ABSTRACT

Process models initially used to serve as a base for planning, staffing, organizing, coordinating and budgeting the complete life cycle of a software development process. The management of software engineering knowledge, to improve quality and productivity, needs pragmatic tools. In this paper we are proposing a process model using knowledge based software engineering approach (PMKBEA). This Process model shall help in various phases of the software development process and ease the burden of managers and also minimize the development huddles. The proposed work is an attempt to integrate the merits of knowledge base System, CASE environment and waterfall model. Experimental feedback has been presented which is quite beneficial.

KEYWORDS
knowledge based software engineering, Knowledge based techniques, Process model, Water fall model, Expert System.

1. INTRODUCTION
There are many different methods and techniques used to direct the Software development process and most real-world models are customized adaptations of the generic models. Since each is designed for a specific purpose or reason, most of them have similar goals and share many common tasks. This process model will help the developer to get his work done on time which shall satisfy the client. We did not fall back in ignoring the basic principles of waterfall model in designing our system as it serves as a base for most of the process models. Software professionals and the clients, share a common goal for building information systems that effectively support business process objectives. In order to ensure the cost-effectiveness, quality systems are developed which address an organization’s business needs. Process models can direct the project’s life cycle. In proposed process model we have also used a knowledge base approach as it reflects the changing need of the customers. As customers demand faster results, more involvement in the development process and the inclusion of measures to determine risks, effectiveness, and methods for developing systems, keep changing dynamically. In addition, the software and hardware tools used in the industry keep changing substantially.

Knowledge base is a centralized repository for information: a public library, a database of related information about a particular subject. In relation to information technology (IT), a knowledge base is a machine-readable resource for the dissemination of information, generally online or with the capacity to be put online. An integral component of knowledge management systems, a knowledge base is used to optimize information collection, organization, and retrieval by an organization for its business concerns. Knowledge Base can promote organization for the information flow and create rapid design solutions where more ideas and scenarios can be evaluated [11]. It is often used to support engineering design decisions, by enabling synthesis and analysis, rather than excelling the knowledge of the engineering designers. Through knowledge base, we can implement a process model integrated with information systems, consequently producing a large numbers of ideas and tools.

2. BENEFITS OF KNOWLEDGE BASE TECHNIQUES
A well-organized knowledge base can save enterprise money by decreasing the amount of employee time spend trying to find information about - among myriad possibilities. Software engineering community can achieve benefits by applying Knowledge base (KB) techniques in various phases of the process model [1].

- Requirement engineering can benefit from KB techniques in terms of knowledge representation and process support.
- Component reuse is chosen as a potential application area during design.
- KB techniques could help to generate basic test cases since they encode domain Knowledge in a machine process able format.
- Concentrate on making use of all available knowledge.

3. RELATED WORK
Research is being done in the direction of knowledge based software engineering [1][5][9][10][11][13][14]. Zdeněk Havlícě, Ondřej Pločica discuss Knowledge-based Approach in Information Systems Life Cycle and Information Systems Architecture [1]. A more recent work by Walt scacchi on process model in software engineering were as Jin Sa works on the usefulness of process model (in the form of case study)[13]. In previous paper Marcus Sandberg, Helena Johnson and Tobias Larsson applied Knowledge based engineering in construction: The prefabricated timber housing case [11].

4. PROPOSED MODEL
The proposed work is an integration of the merits of knowledge base System, CASE environment and waterfall model. This model guides the developer in analysis, design, and
implementation procedures of software project according to the client’s requirement.
The components of proposed model are explained in the following section:

![Diagram](image)

Figure-1: Proposed (Process model) using knowledge base engineering approach. (PMKBEA)

4.1 KB SYSTEM
Knowledge base systems are artificial intelligent tools working in a narrow domain to provide intelligent decisions with justification. Knowledge base is a collection of knowledge in the form of subject-problem-solution information that pertains to a specific topic or subject of interest. The data is typically stored in a searchable database. Knowledge is acquired and represented using various knowledge representation techniques, frames and scripts. The basic advantages offered by such system are documentation of knowledge, intelligent decision support, self learning, reasoning and explanation [10].

