

Agile Computing based Software Project Management AI Agent System

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ABSTRACT

In modern software engineering 'Agile methodology' playing an important role to deliver projects on time with optimal customer satisfaction. In this paper we proposed an AI agent model to support software project management with agile computing. The AI agents are automated intelligent assistants which are self learners and capable to make decisions based on inference knowledge skills. This attempt of fusing AI agent architecture to agile process management improves the efficiency of process management as well as reduces human power and work scheduling times. The utility based AI agent chosen completely adoptable to software engineering environments. We also suggested dynamic knowledge base model to update or improve knowledge about modern project requirements to support optimal decision services in agile project management.

Key Words: - *Agile Computing, AI agent, Knowledgebase, CICD, Project management.*

1. INTRODUCTION

Agile model of software project management is user centric with continuous integration and continuous delivery pipeline [5]. The major activities like Individuals interaction with tools during process management emphasize continuous collaboration with improved adoptability to modern team working environments [6]. The project management tasks are prioritized instead of following in a rigid traditional model like waterfall. Customer satisfaction is directive to project planning which often changes during project development [1]. Great customization with high adaptability to working environments make projects more user centric focusing on rapid development techniques [4]. Some of the major metrics in quality assurance tested are reliability, portability, capability, availability, security, scalability, efficiency and integrity [3]. Scrum management frameworks are vital in agile helpful to self-organize tasks and work towards to common goal accomplishment [2]. Recently AI agents are employed in software engineering process to automate the tasks like debugging, testing and code reviewing. These agents are promising to increase productivity and efficiency in software development [9]. With the advent of AI agents in software engineering more innovative design strategies are generated to handle potential challenges in this cyber world [8]. Project planning has two important estimations cost estimation and resource estimation [10]. AI agents can be useful to make better budget planning with wide range of strategies giving management a choice to pick [7]. In this paper we proposed an AI agent model to automate Agile computing based software project management. This model can be adaptable to medium to large scale companies. The structure supports hierarchical communication flow with multi agent collaboration framework. Agile process model gives flexibility to make new change in software products without more expenses. The development process is transparent and illustrative to all groups. The asset management is minimum in agile approach focusing on adaptability and speed.

2. AI AGENT MODELS

An AI agent system supports rational decisions based on their perceptions and knowledge base to support optimal decisions in environment. The below table 1 describes the AI agent types and characteristics.

Table 1: AI Agents characteristics

AI AGENT SYSTEM	CHARACTERISTICS
Simple reflex agent	Most basic form of agents no need of memory or learning process, employed in simple environments for autonomously make decisions based on condition-action rules predefined. They are designed for specific purpose and limited in actions.
Model based reflex agent	These are designed to work in partially observable environments. They maintain internal memory, data structures and models. They don't maintain past states information but make better decisions in current state. The world model they built is the knowledge base for their decisions.
Goal based agent	They are specific to certain state reach condition. Always apply strategies to reach the goal. The action lists are self generated basing on plans to their goals. They considers past states for estimating future consequences of their actions.
Utility based agent	These systems make decisions by action plans which maximize the overall utility of resources available. They measure the numeric metrics for different plan strategies to reach the goal. They always try to to utilize the maximum possible ways to reach a goal in efficient time scale.

Multi Agent System	This architecture involves several multiple autonomous agents who can share environment, resources and strategies. The work independently to achieve individual goals but cooperatively to support main goals of teams. More advanced with high learning capabilities. They can handle mixed environments very effectively. High work efficiency with greater work load balancing is an optimal outcome of these systems.
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In Multi-Agent systems several agents interact with each other in a large environment. The agents in such environments maintain their individual skills, knowledge and objectives while participating in team objective achievement. In software companies different projects are handled by different project groups. The overall performance of company in perspective of profit estimated with more projects succeeded in prompt delivery with greater customer satisfaction. The multi agent systems must be designed to share company resources with optimal performance maintaining good cooperation within individual project environments and competition with other project agents in reaching milestones by given timelines. Always in agile project management environment agents must follow 'Scrum' process avoiding negative outcomes during project management.

3. AGILE AI AGENT ARCHITECTURE

The Agile AI agent model shown in figure 1 above improves the automation in software project management with optimal decision making capabilities. The project environment divided into three categories such as Design, Testing and Deployment. Agent collects the information from various teams over collaborative platforms. Some of the vital data collected by agents covers the user feedbacks, project states, process states, activities relations, task chains and module concepts.

Knowledge Base:

The central repository of AI agent where it keeps knowledge about various domains is integrated in a refined manner. Supports inference engine to derive conclusions and generate action strategies. The concepts like Quality & Assurance, Testing Plans, RAD models, State histories and Business logic organized in this area.

