**GitHub**

GitHub is a Distributed Version Control (DVC): it stores the entire history of the files on each and every machine locally and also sync the local changes which made by user back to the server when required. All the changes can be shared with others which result in a collaborative working environment. There is another type of version control which is Centralized Version Control (CVC) which all files are kept in the server that users have access to from their local machines. One example of CVC is SVN. DVC are more advance since it offers better performance, offline capability, backup, maintainability and also more flexibility.

Benefits

* Facilitate Collaboration: GitHub allows multiple developers to work on a project using the same repository. Using Github requires developers to actively communicate with others so they can minimize the case such as merging conflict. Developers have to make comment whenever they commit changes or push something. It teaches developers to use meaningful comments so they are understandable by other developers. GitHub also provide places for people to comment on the group works, it is a good place for discussion, sharing experience and encourage people. Specialized repositories can also be created in order to communicate with other departments.
* Support Continuous Integration (CI) development: CI is a software engineering practice of frequently merging all developers work copies with a shared main branch. It is getting more common especially for Open Source Software (OSS) development. GitHub is currently the largest code host in the OSS world. Automated CI services such as TRAVIS-CI is integrated with GitHub itself automates the process of integrating many out-side contributions which can bring lots of potential benefits. Anyone with an account can submit their own changes with just a few clicks. However, not many projects utilize this service of GitHub as it is reported to be underused. (Vasilescu , Schuylenburg , Wulms, & Serebrenik , 2014)
* Backup: GitHub repository is a backup it self. By having all the works in the GitHub repository, all the codes and other documents are safe and secure. Moreover, every developer has a copy of the repository with a full history. Therefore, the chance of losing data due to sever failure is really low. Nonetheless developers have to remember to push their works regularly to minimize the risk of losing codes.
* Project tracking: GitHub provides a simple way to keep track of different versions of your works by providing easy access to different repositories over time. In case of the current code does not work well and begin messy, developers can always move back to the last commit for a fresh start.
* Offline capability: developers work locally most of the time without network access. Tasks such as commits, create branches are not required internet connection. All the updates can be uploaded later until connection is up.
* Maintainability: restructuring can be done on a copy repository before being transmitted to the original repository.

There are so many reasons and advantages of using GitHub to develop software. This regards to project communication and collaboration, project tracking and quality assurance. Therefore, the capability of using GitHub should be compulsory for any developers thus this could be a challenge for the firm. However, GitHub has a friendly design and easy to begin with. With a proper learning session, the organization can quickly upskill its developers.

**Microsoft Project 2016**

Microsoft Project 2016 is the world’s most popular project management software which developed and sold by Microsoft. It is a tool widely used by project managers to sketch a project plan, tracking progress and assign resources to task. It also helps to manage the firm budgets. All 5 project management process groups can be effectively managed by using Microsoft Project.

Benefits

* Project Initiating: using resource sheet view in Microsoft Project, the project manager can easily make a list of people that are going to work for that project. Microsoft Project also assists in classifying different types of resources and assign distinct wages rates for every category. This process also aids the project cost estimation aspect as resources usage cost is a significant part of any project.
* Project Planning: project manager can generate a project schedule using a Gantt Chart, tasks resource assigning is completed effortlessly by just a few clicks with the resource sheet had been prepared. Another handy feature is Microsoft Project notifies users when there is an overlapping resource assigned. Project plan is then visualized by switching to Network Diagram view. A critical path is automatically generated in Microsoft Project showing the path which the project can be finished in the shortest time. Total resource cost is also done following a Schedule Baseline. User can always come up to test different scenarios to find out what something more suitable by quickly modifying Microsoft Project features. This is called “what-ifs scenario”.
* Project Executing: with automatic scheduling feature, changes are relatively easy to be made in Microsoft Project as one modified tasks leads to other automated correlatively changes. Therefore, required updated and adjustments to the schedule, rescheduling uncompleted tasks are simple to be implemented.
* Project Monitoring & Controlling: tracking the project progress is obvious in Microsoft Project. All charts and diagrams are visualized and easy to switch views among them. Additionally, project milestones and deliverables are also specified regularly throughout the project.
* Project Closing: actual project works can be compared to what have been estimated and planned using Microsoft Project at this time. A lesson learned report can be drawn to identify what has gone well and what needs to be improved in later projects.

