

## GUIDELINES IN SELECTING A PROGRAMMING LANGUAGE AND A DATABASE MANAGEMENT SYSTEM

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### ABSTRACT

*Software development is a very complex process. When the project developer is planning to build a project for any organization in that case it is obvious question for developer to select suitable PL (Programming Language) and DBMS (Database Management System). It is a notable issue in project development because if developer fails to select suitable programming language or database management system then it badly affects on project development. This paper discusses what factors play important role for developers to select the programming language as well as database management system. In many cases some researchers point out only about the database management system or about programming language with no thumb rule at all. No published information whatsoever is available on this subject too. This paper gives a working and practical guideline for the developer in selecting upon the programming language and database management system as crucial factors for project development.*

**KEYWORDS:** Software development, DBMS, PL, developer, project development

### I. INTRODUCTION

For building any software project there is need to get perfect understanding of the user requirements and accordingly the users and developers need to plan the project. While planning a project there are some basic facts need to be addressed. Those are user requirements, programming language, database management system, tools etc. If the project developer wants to develop an excellent project then he has to concentrate on these above mentioned things because it plays a pivotal role in the project development. In the case of user requirements it is a lengthy discussion process between the users about his need for the project so as one can go deep into the interactions you may get good requirements from the user. Software testing tool is the testing part of the project that comes after project coding. The most concern part in the project development from initial stage is selecting an appropriate programming language and database management system. It is because after some amount of time if the programming language or database management system becomes obsolete then this will jeopardize the whole work. This paper introduces some guidelines for choosing proper programming language as well as database management system.

Project development in the IT service industry is the crucial factor because the whole IT industry profit depends upon the project's success. Figure 1 shows major causes of IT project failure, in which 29% of IT project fail due the inadequate coordination of resources in the project where programming language and database management system is one the major resources in the project. While discussing the project development some issues need to be sorted out in the early stages because IT project's time duration is very long and hence if we do not settle the issues early in the development stage then it become unavoidable.

## MAJOR CAUSES OF PROJECT FAILURE

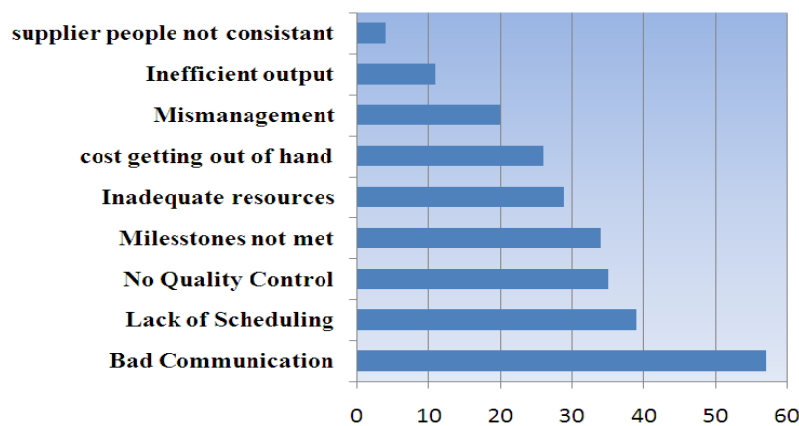


Figure 1 Major causes of project failure

Due to this we need to reopen or restart the project once again and hence it is wastage of money, man power and resources. If the developer can find the technology in the initial stages of the project development then it can achieve better time saving, cost reduction and utilization of the resources in the project development. Without proper decision of programming language and database management system it can take lot of time to build project. This paper guides how to select programming language and database management system as per the applicability of the project in different scenarios.

IT industry has capacity to provide the services to all the businesses. Providing service is the same as providing a software project which fulfills the requirement of the business or user. Project development is a very complex process in which thousands of employees are involved for creating excellent project. Software projects depend upon the Requirement Analysis, Design, Coding and Testing. Sometimes programming language is also called front end of the project and database management system is backend for the project. The brief discussion for selecting programming language for an IT project is as follows:

## II. SELECTION OF PROGRAMMING LANGUAGE

Selection of a particular language should be made based on overall goals of the project. Before starting an important project, it would be important to create several independent testing code programs in various languages. This will describe which one will be best for your task and that will go to save the time over selecting a particular language without unnecessary headache. By considering the user requirements the developer should consider the language for example if user need an immediate project within short amount of time then developer may choose RAD i.e. Rapid Application Development supported languages that will provide drag and drop facilities for the controls and easily available inbuilt functions that saves time of developer from developing controls and functions. If developer is novice in project development then he may go for simpler languages like VB whereas if the project is large enough then using JAVA, .NET, C++ etc. is common. Another approach is to divide project into separate modules or small projects with different languages for each module and selecting the one which may be best suited for the project. Some programming languages need high end configurations whereas other needs common configurations, it is very important to consider the user's machine configuration while selecting language. For selection of particular language, the developer needs to consider the platform dependency, employees who know about the language, popularity of the language, and unanimity of the project team about language. The selected language must be easily understandable by user as well as the developer. It is expected to select the language which can contribute to save time, money, efforts and suitability in project.