CICD Pipeline:

AI agent completely interlaced with CICD tools and manages effectively under automation process. The utility tools inside agent always measure the rate of optimality over CICD process chain. Prioritization of agile activities is judged with optimal strategies.

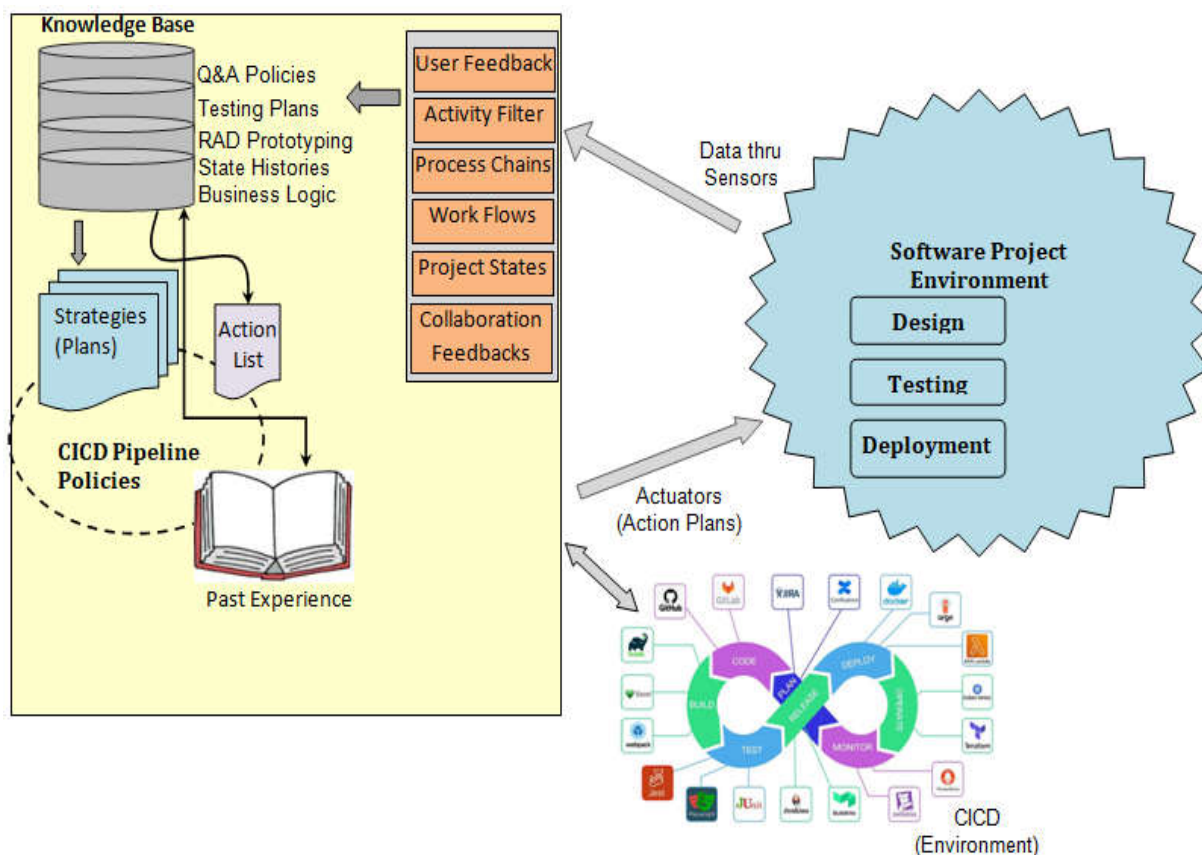


Figure 1: Agile AI Agent Architecture Model

Strategies:

Automated plans to schedule project management activities with dynamic evaluators. Choosing best strategies among available plans is the goal of AI agent. Strategy builder prepares strategies to meet the requirements of optimal agile infrastructures similar to an expert.

Actuators:

The collection of software modules which dynamically interact with two environments one is CICD platform and other is Project Management platform. In CICD platform agent can choose various tools based on current state of project. Uses an action list in conjunction with the Design-Test-Deploy (DTD) cycle to achieve the objective state, which is project completion. Minimizing the human intervention and increasing the efficiency of software product.

Sensors:

The collection of input channels such as design documents, testing documents, test case reports and deployment schemes are collected through sensors. This data is analyzed with inference logic rules generated using ‘Knowledge Base’. AI agent sensors are affordable, reliable and quick in extracting information from various agile collaborative teams.

Past Experience:

This is a collection of state transition histories of various processes in project modules already completed successfully. Used by AI agent to recollect any best strategies previously applied over similar goal tasks. Past experiences improve domain knowledge of AI agents. These experiences are used to judge the current skill levels over old skill levels of AI agents.

