficient ones while creating new ones to suite the standards and they include Quality improvement paradigm (QIP)/Experience Factory (EF) organization techniques such as goal/question/ metrics (GQM, the SEI capability maturity model. The aim is to achieve continuous process improvement through defect prevention, technology innovation and process change management.

- **Design Paradigms and Programming Languages**: the use of object oriented approach to design and programming to software development. It has a significant influence on software reuse and portability. The use of programming languages that support the object oriented paradigm improves coherence check.

5.CONCLUSIONAND RECCOMMENDATION

There is significant evidence that globalization is a continuous trend and as a result, GSD is very essential. The extensive practice of project management overtime led to the development of guidelines and standards in the profession. This paper stated a number of best practices utilized today [11]. Because of the difference in GSD projects, it becomes difficult to say that particular practices will be effective for a given project. The kind of software product to be developed determines the best practices to be used. Also consideration should be put into selecting best practices based on the kind and number of stakeholders involved in the project. For future research purposes in this field, an avenue should be made where it is possible to analyze the methods for choosing a best practice and to incorporate more experimental processes in the development of software products.

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