Microsoft Project 2016 is undoubtedly one of the best project management tools available in the market. Microsoft is a large company and its products are renowned and proved for their reliability and efficiency. Therefore, Microsoft Project is indeed a worth investment for long term. Microsoft offers an excellent post-purchase service, constantly updates its software and releases new version every couple of years which is another advantage. We strongly recommend the organization to use this project management software.

**Slack**

We suggest the software team use Slack as our online communication tool, all of team members are in the team called "name". They can have group or one to one chat in Slack. Most of the communications between team members and client will be there.

Benefit of Slack:

More and more software development team use Slack over other communication tool, there are the few reasons why:

* Notification: Slack enables user to fine-tune notifications (by channel, keywords and more) so they can focus on highest priorities.
* Can be used in any platform: whenever you go, Slack can be used on mobile apps for iOS, Android and Windows phone. Slack
* also offer for desktop: Mac, Window and Linux
* Price: Slack is a free to use forever communication tool.
* Integration: Slack offers built-in integrations such as Github, Google Drive, Trello, Twitter, and so on, so that the team member can pull any information from outside tools into Slack in a way that timely, relevant and searchable.
* Share-able: Slack allow to share any type of files (image, documents, PDF, spreadsheet, your files), even those stored outside of the solution itself.
* Direct message to anyone.
* Private channels: Slack also has invite-only channels feature for users who need privacy.
* Search feature: Slacks robust search functionality enables to find key information quickly, even if inside of a document the user has share.

Slack is a world class online communication software which is widely used in professional IT circles. We would recommend that Slack to be used as a communication tool for this particular project.

**FindBugs**

FindBugs is a popular static analysis tool, what make it stands out from other prominent tools is its tendency to reduce the number of false positive warnings as many as possible. FindBugs is capable of finding over 400 possible bugs, they are classifed into 8 different categories: ‘Bad Practice’, ‘Correctness’, ‘Internationalization’, ‘Malicious Code Vulnerability’, ‘Multi-threaded Correctness’, ‘Performance’, ‘Security’ and ‘Dodgy Code’. Additionally, each warning is also prioritized based on how confident FindBugs is to determine whether the warning is in fact a bug. (Khalid, Nagappan, & Hassan, 2015)

Benefits

* FindBugs can improve code quality since it does not only catch bugs but also bad programming practices. It makes your code looks more discipline and elegant which result in better code review and code reusability.
* FindBugs can detects over 400 different type of possible bugs and categorize it into different classes. It also provides good reasoning of why the bug is harmful when examining code.
* FindBugs often finds real defects which equivalent to encounter a low number of false positives rate. It proves that this software is legit to find valid bugs.
* FindBugs runs fast and efficient as it scan byte code for bug pattern to find defects.
* FindBugs support plugin for many Integrated Development Environment (IDE) such as Eclipse, Netbeans, Maven, Jenkins, Hudson and IntelliJ.
* FindBugs is free and continously updated and released new version by the developers. The software is generally always up-to-date and still has lots of potential in the future.

However, since this software is free. It has some drawbacks compares to its competitors:

* FindBugs needs compiled code.
* Not all bugs found will be real bugs as even FindBugs has a high rate of finding real defects, the chance of catching false positives is still there.
* No quick fixing feature for common bugs found. This can make its easier and more convenient to use FindBugs.

As a quality assurance tool, FindBugs generally has its job done. It does not only assist developers in finding bugs but at the same time increases developers coding skills by reviewing the mistake has been made. We recommend the developers of the project to use FindBugs, it is free and compatible with most IDEs.

**Trello:**

Trello is an online web based Software productivity tool that can be used to organise and track progress and productivity for any kind of software development project.

This tool is able to support many different areas of software practice. It covers parts of requirement engineering, project planning and tracking; and managing change within a project.

