Roles Communication model for RUP Using: Pair Programming Concepts

Abstract

The effectiveness of a process model leads to the production of quality software in timely and chivalrous manner. Currently the professional has a pile of software process model which has been proved their effectiveness and importance in the software projects. Rational Unified Process is one amongst them. The RUP process model comprise on nine workflows, thirty role/worker, six best practices and more than hundred artifacts. Each role can work on one activity or one activity can be done by more than one roles. Similarly at the end of each phase of RUP all artifacts are integrated through collaboration of roles. The asynchronous communication among roles causes delays in product delivery and inconsistent development environment. To synchronize the different roles with in RUP, the authors introduced pair programming as a best practice, process model such as XP or other agile methods, pair programming is considered as a best practice to avoid from code review, to increase team collaboration, to minimize confidence bias and to increase productivity. This research is focused on the optimization of RUP by introducing Roles Communication model for RUP Using Pair Programming Concepts. Effectiveness of the idea is subjected to some university student level software projects to ensure that model’s theory and hypothesis are up to the mark and according to authors’ expectation.

1. Introduction:

The software engineering is always eager to introduce the methods, tools and techniques to facilitate its targeted professional and common users as much as possible. In the course of its growth the software engineering professional initiated different paradigms for the software development and process models according to their environment and technique complexity. Software process model is an abstract representation of a software process. The Process model exhibits a particular perspective of the software development process. The process model is not the complete outline for exercising the process of complete activities the software products. The process model is concerned with visualization of a software product’s big picture. Rational Unified Process (RUP) is among those software engineering professional efforts for fixing the software development activities within a consistent, stabilize repeatable and managed framework. RUP is an example of modern process model that has been derived from work on UML and associated Unified software development process. [23]. The RUP recognizes the conventional process model present single view of a process. In contrast the RUP is normally described from three prospective. A Dynamic prospective that shows the phases of the model over time, a static prospective that shows the process activates that are inactive and a practice prospective that suggest good practices to be used during the process. [24]. RUP is a software engineering process model and was developed by Kruchten, Ivon Jacobsen and others at Rational Corporation. The RUP is the complement of Unified Modeling Language i.e UML but it is particularly used for Object Oriented Development. The RUP provide a disciplined approach to assign tasks and responsibilities within development organization. The goal of RUP is to produce high quality software that meets the needs of its end user within expected schedule and budget. The RUP is an iterative approach for object oriented system. RUP squeeze use cases for modeling requirements and build the foundation of system. The RUP is also an open process framework that allows software organization to adapt the process to their specific need. The RUP has four basic concepts: Worker, activity, artifact and workflow. A worker is known as role which comprise on set of behaviors and responsibilities that an individual carry out. A worker can represent more than one individual and one individual can represent more than one worker. E.g. test designer, architect, system analyst. An activity represents something which is performed by a worker. Each activity produces a meaningful result e.g. testing a component. An artifact is the output of an activity e.g. test procedure, design model, component. A workflow is a logical group of activities e.g. testing, implementing. Extreme Programming (XP) is a light-weight methodology for small-to-medium-sized teams developing software. It is called extreme because it makes use of extreme levels of good programming practices. Its focus is on coding, testing, user knowledge elicitation, and design. XP as new methodology for software development has gained much popularity within the object-oriented programming community. [25]. Pair programming is considered as best practice of XP or agile methods. In Pair programming “two people working at one machine, with one keyboard and one mouse” . Within the extreme Programming framework, a pair is not usually fixed, that is, a programmer does not tend to work with the same partner all the time. More usually, a pair will work together for the duration of a single task that might most often take a day or two to develop.[19] Due to this Pair programming is considered as form of collaborative learning. [15]. The benefits of pair programming are to increased productivity, improved code quality, enhanced job satisfaction and confidence [18]. Pair programming has also received criticism over increasing effort expenditure and overall personnel costs, and bringing out conflicts and personality clashes among developers.[12,16]. The authors work evolve around the above describe two (i.e. RUP and Pair Programming) state of the art software development process practice. The concept is to improve the efficiency of the different Roles with the consideration to identify their possessive activities, task and dependencies with the well identified roles. The authors noted a framework which will properly associate these


roles by using different communication channel. So the role communication model for RUP is base on pair Programming but by the now Pair Programming is not limited to customer and developer communication as it was in XP’s best practices.