## III. SELECTION OF DATABASE MANAGEMENT SYSTEM

Database management system (DBMS) is set of software which takes part in controlling the creation, maintenance, and organization of a user's database. DBMS allows organizations to easily develop

databases for various applications. A database is a mainly collection of data records, files, and other objects. It gives concurrent access to different user application programs to database at single time. It provides variety of database models, such as network model, hierarchical model, relational model and object model to conveniently support different applications. It generally supports query languages which are also work as high-level programming language. Database management system provides facilities for controlling data access, enforcing data integrity, managing concurrency control, and recovering the database has capacity to restore data from failures with the help of various backup techniques as well as maintaining database security. IT project requires database management system to store, retrieve and organize data from the database. There are some different types of database management system viz.

1. Hierarchical Database
2. Network Database
3. Relational Database
4. Object oriented Database

There are number of database types available today; this paper describes some commonly known database types which are frequently used.

### 3.1. Hierarchical Database-

Hierarchical Databases are mostly used for mainframe computers. These are very traditional methods of managing and storing data. This kind of database is organized in pyramid fashion, where all the leafs are extending from the roots as shown in the Figure 2 where the library collection node is at the root position and all other nodes are extending from the root. The advantage of hierarchical databases that data can be accessed and updated rapidly because it consist tree-like structure and the relationships between records are maintaining in advance.

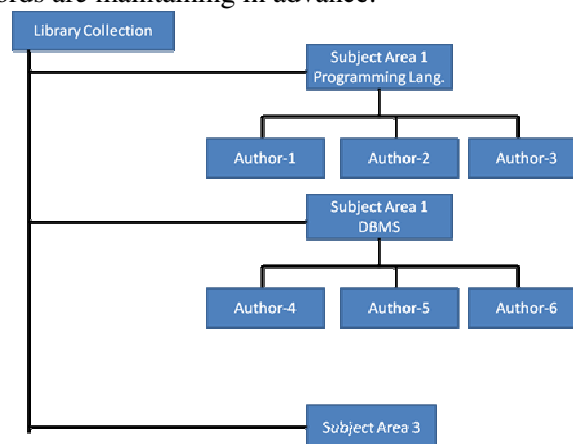


Figure 2 Hierarchical database

The main disadvantage of this type is that each child in the tree may have only one parent, due to which relationships between children are not permitted, even if they make sense from a logical point. These databases are so complex in their design that addition of new field or record requires that entire database be redefined.

### 3.2. Network Database

There are a considerable differences between hierarchical and network databases. In this database type, children of database are called members and parents are called owners. The most important difference is each child or member can have more than one parent as shown in Figure 3

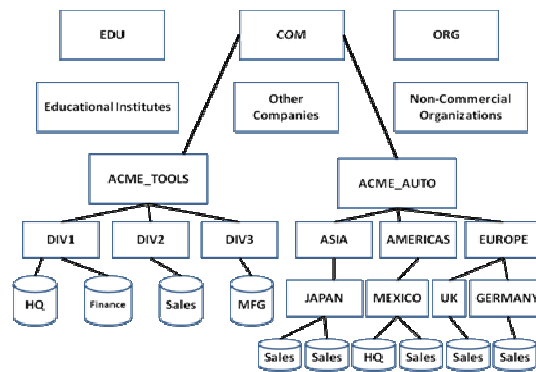


Figure 3 Network database

where edu, com, org are the parents and they have multiple child's from different domains. Network databases are considered more flexible than hierarchical database because it has more than one parent. Limitations must be considered when using this kind of database is network databases must be defined in advance and limitation to the number of connections that can be made between records.

### 3.3. Relational Databases

In Relational database, relationship between data files is relational. Relational database connect data in different files or tables by using common data elements or a key field like primary or candidate key. Data in relational database is stored in different tables, each table having a key field that uniquely identifies each row as shown in figure 4.