4. WORK FLOWS

The AI agent model work flows are shown below with activity diagrams. The basic CICD pipeline oriented process handling in AI agent shown in figure 2.

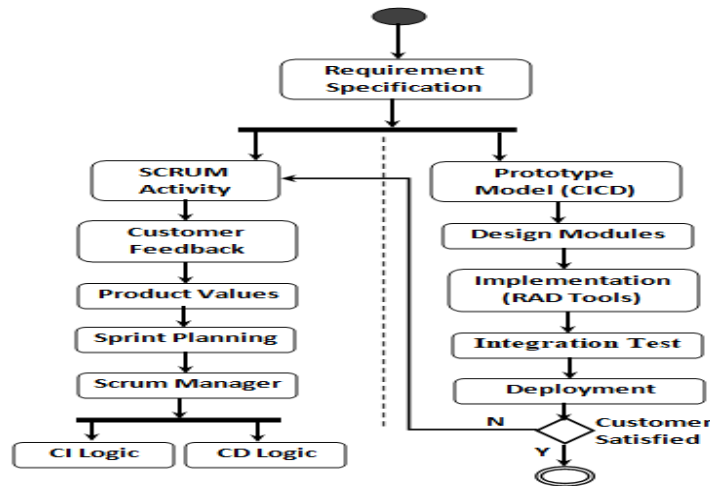


Figure 2: AI Agent Scrum Activity Management

The AI agent knowledge base is the central repository and memory for system to make decisions with planned strategies. Figure 3 shows the activity diagram of how AI agent manages the process and work flow in agile computing environment for software project management. The overall project activity regulated autonomously with AI build strategies in dynamic action list generation mode.

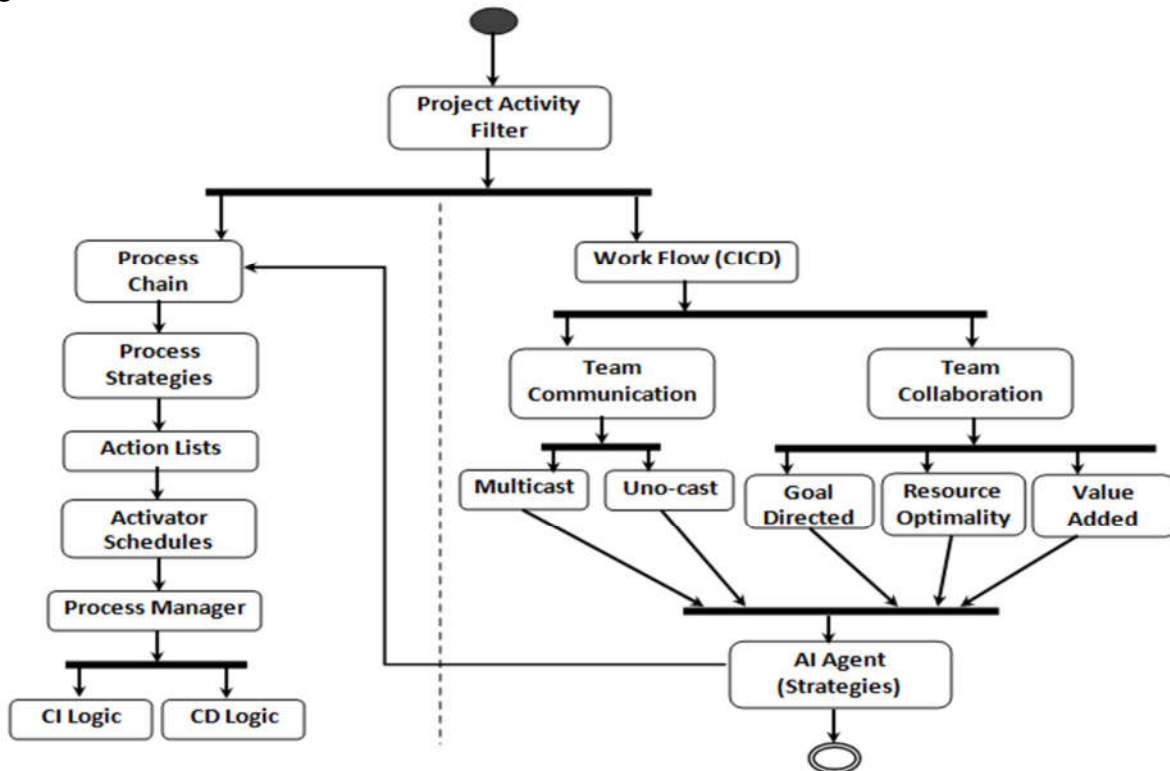


Figure 3: Project Activity management in AI Agent model

The Knowledgebase management activity by AI agent model is shown in figure 4.

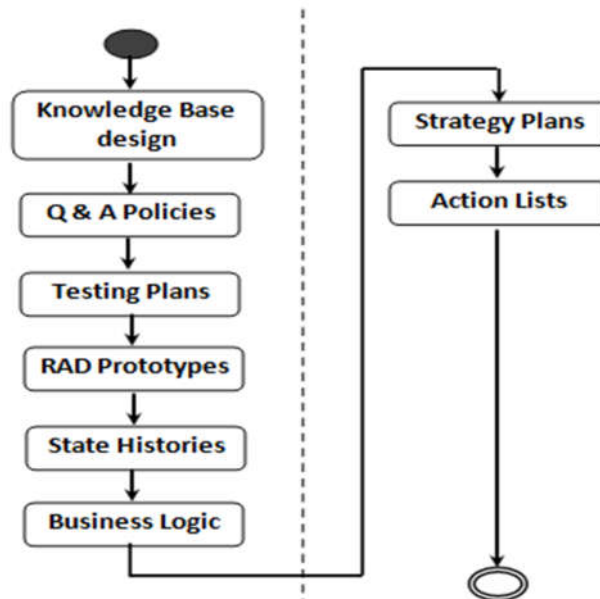


Figure 4: Knowledgebase activity of AI Agent model

The user satisfaction centric feedback mechanism highly influenced with AI agent automated knowledge extraction process figure 5 shows the feedback system in agile project management. All these process modules are AI agent managed for efficient decision making.

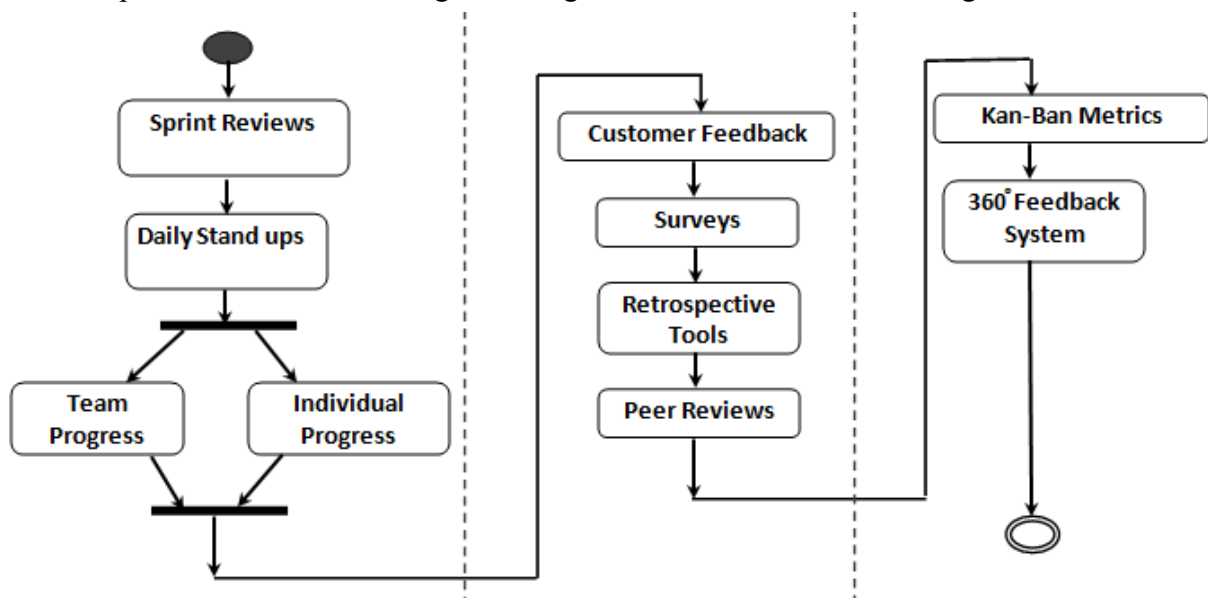


Figure 5: AI Agent governed Agile Feedback process

5. CONCLUSION

In modern project environments quick design and deploy oriented procedures are in demand. Agile computing transforms the project life cycle by prioritizing customer needs, thereby ensuring timely and rapid delivery. Human resource is costly compared to machines. So

companies are looking for Generative AI to handle project management process. Our AI agent model significantly support software project management in an affordable way similar to a human expert. This model can govern project management in various dimensions based on its knowledge base which can be updated or extended according to current trends in market. In future research we are focusing on communication optimality schemes among these multi agents during work flows.

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