2. Rational Unified Process (RUP):

Rational Unified Process (RUP) is a development methodology which is develop and marketed by Rational Software but now-a-days owned by IBM. The first release of RUP came in 1998 with cooperation of Grady, Booch, James Rumbaugh and Ivar Jacobson [23]. The core values of RUP are to design Use Case, Process tailoring and Tool Support.[26]

2.1. Phases

The process of RUP project is divided into four phases named Inception, Elaboration, construction and Transition. Further each phase is divided into iterations. Each iteration is two week to six month long and produces a demonstrable piece of software [22].

Inception Phase, in this phase the objectives of the project are stated according to need of stakeholders such as End User, Purchase and Contractor. This phase define the scope, boundary condition and acceptance criteria of project. In this candidate architecture are works out, cost and schedule of project are estimated. The use cases which derive the functionality of system are identified.

Elaboration Phase, in this phase problem domain is analyzed and plan of project is define. This phase yield a sufficiently solid architecture along with sufficiently stable requirements and plans.Executable prototype of architecture is created in this phase after the elaboration phase most use cases and actors have been identified and described. Similarly realization of risks, the stability of vision of product and stability of architecture is analyzed.

Construction Phase, In this phase is also known as manufacturing process because all remaining component and applications are developed and integrated into product and tested. The main emphases of this phase is on managing resources, controlling cost, schedule, quality improvement, alpha and beta test releases Transition Phase, in this phase software product become mature for the release to user community. Based on the user response subsequent releases are made to correct any outstanding problem. The transition phase consists of beta testing, piloting, training the user and maintainer of the system. Several iteration is often made in this phase.

2.2. Workflows

Throughout the phases of RUP, nine workflows [26] are taken place parallel. Each iteration more or less addresses all the nine workflows. Business Model workflow is used for ensuring the customer’s business needs. This workflow is often done during inception and elaboration phase. Environment workflow comprise on activities which are used to support development work. This environment workflow done practically during inception phase. Requirement Management workflow comprise on activities which helps in eliciting, organizing and documenting requirements. Analysis and Design workflow comprise on activities which are used to create the architecture and design of the software system. Implementation workflow comprises on activities which help in writing and debugging source code, unit testing and build management. Deployment workflow comprise on activities which help in packaging the software, creating in installation script, writing end user documentation and other task needed to make the software available to its end user. Project Planning workflow comprise on activities, which help in project planning and monitoring. Configuration and change management workflow comprise on activities, which help to cover all tasks concerned with version and release management and with change request management. Test workflow comprise on activities, which help in system, acceptance and integration testing.

2.3. Roles

In RUP roles are assigned according to activity type. RUP define thirty roles or worker. The main activities which are performed by roles are developing and maintaining information architect, maintain the documentation project plans, to consist the document, to read, write and review document, to allocate documentation resources, to elaborate business use case, to
detect defects and control changes to documents. The main roles of RUP are Information Architect, Technical Writer, Technical Editor, Document Reviewer/Tester, Document Manager, Tool Supporter, Production Specialist, Page Designer, Technical Illustrator, Business process Analyst, Business Designer, Business Model Reviewer, Course Developer, Toolsmith, Documentation Project Manager, Software Architect, Tool Specialist, Information Designer, Usability Engineer, QA Engineer, and Book Designer. [6]. In each phase of RUP number of roles are define to perform activities. Each role know about his/her activity and perform asynchronies communication with other roles but he/she not known about concerned role for communication especially at the end of phase and similarly each role needs to communicate with number of roles. Due to such asynchronies communication each role waist his/her time.

