Question 1

1. 8th month,

AC=156,000

PV = 164,000

BAC = 200,000

Earned Value, EV = 200,000 \* 0.8 = 160,000

Schedule Variance, SV = EV - PV = 160,000 - 164,000 = (4,000)

Cost Variance, CV = EV - AC = 160,000 - 156,000 = 4,000

CPI = EV/AC = 160,000 / 156,000 = 1.026

SPI = EV/PV = 160,000 / 164,000 = 0.976

CPI is performing better as we can see that the CPI (1.026) is greater than SPI (0.976).

1. **The project manager can construct a functional organizational structure** to manage the project team in completing the CompIT project. For example, each of the staff only reports to one functional manager to avoid role conflict assigned by multiple managers. For example, the junior programmers and system analysts who stayed in the IT department will only need to report their work to the IT managers. Moreover, using functional organizational structure will ensure the clear definition of authority. For example, the staff have a clear reporting relationship, they know who they need to report to. Moreover, it also ensures clear career paths. Due to the job specialization practices, the junior programmer only needs to perform the job related to IT matters only such as writing source code to develop the system. Different jobs require a different set of knowledge, skills and attitudes, we only need to specialize in certain areas.
2. The most relevant technique will be **software development cleanroom**. This is because the purpose of this technique is to avoid defects rather than detect and repair them which meet the John’s requirements : defect or error removal in the major deliverables. To illustrate, software development cleanroom can lower number of errors because the development team will develop the modules on incremental basis as the user may need to change later, we still can accommodate the user change request and the certification team will test the module using statistical methods until the failure rate is drop to the acceptable levels, beside that these techniques aims to avoid defects in the software, break down the complex components and make sure each components or modules has one entry point and one exit points. Moreover, it can lead to a lower cost for the whole project as the lower defect and number of errors result in a lower repairing cost.

Question 2

1. -

Dynamic metrics :

* ***Efficiency*** assesses how well the ordering system is performing its intended function and meets the requirements. It also refers to the amount of resources required by a software to perform a particular function.
* Measurement:
  + It can be measured by ***recording the response time of the system*** when performing a particular function. To illustrate, the ordering system shall be tested under low, moderate and heavy load conditions, which is under low load conditions, the system shall provide a 1 second response time while under heavy load conditions, the system’s response time shall not exceed 3 seconds.
  + Furthermore, it can be measured by ***monitoring the CPU and memory usage under peak conditions***. The CPU and memory usage should be utilized as much as possible under peak conditions. If the CPU remains idle under peak conditions, it indicates that the efficiency of the system is poor.

Static metrics :

* **Line of code** which refers to the number of lines of the source code in a program. It is used to access the size and complexity of the software. It is relatively simple to be measured and understood.
* Measurement:
  + It can be measured by ***counting the number of lines in the program source code***. The more lines indicate the system is more complex thus can be more error prone (i.e more bugs). Hence, the bugs need to be rectified before releasing the appointment scheduling system for operational use.

1. Size-oriented metric such as Line of codes (LOC) is not commonly used by an experienced software developer because this metric is **depending on the programming language selected** in which the amount of effort to develop the software system would be different for different programming languages. This metric becomes even worse if multiple programming languages are used to develop the software. Furthermore, this metric is **lacking in counting standards**. For example, there is no standard to measure the LOC metrics, when each of the departments use the LOC metrics based on their own standard/definition, the measurement will become not accurate. Hence, the experienced software developer most probably won’t use the size oriented measurement as this measurement (i.e LOC ) will differ among the department and make the software measurement incomparable in an organization.

**Forming** : Be very clear about the team goals and project goals and provide clear direction on the project. The project manager must work with the team to establish team norms for working together.

**Storming** : Help the team to get through this stage by ensuring they listen to each other, understand each other’s point of view and respect their differences. They all bring a unique perspective to the project and will all have ideas to share. Facilitate conversations in team meetings to keep the team moving in the right direction.

**Norming** : When the team is in the norming stage, the project manager should be less involved in every day team decision making and problem solving since the team members are working well together and take on responsibility in these areas. Continue to ensure the team resolves conflicts quickly and continues to work collaboratively; stepping in as needed to ensure the team keeps moving in the right direction.

**Performing** : The project manager serves as a gateway between the project team and the stakeholders, helping to get decisions made when a decision needs to be made at a higher level within the organization.

**Adjourning** : Ensure the time to celebrate the project’s success, capture lessons learned and share and capture best practices for future projects. Even a small gathering for dinner or drinks after work or meeting for coffee in the cafeteria is a welcome opportunity for the team members who have worked hard to reach their goal.

Question 3

Goal: Increase Staff Job Satisfaction by using the new systems

Question 1: Will the ordering processing requests be completed within a short time? Any improvement compared with the previous practice, does the new systems help the staff to become more productive?

Metrics:

* Number of clicks for input, auto retrieval information based on relevant input for example input the orderID to retrieve order information
* Time taken to complete an ordering request.
* The number of errors found during product information retrieval.
* The average waiting time for retrieving product information.
* The accuracy of information generated in the summary report.
* All these metrics will determine how productive the staff, how efficient they are

Question 2: Do the functions provided by the systems meet the customer or staff’s needs?

Metrics:

* Number of clicks or steps to perform functions (i.e customer order placement, report generation).
* Message, help, or guidance provided when the user clicked on the wrong option.
* Rate of satisfaction in terms of the functions performed as requested.
* Number of functions to complete the processing or request.
* Usability rate in terms of the ease of use for the functions (system)

1. -

| The project team members are not equipped  with appropriate skills to complete the project. | Staff size and experience which refers to the risks associated with the overall technical and project experience of the software engineers who will do the work. | 4, the project team has not much experience in developing the system using Python language, thus it affects their productivity badly and causes projects to be delayed. | **Risk Mitigation**:  • Register a Python course for the project team to learn about new skills, to ensure that all the team members have sufficient knowledge to complete the project.  **Risk Monitoring**:  • Monitor the project progress in the coding stage that is assigned to each team member regularly.  • Monitor the attitude of the project team and increase employee motivation based on Maslow's Motivation Model to ensure they are eager to learn the new technical skills arranged by the project manager.  **Risk Management**:  • Use the contingency allowances to hire third party expertise that has experience in using new skills in order to lead the project team to achieve their goals. |
| --- | --- | --- | --- |
| Requirements are not clear | Customer characteristic which refers to the communication between development and customer | 3, Unclear requirements will cause the software to fail to meet the user requirements. Furthermore, the quality of the software will be compromised and would not meet the customer's expectations. | **Risk Mitigation:**  • A tool-drawn prototype using Visual Basic is presented to the users to identify the interaction flow of the system and let the project team elicit the requirements.  **Risk Monitoring:**  • Observe and record users' responses during the prototyping demo session.  • Examine and ensure there is no requirements conflict emerging between users and the project team before proceeding to the actual system development.  **Risk Management:**  • Tool-drawn prototyping will be used to obtain feedback from the stakeholders. The feedback gathered will be incorporated into developing and improving the system.  • If any issue arises because the users' requirements are being incorrectly identified, the contingency allowances and reserves will be used to hire third-party experts to solve the problem to ensure the project can be completed within the schedule without delay. |

Question 4

1. 2 Functional reliability requirements for CompIT’s online ordering system

**RR1** : A predefined range for all operator inputs shall be defined and the online ordering system shall check that all operator inputs fall within this predefined range. (Checking). For instance, the online ordering system shall check all the inputs such as quantity ordered is valid (e.g not a negative value or not exceed the current stock value) before it allows the user to submit the input to the system for further processing.

**RR2** : Copies of the customer and order records in the database shall be maintained on two separate servers that are not housed in the same building. (Recovery, redundancy). For example, if one of the servers has failed unexpectedly, the backup server will switch automatically and immediately to assure the availability of the system (24 x 7) so that the customer won’t feel unsatisfied with the services provided by the CompIT.

1. The importance of VC system

* The version control system will **keep track of the different versions of software components and record its change history.** For example, the changes that are made to the code of a system or software component will be recorded, if something happens (i.e the source code added or modified by the colleague has minor or major bugs), the developer team can roll back to the previous version of the code and continue to develop the system.
* The version control system can **assemble all critical project files and foster actionable communication which can help in improving code quality**. The team members across the team can collaborate easily to build innovative solutions. Without a version control system, the project might go into a mess in which different versions of code or software components are facing conflict and collisions will happen, which will cause the developer team to spend extra time to fix the error, project delay might happen.
* The version control system **enables teams to work in distributed and asynchronous environments**. To illustrate, this allows the development team to review, comment and improve other team members' code regardless of the location and time which is convenient and easy for team collaboration.
  1. For example an ecommerce online ordering systems, during the peak hours , such as 12.12 events , we are expecting a high volume of network traffics and order request from the client's site, we should prepare a backup servers to handle such volumes of client request, fault tolerance hardware, failing to do so, may caused the client dissatisfaction as the systems is not available for them to use, they may turn to another ecommerce providers to placed their orders,
  2. **Redundancy**: Keep more than one version of critical components so that a backup is available ,if availability is critical (e.g. e-commerce systems), companies keep backup servers and switch to these automatically if failure occurs to ensure the systems is always available at 24 x 7 during the peak hours