One of the obvious advantages of Trello is the ability to plan and track a project’s progress. It is simple and instantly recognizable to see how much work has been done and what work is outstanding due to the colour coded, Kanban task board. A user can also add notes, files and details without congesting the overall simplicity of the task board. Basically Trello gives you columns called boards with which a user can fill them with lists. A list consists of cards which can be made up of user stories, requirements, notes, sub lists etc. These cards can be dragged within and between task boards. This layout allows a user to visually track cards as they move between task boards over the duration of the project hence tracking a projects progress of work done and outstanding.

The Kanban board layout allows a team member to easily view requirements that have been entered in. A person can easily see how a requirement or user story transitions from the various logs and boards. Being able to track and see how a requirement evolves and when it is implemented is an important part of requirement engineering.

This layout and structure of visually organising work allows a team to manage project changes more efficiently. It allows the user to manage a project as a whole with task boards and also can break up big chunks of work effectively via task cards to manage the project at a more detailed level. If any changes need to be done, user stories can be added or removed easily from any of the logs or task boards. Trello also records any activity that is done to the account so that if any mistakes are made, they can quickly be traced. These features allow a team to manage project changes easily.

Other benefits of Trello are that:

* Task board names can be edited at any time. This allows a team to better customize task boards that will be most relevant to their project.
* A user can attach pictures and files which will be displayed on the overview of the task board.
* Card details are hidden from the overview until clicked on. This helps keep the overview of the task board simple and readable at a glance.
* Hyperlinks can be inserted onto any card.
* Cards can be color- coded and colors can be customized.
* Activity list displays all alterations made to the project.
* Can set due dates, create checklists, classify and label the task and assign team members on task cards.
* Multiple different users can be added to a project.
* Different users can communicate with each other by using **@ another user.**
* Trello is compatible with Google Drive and Dropbox.

Trello is an easy, efficient and well proven project tool that is being used by millions by people around the world, free of charge. It is used mainly in Information Technology circles making it highly recommended for use in this project context.

**Workfront:**

Workfront is a first class project management software (PMS). One of the main benefits of having this PMS is that it is a cloud based software, meaning that can be accessed by any device that is internet capable. This allows an organisation the power of mobility and widespread accessibility. Workfront has a range of different features and benefits:

Project Initiation: Workfront caters to IT projects by providing IT specific templates e.g. stakeholder registers, kick off meetings etc. Having the option of having IT customisable templates would be very beneficial when collecting documents during the initiation phase of a project.

Project Planning: Workfront implements a feature called Ask. This feature effectively manages the request life cycle by implementing a submit & approval form process which can be customised to meet a projects demands. By having an easy to use request process, it allows work prioritization to be optimized.

Project Executing & Monitoring and Control: Workfront implements a tool named Capacity Planner to help deal with project execution and monitoring & control issues. This tool displays a live feed of project prioritization in relation to allocated work resources. This enables any user to immediately see where work resources are needed and when certain projects are due as well as projections of current deadlines. This is a powerful tool which helps to keep the project well co- ordinated. Another feature which Workfront has worked hard to implement is its integration with Outlook Mail software. This integration allows Outlook users to view and edit work request items within Outlook live. All interactions are immediate and automatically updates on all channels of Workfront interface.

Project Closing: Workfront has a customisable automatic report system which allows a selected user to select whatever aspects of a project that they wish to monitor and collect information for over the course of the projects duration. At the conclusion of the project, the requested reports from the beginning of the project will be automatically produced, creating a fast and hassle free method of reviewing the project. From there the user can reflect on the positives and drawbacks of the project’s completion.

Workfront has a very credible history within the Project Management Software industry and has now become a premium choice for organisations around the world. In a large context, Workfront can benefit an organisation financially due to its Software As A Service approach. This means that instead of a large fee for individual licenses, Workfront charges an organisation a fraction of the cost at a monthly rate. This is a lot more economical especially for organisations in the long run. We would recommend Workfront as Project Management Tool for this project.