

DEVELOPMENT OF PROJECT INFORMATION SYSTEM FOR AN ENGINEERING PROCUREMENT CONSTRUCTION (EPC) COMPANY

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Abstract

Project Information System (PIS) is an application developed to enhance the operation of marketing department in a company. Further, the PIS acts as a repository of information about the projects carried out in the company. In addition, this application provides the feasibility of accessing the data of projects in a single database. Hence, PIS has complete information of projects needed by a marketing team to perform their work efficiently.

In the current work, the existing manual systems and processes in the marketing department has been studied and analysed. By studying the various processes with the help of tools like Flow Charts, Data Flow Diagrams and Entity Relationship Diagram different parameters like project details, project duration, client details etc. has been analysed. Further, PIS has been designed using Structured System Analysis and Design methodology along with VB.NET as front end programming language and Microsoft Access 2007 as the back end database. Various forms like Project Information, Client Information and Competitor Details has been designed. From this, the manual data entered by employees can be viewed by executive management through detailed reports developed using crystal reports.

The PIS has been partially implemented against the existing system leading to 62% reduction of time compared to the existing system. The developed PIS will help the organisation to effectively store employee data more securely and accurately. Finally, the PIS has made the data entry much more user friendly. The study can be further extended in implementation of other modules like procurement, finance, design and planning.

Keywords: Data Flow Diagram, Entity Relationship Diagram, Structured System Analysis and Design

Abbreviations

DFD	Data Flow Diagram
ERD	Entity Relationship Diagram
IM	Information Management
IT	Information Technology
KM	Knowledge Management
MIS	Management Information System
PIS	Project Information System
PM	Project Management
PMIS	Project Management Information System
SPMIS	Smart Project Management Information System

Project Information System basically acts as decision making tool which enhances organization's marketing operations.

Project Information System is an application developed to enhance the operation of marketing division in the company. Further, the PIS acts as a repository of information about the projects carried out in the company. In addition, this application provides the feasibility of accessing the data of projects in a single database. Hence, PIS has complete information of projects that will be needed by a marketing person to perform their work efficiently [2-4].

1. INTRODUCTION

In the competitive business world, the need of smart thinking and actions are vital to gain competitive advantage in the market and for business development. For any business, the marketing team acts as the front soldiers of the organisation where they find out opportunities and turn it into business. For this, there should be a reliable and effective information system available to support and enhance the operation [1]. Presently the competition is very high in the booming water industry market which has brought the necessity of maintaining an information system on the market for gaining competitive advantage. VA Tech WABAG is one of the world's leading companies in the water treatment field. WABAG's key competences are designing, planning, execution and operation of drinking water and wastewater plants for both the municipal and industrial sectors.

1.1 Importance of PIS in an Organisation

Modern, computerised systems continuously gather relevant data, both from inside and outside the organisation. This data is then processed, integrated, and stored in a centralised database (or data warehouse) where it is constantly updated and made available to all who have the authority to access it, in a form that suits their purpose [5]. The key benefits offered by PIS in an organisation are as following [6, 7]:

1. Facilitates planning
2. Minimizes information overload
3. Encourages decentralisation
4. Promotes co-ordination
5. Makes work simple

1.2 Project Management Information system

Project Management Information System is a system which supports and facilitates the delivery of

any project, particularly those which are complex, subject to uncertainty, and under market, time and budget, or otherwise difficult to manage. The main capability requirements of a PMIS are:

1. Systematic modelling, recording, storing and validating.
2. Retrieval and general management of information.
3. Data related to the life cycle management of a project.
4. Integrating information across the entire project life cycle, from feasibility study through to execution and finalization.
5. Processing and reporting.
6. Proactively facilitation
7. Inter-operability and compatibility [3].

2. PROBLEM DEFINITION

The information about projects is vital in case of a company which works on projects. In Va Tech Wabag, current information system is very complex and not available as a single database. Data is stored and maintained in MS Excel. The individual team member has to enter the data in individual Excel sheets hence sharing of the information across the entire marketing team is difficult. Problems like duplication of data, loss of information occurs. All the processes are time consuming which effects in effective decision making. In case of the marketing department, the information is not available as a single database. This makes the work difficult and consumes more time for any operation of the department.