3. Pair Programming:
Pair programming is the key practice of XP and it was incorporated to increase the productivity and satisfaction of project members [4]. Pair Programming is the technique in which two programmer work together at one computer on the same task [27]. The person which typing is called a driver and the other partner is called navigator. Pair programming is an area that evokes personal discomfort and breed conflicts [14]. Pair programming encourage the exchange of talent and resources by creating an atmosphere of unity and team building [20]. Pair programming is a form of collaborative learning that is pair works together to achieve a common goal. The five critical attributes common to successful collaborative learning are Common task or learning activity suitable for group work, Small group learning, Cooperative behavior, Interdependence (referred to as positive interdependence) and Individual accountability and responsibility [1]. Pair programming does not happen in a vacuum. In fact, pair programming has been shown to “take place in the context of a rich environment of artifacts and talk” where tools created for individual use are often re-appropriated by programming pairs, for example the mouse and keyboard are subtly used to help smooth driver-navigator role exchange[19]. The main benefits of Pair Programming are higher quality programs, Decreased time to complete programs, improved understanding of the programming process, Increased productivity and Exchange of Knowledge.

4. Roles Communication model for RUP:
The authors considering the pair programming as concept by modifying it for RUP as four fold phenomenon. The static aspects of pairing the roles as workflow and developer pairs, customer and developer pairs, developer and developer pair and management and developer pairs. On the other hand workflow communication pair, phase integration pairing and process monitoring and control pairing represents the dynamic aspects on the bases of phase to phase influence, involvement and importance of the define roles for the process. The roles are classified in three major categories i.e. Operator, Driver and constitutor. The operator role perform its assign activity and communicate only with constitutor role, the constitutor role perform synchronize communication with driver and operator role and driver role always make communication channel with constitutor role to perform workflow activity, integration activity and process management activity. The work has been done on identifying the who, what and when of the workflow and phases roles. Each who, what and when has its own unique identification.

![Fig-2. Phases WWW Matrix for workflow](image)

Different matrices have been suggested for phases regarding the workflows and roles and their impact weights. The impact weight is based on influence, involvement and importance (III) of a particular role regarding specific workflow in a phase. This III will be suggested by major stakeholders of the project.

![Fig-3. Phases Roles III Matrix](image)

In III the term influence represent that what is the caliber of role in phase, the term involvement represent the degree of work of a role and the term importance represent the priority of role in a phase. In different phases the impact value III of a particular role is vary due to its assigned activity and the scope. For the model three type of pairing has been suggested i.e.

Workflow communication pairing Fig4, Integration
The above pairing concepts in the model cover three aspects of development environment. The first one deals with RUP workflows communication with development personals or drivers, the second type of pairing facilitate the roles involve within the artifact integration either it is phase or process end and the third type of pairing covers the monitoring and control roles which helps in managing the overall project activities.

In workflow communication pairing all roles works on a workflow activity in different way. The Fig-4 represents two way communications between operator role and constitutor role, and constitutor role and driver role.

The communication between workflow activities to operator role is one way, workflow activity to driver role is two way but no direct communication between workflow and constitutor role.

In integration activity pairing the work of constitutor role is to communication in to way with operator role for receiving artifacts.
The work of driver is to communicate with constitutor role in two ways for integration of artifacts.

Even though the idea is passing through its infant stages, yield some positive indicators towards its success. This reshaping maturity is subject to the completion of student level projects, then may be deployed in commercial software projects to be practices for process optimization.

5. Conclusion and Future Work:

RUP is the most widely used development process model in the modern era. RUP deals with the real world concepts i.e. objects and classes and with natural human behavior i.e. iteratively the reconsideration. Mechanism of RUP provides the opportunity for more fine tuning both the process and product. The introduction of Role Communication model will facilitate the targeted stakeholders i.e. the developing organization, managers and customers etc to communicate their concerns regarding process and product for achieving the optimum solution of their type in convenient and timely manner. The roles communication model is the first effort of its type which considers the development process with respect to human factor. The stakeholder’s interaction optimization may lead to a greater degree of improvement for the process and product quality, but due to roles communication model’s infancy stage still candidate for improvement in its effectiveness and efficiency in future.

6. References:


