An Ontological Analysis on Recursive Reusability of Comprehensive Web Service in Project Management Software

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Abstract— **As information technology projects are creeping it is important to manage and maintain those projects using various project management tools most of the project management tools are designed to cater to the requirements which are laid down by the industry but designing the project management tool from scratch is a cumbersome job for the IT industry thus most of the IT industries are now focusing of designing web services which can be consumed by the project management companies at large based on the requirement of the project selected web services can be consumed by the enterprise requesting the project management modules. As the number of projects are creeping and the same codes are being used in different projects its important that the code archive should be maintained and the software should help the stakeholders using the software development tools to keep track of reusability of the code so that the efficiency of the project can be improved Some of the project management services such as task scheduling and resource allocation to the project can be recursively used and data repository can help in collection of relevant data items in the repository of the web services and segregate the information based on the project name and requirement of the project there is no need to rewrite these web services from scratch. Thus, such comprehensive web services can be grouped can and can be consumed by the enterprises as and when required for their project management activity. Archiving the project web services will help the project managers and the team members to run the web services live and will help the developers to contribute to development only on the required web service development environments.**

Keywords—PMS; WSDL; Web Services; SOAP; Project management and scheduling; project portfolio

I. INTRODUCTION

Most of the project running in the industry need project management tool to monitor and schedule the activities this can only be achieved using the project management software tools available in the market today. Due to lack of budget and time constraints on the project, most of the companies do not invest money in procuring a PMS(14,15). As it has been noticed that project management software is expensive to buy and also most of them are not modularized the enterprises need to buy full solution provided by the project management companies it becomes difficult for some companies to buy a good project management solution.

Also, if the enterprise decides to buy a project management tool which is modularized it is important to buy the remaining modules from the same project management software company as the other modules if purchased from other companies will not integrate with the existing module which is purchased thus this becomes a sticky job for the enterprises to invest huge amount of money in just managing the project activities(7,12). Thus, the concept of web services was introduced. Web services for project management software's and its phases have been developed by many software development companies(9,10).

Most of the companies have similar templates which cater to the project requirements in an enterprise so it's important to find common services which are consumed by most of the customers around the globe and thus design a recursively reusable web service which can cater to the project requirement of the customers. In a survey conducted it has been noticed that the project management software has many modules some of the commonly used modules by most of the enterprises include scheduling of project tasks, assigning resources to task and project managers module (1). These commonly used modules can be grouped by the web service providers of project management software.

It has also been noticed from the survey that the design reuse and the code reuse functionalities of projects are most common in the enterprise so web services related to design reusability and code reusability can be targeted by the project management companies. Some of the companies start from required gather and requirement capturing of the project one of the most important components in project management software(11). Requirement plays an important role in the design and development of the project which can be captured as a service module in the PMS.

II. PROJECT FUNCTIONALITY REUSE.

Projects which are under development have many functionalities integrated to design a final product these functionalities from the different on-going project can be combined and can be used in a new project in the same enterprise (2). Analysis can be done on what part of the project functionalities can be reused in the project and which

parts can be left without reuse. This will help the development team to only focus on the code and the design which can be reused in a new project from an ongoing project. Functional requirement web service can determine which part of the functionality is similar from the project repository maintained by the enterprise about the project which are under development and which have been completed by the business for some other companies.

A. Web service for functionality reusability

Functionality reuse web service will help in reducing the time required to complete the project in time and also the overhead of reprogramming the functionality from the scratch this web service will be consumed by the project development companies at large.

B. Web service for data reusability

Data being a crucial part of the project also needs to be reused by many modules inside and outside the project thus it's important to segregate which part of the data can be used inside different modules and which part can be given to the outside world for reuse (3). The other most important part is to statically analyze the redundancy of data in a project so that data can be maintained at one point instead of multipoint. Web services which can be integrated by the enterprises in their application will help to overcome some issues and will provide insight and granular look into the enterprise data warehouse(18,19).
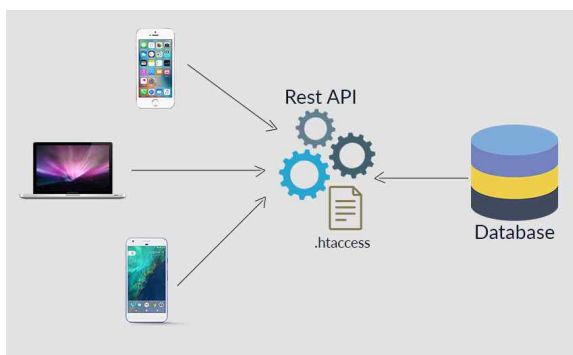

Fig. 1.　Web services for data reusability

C. Web service for design and code reusability

Web service for the design and code reusability will be of frequent use in most of the enterprises using the project management software. As shown in figure 1 above some of the web-based solutions which have been completed by the industry will have their design footprints in the repository of the company's database. These designs can be referred to and sometimes they can be used in an ongoing project this will reduce the time to redesign the same functionalities for a new project such as the payment modules most of them have a standard design and the login screen. Thus, this will also reduce the time to recode the module again for the new project the existing code with some or no modification may work for the new project this will boost the development time and reduce the delivery time of the project to the client.

III. Risk Reduction using Reusable Web Services

Software project those are under development and that have been completed are most of the time under risk thus risk matrix helps in calculating the risk of a software project. Most of the enterprises have risk reduction matrix at a place which helps the development teams to reduce the project risks. Web services for risk reduction can be designed by PMS companies, and these services can be consumed by the enterprises to reduce the risk of the projects(4,16).

If same web services are used again and again with have been tested for risk and are stable for work then these web services can be consumed by the enterprises directly without any modification to the code this will reduce the time taken to develop the software project by the companies and thus an error-free code can be deployed at the clients premises and the company will get the required development tools which are risk free.

IV. Comprehensive Reusability of Technical Development Tools and Techniques

As a developer from different companies can contribute good code and design to other enterprises, it is important to collaborate on a project which requires excellent technical skills thus web services for collaboration of teams with good technical knowledge can be integrated together so that the project under development should be completed with needed technical expertise (4). Web services for professional development tool can be incorporated into the enterprise project management solutions so that the project development team can take advantage of the tools and need not shift from one development environment to the other for design and coding purpose.

A. Web service for software development package reusability

Software packages are needed by the developers and the designers of the project most of the time they need to configure the project development environment to start developing the client's project this task is cumbersome for the developers. Thus, it's important to design web services which can be deployed on the developer's computer system and the client's computer system so that the project which needs to be developed by the company requires less or no configuration to implement the same on the client's computer system.

B. Web service for software domain analysis

Project management companies have domain analyst who is responsible for the software project under development and the new project analysis. The project domain is of significant concern as it reduced the effort of the company and automized the process of the company(8,15). Optimized domain analysis helps in reducing the struggle of the project development thus decreasing the time for delivering the final product to the client. Web service for the

domain analyst will lessen the cumbersome job of refactoring the project domain for multiple ongoing projects in the company thus decreasing the time to complete the domain factoring of the project.

C. Web service for software development techniques

Software development techniques reduce the time to code and redesign the project from scratch also if the client request for any changes in the ongoing project the development team can incorporate the change at any given time of the project development lifecycle as some of the project development companies use the agile software development techniques(6,16).

These development models or techniques will help the team members working on the clients project to incorporate changes at any level in the project without disturbing the existing code thus it's important to find the technique or the method which will exactly help in catering to the clients project requirement and reduce the development time also deliver the projects to the client within stipulated time given by the client. This web service will help project management companies to cater to the need of the software project under development and the tools and techniques which are available to the groups.
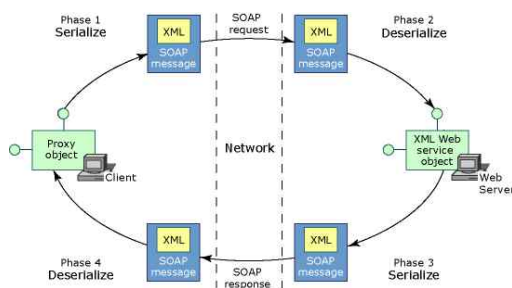

Fig. 2.   Software development techniques Web services

V.   WEB SERVICE CREATION AND DEPLOYMENT MECHANISM

Project management software which is designed using the Microsoft technologies can be deployed on the Microsoft platform which includes the .NET framework (5,13). It's important to know as shown in figure 2 above which technologies are used for the creation of the web services and how the web services are integrated with the web applications so that the enterprises who would like to invoke web services into their application get an insight into the web service creation and deployment models(14,17).

A. Web service created using the Microsoft context

Web services can be created using the Microsoft technologies and tools these services can then be invoked using the same platform and can be tested for any error or bugs which can be resolved using the developer assigned to cerate web methods, web services are created using WSDL language which is provided by the company for designing the web service they can be deployed on the web servers to test and run the web service for the bug detection(23).

Web development tools can be used for running the web services and client applications can consume the web services designed by the developers of the enterprise (18,6). The creation mechanism for the web service is a step by step process which involved creating the functions which can be consumed by the client at large for example in a project management software solution web services such as task management service, task scheduling service, resource allocation web service, resource management web service and many more can be designed which can then be invoked and tested.

1) *Design and develop a project using MSV*
2) *Design and develop web services for the created project*
3) *Wite the function which will be performed by the web service using the web method code*
4) *Run the web service using a web browser*
5) *Invoke the web method to test the web service*

B. Steps for invoking a web service in web application

Web services created using the Microsoft technology can be invoked in the web applications which are running on the client's machines these web services need to be added to the local deployment environment of the enterprise so that the methods which are written in the web service can be invoked in the application of project management software(20). These web services can be configured and the methods can be updated by the service provider to help function these services much better.
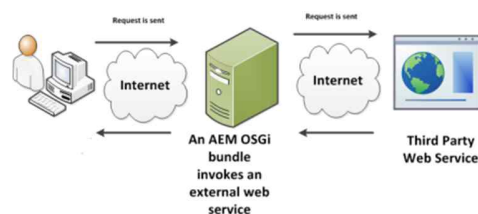

Fig. 3.   Invoking a web service in web application

Information which is requesting the web service must be integrated with the web application so that the system functions effectively the web reference to the web service which is running need to be added to the application server the as shown in above figure 3 URL of the web service should be provided by the web service provider so that the software development project can add the web reference to the application(24,25).

VI.   QUALITY CHARACTERISTIC OF THE WEB SERVICE

Software web service have performance quality factor and the throughput factor which need to be measured by the enterprise who would like to invoke the web service in their application for project management.

A. Throughput / Efficiency of the Web Service

It's important to measure the throughput and the efficiency of the web service as the web services are running on the remote servers and the integration URL's are used to integrate the web services to the web applications(2). As some web services transmit huge amount of data from one end to the other its important to measure the throughput of the running web services if the throughput of the web service is not good then this may create a delay in processing data on the clients end and the software modules which have web services will run slow and with very low efficiency which may delay the time of the project development. The efficiency E of the project P is directly proportional to each other.

B. Performance quality factor of the Web Service

Performance of the web service is also an important factor and need to be monitored carefully by the project management company as the web services are consumed by the products which are running on the clients end, and some of the services can be real-time monitoring systems which are collecting data from different sources at realtime then these web services should run effectively and efficiently to produce the desired results. Most of the IT industries who are consuming such kind of web services keep monitoring these real-time web services on a regular interval.

Performace has been a critical factor for most of the project running in the industry today(1,21). Performace factor of the project depends on all the modules working effectively and efficiently to produce the desired result and without latency in the project development and design.

C. Security of the Web Service

As most of the web services are created by the third-party vendors it's important to check for security of the web service before integrating it into the application of the client the web service should be tested on the testbed which should be created by the integrating agents of the web service into the web application web services should be tested using the following testing techniques.

1) Regression testing: Web services send a huge amount Of information from one end to the other and they require huge amount of data transmission speed so that the performance can be achieved using the web service using the clients applications the regression testing will help the companies to know the performance and the load balancing assigned by the web methods by using web app which consumes the web service. Applications invoking the web service also need to be tested for performance after integrating the web service(22)

2) White box testing: This testing will help the consumers of the web service to get internal methods functioning and its code so that the exact parameters can be implemented and pushed to the web service for computation.

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