Knowledge Based Assessment AT1

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# Q1. Describe client business domains, give two examples of one.

# For each example explain what sort of business needs would need to be taken into account.

Business domains are the encompassing fields that a business may operate within. Businesses may operate within single domains such as consumer banking (retail banking institutions such as Commonwealth Bank) or operate under several domains simultaneously such as manufacturing and consumer electronics (Samsung). Business domains will house the wealth of logistical and operation knowledge within specific sectors and will often differ drastically from each other in terms of operational requirements, stakeholder management and internal structure. Because of the wide diversity of needs that a business operating under a single domain would require, domain knowledge is a powerful tool to have when developing software or systems too meet the needs of those businesses. For example; a business operating within the retail clothing domain will require systems to track inventory, count timesheets for employees, manage receipts and track purchases. However, a business within the financial sector, such as a bank or a credit union will require software that will track account information, manage loans and repayments, handle high volumes of transactions per second and allow account holders to manage and update their personal information on a semi frequent basis.

# Q2. Describe three hardware and software products used in Software Development, describe the features and capabilities of each

### Computing device

While modern programming can be written without the aid of a computing device (hand writing code) one will be required when it comes to run and test the code. A computing device, normally in the form of a personal computer (however other devices can be used for small scale application development such as smartphone and tablet devices) is the most important tool for a software developer. This tool provides the base point upon which all the developer’s other tools and work will be stored, completed and tested. A modern computing system should at least comprise of a CPU, RAM, some form of data storage device, and input peripherals (mouse, keyboard etc.), these are the basic requirements for even the most basic modern operating systems.

### Operating System

The operating system is the driving software for a computing device, and while the software isn’t necessary for the archaic primitive computers of the mid-20th century, modern computers require operating systems to manage all the computers resources and tasks in an effective way. There are three major operating systems that currently dominate the market for computing devices. These are Microsoft Windows, macOS and Linux based systems.

### IDE (Integrated Development Environment)

IDE’s are arguably the third most important tool for software development, however is the only listed that is not *necessary* for software development. IDE’s are essentially a collation of modules and software designed to enhance programmer efficacy. While a basic compiler and text editor can be used to code in most cases, these are usually inefficient at best and do not provide the wide range of features that an IDE can offer, such as predictive code completion, refactoring options, debugging modules and code compilers. Having these tools available in a single, easy to use piece of software can greatly reduce the workload of a programmer during the development life-cycle.

# Q3. In software development, describe the different roles of stakeholders and how they are involved during the development process.

Stakeholders in terms of software development comprise of anyone who is impacted materially by the development or release of a software product. This can include but is not limited to customers, end users, managerial staff, operational staff, the project funder, project support and help desk staff, project analysts and maintenance staff.

Due to the broad range of possible stakeholders, compartmentalising them into five separate archetypes defined by the functions they perform and how they are impacted by the software.

### End Users

End users are the actors that will inevitably use the system for it’s intended purposes. They can be employees for the company you are developing the software for or consumers that have purchased software that has been released to the market. Generally, end users are most effected by the systems user interface elements and the functionality and performance of the system.

### Principals

Principals can be considered as the actors that have paid for the systems development. As such, they will tend to have the final say in the outcome of the system or software and make decisions on the software’s’ intended uses. These people will be mostly comprised of major shareholders, senior management, and project clients.

### Partners

Partners are the people that ensure that the system is working during production. These people are most effected by the architecture of the system of software. If the system is poorly planned, then it becomes harder to maintain in a production environment, especially if the software is critical to the business with many end users. Partners usually consist of operational and support staff, legal experts, hosting companies and external application partners.

### Insiders

Insiders are members of the development team that provide supplementary support for developers during the software development life cycle. These can be but are not limited to enterprise architects, database administrators, professional consultants, tool smiths and marketing and sales staff.

### Developers

Development staff comprise anyone directly involved with the production of the project. Developers are affected by every area of a project, as they must consider every other key stakeholder during the entire development process.

# Q4. Describe at least two quality assurance practices and how they are used when determining requirements?

### Statistical Process Control

Statistical process control (SPC) employs statistical analysis methods in order to monitor and control a process. In terms of software development, statistical process control methods are used to minimise resource wastage during application run time and ensure that the application is running optimally on hardware. SPC is an especially effective quality assurance technique for software development, as output and performance of applications can be easily measured by the machine the application is running on.

SPC measures set up the framework for early error detection in software by engaging procedures to monitor the progress and behaviour of the software. This can be used to determine performance requirements of the software and underpin resource and cost constraints of the project.

### Cost benefit Analysis

Cost benefit analysis (CBA) are a series of methods and processes that are used to determine the cost to value ratios of certain elements within a project. The analysis will provide expected outcomes for the project in both dollar value and intangible benefits relative to the amount of money spent on development. To do this, a framework must first be established, which will then be used to identify and categorise the costs and benefits of individual elements within the project. These are then measured against each other and a total value is provided. The total value is indispensable when working within budget constraints and allows the project owner or manager to ensure that the greatest amount of value per dollar spent is extracted from the project.

# Q5. Describe your current systems hardware, software and communication functionality and how it is used in relation to Software Development?