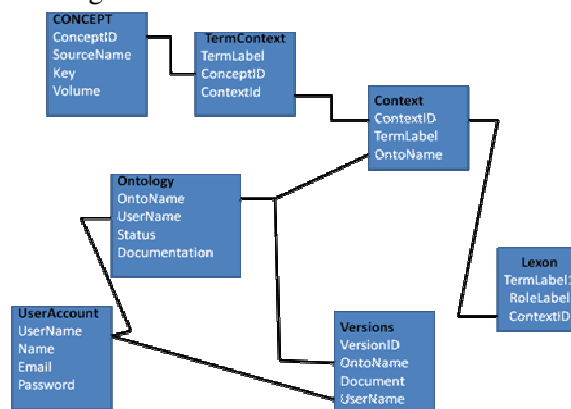


Figure 4 Relational database

This database is now more popular for these major reasons. There is no need to get trained for using relational database only introductory knowledge about database is enough. Database entries can be modified without redefining the entire structure.

### 3.4. Object-oriented Databases

This type of database is able to handle many new data types such as graphics, photographs, audio, and video. Object-oriented databases are useful for small, reusable modules of software called objects. The instructions contained within the object are used to do something with the data in the object. Though object oriented also has some disadvantages such as cost for developing this database is very high. The benefits to object-oriented databases are ability to mix and match reusable objects provides incredible multimedia capability.

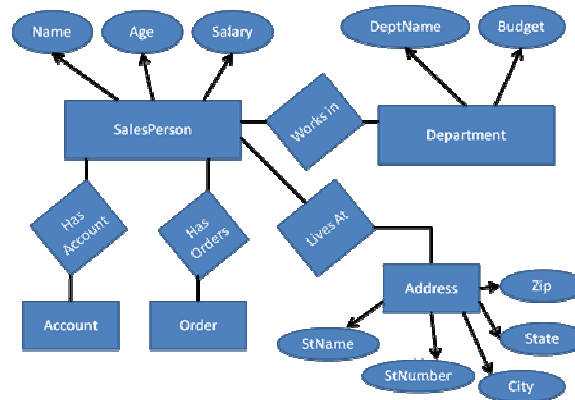


Figure 5 Object oriented database

#### IV. DBMS

Various Database management systems have their own advantages and disadvantages. After analyzing the dbms, developer has to decide which database type is appropriate for the project. This paper discusses some cases which provide useful information for novice developer in selecting programming language and database for the project.

a) Suppose there is a need to build a parametric design application for mechanical engineering CAD product like UG, Catia, Solidworks, etc. where the design table which is a simple database is available in the excel table, where the programmer will just access this database and update existing values. While developing such kind of file there is no need to get knowledge of high end databases like oracle or Microsoft SQL. The same task is performed with the help of Microsoft Access or the excel file can also function as a basic database too.

b) Civil engineer's mostly work with the estimation, costing, measurement, etc this kind of application database don't need of any special kind of services like performance tuning, security it only needs to store numbers and retrieve wherever necessary. Here, there is no need of performance tuning or security then the Microsoft Access is the best choice because it is easily available.

c) Consider that the developer is going to develop banking system application at novice level, any banking application needs performance tuning, security, Business Intelligence, scalability, reliability then Microsoft access is not going to satisfy the requirements and hence developer have to think another databases which provides such kind of requirements for e.g. ORACLE, Microsoft SQL. While selecting database developer has to analyze and understand the current as well as future requirements of the user. Nowadays, it is not possible for businesses to hire a person who will be only hired for handling the project but business need an employee who can simultaneously do the project operations as well as handle the given work. If the developer is going to develop project for the first time then Microsoft Access is the best solution, it is because Microsoft Access is easily available with Microsoft Office, easy to understand and can handle database transactions up to certain level. When the developer gets trained on Microsoft Access and able to understand the database transactions then by experience it will use advance database management system efficiently.

#### V. RESULTS AND DISCUSSION

Proper selection of programming language and database management system for project is a crucial task. After studying different database management systems, this paper gives some basic differences between these dbms in Table 1 Software project development is project life cycle process which starts from requirement analysis from user to the testing of project and deploys it on to the user side.