4.2 ANALYSIS
This step refers to the gathering of system requirements, with the goal of determining how these requirements will be accommodated in the system. Extensive communication between the customer and the developer is essential.

4.3 DESIGN
Once the requirements have been collected and analyzed, it is necessary to identify in detail how the system will be constructed to perform necessary tasks. More specifically, the System Design phase is focused on the data requirements (what information will be processed in the system?), the software construction (how will the application be constructed?), and the interface construction (what will the system look alike? What standards will be followed?)

4.4 CODING
Also known as programming, this step involves the creation of the system software. Requirements and systems specifications from the System Design step are translated into machine readable computer code.

4.5 TESTING
As the software is created and added to the developing system, testing is performed to ensure that it is working correctly and efficiently. Testing is generally focused on two areas: internal efficiency and external effectiveness. The goal of external effectiveness testing is to verify that the software is functioning according to system design, and that it is performing all necessary functions or sub-functions. The goal of internal testing is to make sure that the computer code is efficient, standardized, and well documented. Testing can be a labor-intensive process, due to its iterative nature.

4.6 EXPERT SYSTEM
Expert systems use human knowledge to solve problems that normally would require human intelligence. These expert systems represent the expertise knowledge as data or rules within the computer. These rules and data can be called upon when needed to solve problems or Software packages with functions which help the user construct special-purpose.

- Provide a framework for organizing and representing knowledge.
- Provide procedures for accessing knowledge in order to respond to queries or make decisions.

5. EXPERIMENT
The proposed model was used by the student of M.Tech, M.C.A, during their dissertation phase. They returned the feedback about the model, which is summarized in following tables.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are requirements easily understandable and defined</td>
<td>Yes</td>
</tr>
<tr>
<td>Do we change requirements quite often?</td>
<td>No</td>
</tr>
<tr>
<td>Can we define requirements early in the life cycle?</td>
<td>Yes</td>
</tr>
<tr>
<td>Requirements are indicating a complex system to be built</td>
<td>No</td>
</tr>
</tbody>
</table>

Table1: Experimental feedback of proposed model based on characteristics of requirements.

<table>
<thead>
<tr>
<th>Development team</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less experience on similar projects</td>
<td>Yes</td>
</tr>
<tr>
<td>Less domain knowledge (New to the technology)</td>
<td>Yes</td>
</tr>
</tbody>
</table>
PMKBEA: A Process Model Using Knowledge Base Software Engineering Approach

<table>
<thead>
<tr>
<th>Table 2: Experimental feedback of proposed model based on status of Development team.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Involvement of users</strong></td>
</tr>
<tr>
<td>User involvement in all phases</td>
</tr>
<tr>
<td>Limited user participation</td>
</tr>
<tr>
<td>User have no previous experience of participation in similar projects</td>
</tr>
<tr>
<td>Users are experts of problem domain</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3: Experimental feedback of proposed model based on user’s participation.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Project type and Risk</strong></td>
</tr>
<tr>
<td>Project is the enhancement of the existing system</td>
</tr>
<tr>
<td>Funding is stable for the project</td>
</tr>
<tr>
<td>High reliability requirement</td>
</tr>
<tr>
<td>Tight project schedule</td>
</tr>
<tr>
<td>Use of reusable components</td>
</tr>
</tbody>
</table>

6. CONCLUSION
The strength of proposed model is to take benefit of knowledge base and CASE Environment at each step of proposed model. The proposed model is best suited for industry to meet the client deadlines as it is the integration of the archives in knowledge base, embraced with current case environment following the footsteps of waterfall model. It also helps the developers to gain more expertise in wading through knowledge bases as and when required. This integration results in the formation of the Expert system. All the experimental feedback depicted in Table -1, Table-2, Table-3 and Table- 4 shows that the developers and clients, both are highly satisfied.

7. FUTURE WORK
The results have shown that proposed model give better results. In future more emphasis will be on usability of knowledge base and CASE environment. Soft computing technique can be incorporated in development of knowledgebase system. Testing of this model will be done on large scale.

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