My current working machine is running with an Intel Core i7-8750H hexacore CPU clocked at 2.2GHz with 16gb of dual channel DDR4 RAM clocked at 2400 MHz. My internal storage consists of one 512mb SSD drive and a 2TB HDD. The system runs on Microsoft Windows 10, and connects to the internet via 5G wireless connection.

This computing power translates to very short load and compile times for my IDE’s and any software that I develop for student and personal projects. The majority of the work that I complete at the moment is far less demanding than the total capabilities of the machine that I work from, however, the RAM quality and size and the CPU power allows me to multitask efficiently without experiencing performance issues during peak loads.

# Q6. Describe 4 Programming Languages, compare and contrast the similarities and differences.

### C#

C# is an object-orientated statically typed programming language developed by Microsoft in 2000 as a rival to java. Both were originally based upon C++ code and share many similarities in terms of code structure and features. Perhaps the largest and most defining difference between them is that C# requires a .NET framework to operate and Java can run on any system that has the java runtime environment installed.

### Python

Python is a powerful adaptive general-purpose language with a simple syntax that closely mirrors English in terms of instruction delivery. Python is dynamically typed, instead of statically such as Java and C# and is mostly used for its powerful backend web functionality when paired with Django.

### Java

Java is another child of C and was created with one idea in mind “write once, run everywhere”. Java is an object orientated language that is simpler for users than its parent language, C++ as it uses automatic memory allocation and garbage collection. Java is used widely around the world today, most notably as the base for the Android operating system and it’s back-end capabilities. Java shares many similarities with C# with one defining feature; it can be run from any modern computer.

### Swift

Swift is Apple Inc.’s in house developed language that is used for application development for it’s proprietary OS’ macOS and iOS respectively. Swift was a collation of functionality of its predecessor, Objective-C and modern high-level languages such as Python and Ruby. It was designed for easy readability and requires significantly less code than Objective-C, in favour of a greater resemblance to English instructions. Swift is less prevalent than many other major languages due to the constrictions of its operating environment.

# Q7. Describe 2 Programming Languages that are best for a GUI environment, in your answer describe why they are best for GUI’s.

### C++

C++ is an incredibly powerful language that allows the programmer to control and manipulate every aspect of the applications performance and uses. The powerful complexity of C++ does come at a cost though; it is often more time consuming to develop on C++ as it requires much more framework development than other object orientated languages.

### Java

Java is a relatively easy language to learn comparatively to C++ and contains many packages that make GUI development smooth and easy, such as the swing library. Android studio is also a very powerful IDE for Android mobile development which contains a drag and drop GUI editor feature.

# Q8. Summarize techniques for developing large scale applications, in you answer refer to the SDLC (you must not use waterfall in your answer)

SDLC’s may differ in their approach to tackling projects, but they all share common grounds in the stages they must complete either once, or many times in order to ship a deliverable product. These stages are necessary to ensure that the project meets the clients or major shareholders requirements and expectations for the product. The stages may differ slightly in terms of time spent, order, iterations etc, but they all generally follow the same layout. The problem is identified, a plan is developed, the architecture erected, the project is built and then tested, and finally deployed. The larger the project becomes, the more important the emphasis on these stages become, regardless of whether a dynamic, iterative or static SDLC methodology is used to develop the product.

# Q9. When implementing complex data structures (like doubly linked lists and binary trees) what procedures must you follow. Give an example of what might happen if you do not follow these procedures.

### Determine whether and advanced data structure is necessary

Advanced data structures require significantly more effort to update, control and maintain than simple data structures, determine whether the need for a complex data structure is necessary for your program

### Decide how the data structure will be accessed and modified

Depending on the type of data structure you use, accessing and modifying the data structure will require specific algorithms. Understanding these algorithms is key before implementing complex data structures

### Determine how the data structure will interact with other application elements

Complex data structures may be more efficient in certain cases but become increasingly difficult to manage interactions with other elements with increasing complexity. Defining an interaction plan can help to mitigate these difficulties in advance

# Q10. When using third-party supplied libraries in software development, what procedures must be followed? Give an example of what might happen if you do not follow these procedures.

### Use only Actively Maintained Libraries

Check that the library is maintained regularly and that it is consistently supported by the developers. This ensures that the code is of a high standard and free of bugs and errors that could cause issues within your own code.

### Only use libraries with an appropriate license

Determine the requirements and eventual uses of your application or system before implementing any libraries, many are open source and free to be used, however, there are also proprietary libraries that could create legal issues if used without the appropriate permission from the owner or developer of the library.

### Limit the amount of code that touches the library

The Façade design pattern creates a front facing interface that can be used to mask the complex code within a library, this has several uses, such as improving readability, allows library replacement and additional library functionality.

### Update the library regularly

Updating libraries regularly mitigates the risk of bugs and security vulnerabilities when using libraries within application development. There is no point in using an actively maintained library if you’re not going to actively update it.

### Use Regression Tests

Whenever a library is updated, make sure that it runs well and doesn’t cause additional issues over a previous release. Regression tests are used to prove that the library components you want to use are still working as intended.

### Document the libraries that are used

This ensures that you have up to date information on the library licenses and whether you will be exposed to vulnerabilities or errors in versions of a library.

### Take ownership of a library

End users will not be able to identify that a library was used in the development of an application, and if there is an issue or a bug with the application, it will be perceived as an issue with your code, not the library that you used for that specific functionality. Take control of that error and ensure that you handle it appropriately.

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