Table 1 Difference between various Database Management Systems

Issues	Microsoft Access	SQL	Oracle	Postgre SQL
Easily Available	EXCELLENT	GOOD	GOOD	EXCELLENT
Ease to Understand	EXCELLENT	GOOD	AVERAGE	AVERAGE
Security	AVERAGE	GOOD	EXCELLENT	AVERAGE

Scalability	AVERAGE	VERY GOOD	EXCELLENT	AVERAGE
Portability	GOOD	GOOD	VERY GOOD	GOOD
Data Handling	AVERAGE	GOOD	EXCELLENT	GOOD
Database Administration	AVERAGE	GOOD	VERY GOOD	GOOD
Business Intelligence	AVERAGE	GOOD	GOOD	POOR
Basic Data Types	AVERAGE	AVERAGE	AVERAGE	VERY GOOD
Concurrent Access	LIMITED	YES	YES	YES
Costly	NO	NO	YES	NO
Support Size of project	SMALL-MEDIUM	ALL	ALL	ALL
Stores Procedure	NO	YES	YES	NO

Without proper selection of database management system and programming language, the goals of project are not achieved. Due to which there will be a loss for the organization directly affecting the profit of the business. Table 1 shows the difference between the various database management systems which are commonly used. By analyzing the table it is very clear that Microsoft access and PostgreSQL dbms are most favorable for the developer.

PostgreSQL is an open source database management system which is freely available but due to some of its technical issues it not famous as Microsoft access for novice level application development. Microsoft access is used for small or medium sized projects, where there is no need of security, scalability and efficiency. Microsoft access is used by the beginner or the developers who want to develop the module or small project in short time. Whereas other database management systems like SQL, Oracle and Postgre SQL are useful for all projects, where there is need of security, efficiency, scalability and concurrent access to database. But these databases are not affordable for the small industries.

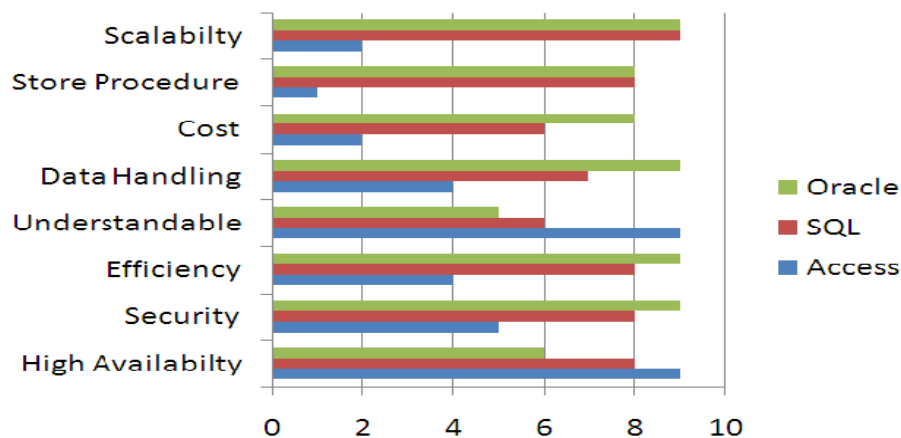


Figure 6 Popularity of the databases according to the cases

If developer decides programming language and database management system in initial stage of the project then, risk management will be achieved in the project and resources are also properly utilized. By referring this paper developer will come to know the factors on which the programming language and database management system will be selected for project. Figure 1.5 shows use of the some popular database management systems. By observing the figure it can easily understand that for advance operations like storing procedure, efficiency, security there must be a need of Oracle, SQL, Postgre SQL etc database management systems. For the novice level database applications developer must have to work with Microsoft Access.

## VI. CONCLUSION

The primary goal of the developer is to develop a project which satisfies user's need as well as the project will complete within time deadline. If the selection of programming language and database management system fail at initial stage in the project, then developer team need to go to basics and

start the work again. It is wastage of resources for the organization. This paper provides guidelines for choosing a programming language and database management system for project development. If the developer working with unsuitable programming language and/or database management system then project will definitely not function properly and due to which the user is not satisfied with project. For developing the small and medium sized projects for the routine functionalities and there is no high expectations from project then developer may use Microsoft access as the backend. If there are tremendous needs from the project for security, scalability and performance in the project it is better to use SQL or Oracle like architectures. Cost of IT projects is in millions or more, it is not affordable for any company to invest such big amount again and again for project development only. If software developer considers the points discussed in this paper for selecting programming language and database management system then project will achieve the goals set by the developer as well as clients of project.

## ACKNOWLEDGEMENT

I would like to express utmost gratitude to my Co-author Dr. Virajit A. Gundale for his continued support, encouragement and guidance provided in articulating this paper. I would also like to thanks Mr. Babaso Ghag who extended his help in preparation of this paper.

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