The main concern is on the tendering process which is the core of marketing. Data related to bids of projects are not available in a single place. If the data are available in a single place, then the marketing team can use the database for bidding process which will be carried in more effective way. Other issues that affect the operation of the marketing and business development are:

- At present, information about the clients, competitors, markets etc are obtained through portals, employees, contacts in other companies, websites, magazines etc.,
- Resource planning for projects is carried out through historical data in which the data are available as hard and soft copies but not as a single database.
- Identifying suppliers in a location of a project is another major problem as the International Business Group is working in many countries. There is no database available which has all these information.

The top management also faces huge difficulties to track the performance of marketing members because of decentralised database. The aim of the study was to design, develop and partially implement PIS for the International Business Group of VA Tech Wabag Ltd.

The objective of designing PIS was to eliminate manual work which results in timely delivery of information.

3. PROCESS FLOW

The process flow of the PIS is shown in the Figure 1. The activities involved in marketing and project management are shown in the flow chart.

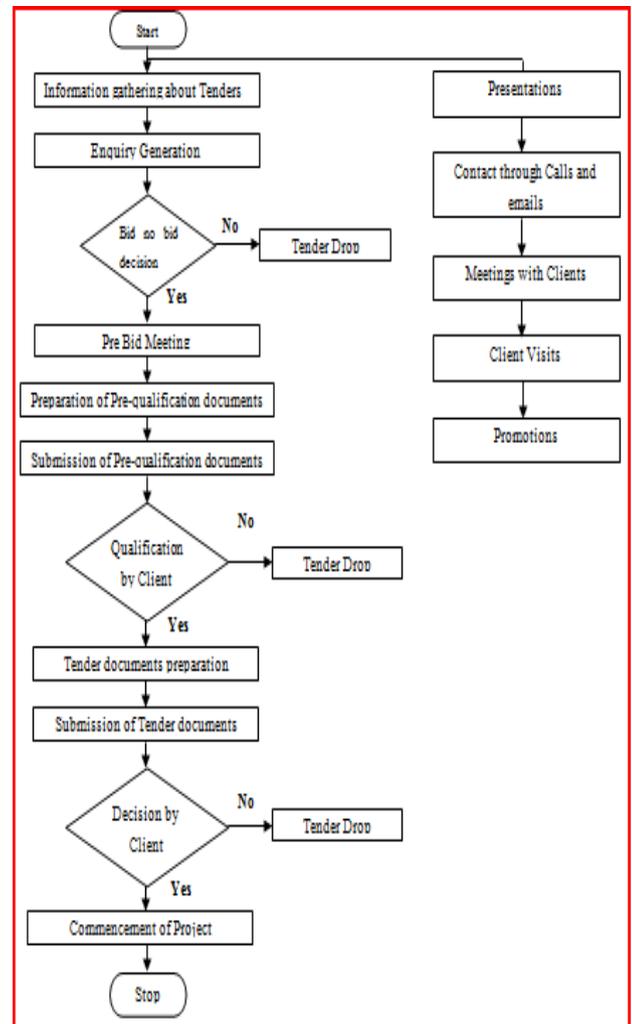


Fig. 1 Process Flow Diagram of PIS

4. DATA ANALYSIS AND INTERPRETATION

The Project Information System has been developed for the VA Tech Wabag Ltd.

The data has been collected for the partial development of Project Information System in the marketing department of VA Tech Wabag Ltd.

4.1 Existing System in Wabag

The marketing department is currently maintaining the information and details of the project in Excel sheets. The information required for the marketing team to bid is not available with them as single database but are present with all the departments in the form of documents and Excel sheets.

The PIS will give the accessibility to the employees for knowing the details of the clients and about the projects for the processes like segmenting, targeting and positioning of the business in the market. The management can also gather information like project details, client details, business opportunities etc. The PIS designed allows faster and efficient in processing of information. In general, it is user- friendly and helpful.

4.2 Developed Project Information System

Figure 2 represents the server based developed PIS where the data is stored in centralised database. Each employee can view and store the data by using internet service and is easily accessible from any location. The developed PIS will also help the top management and marketing team for decision making in their further operation.

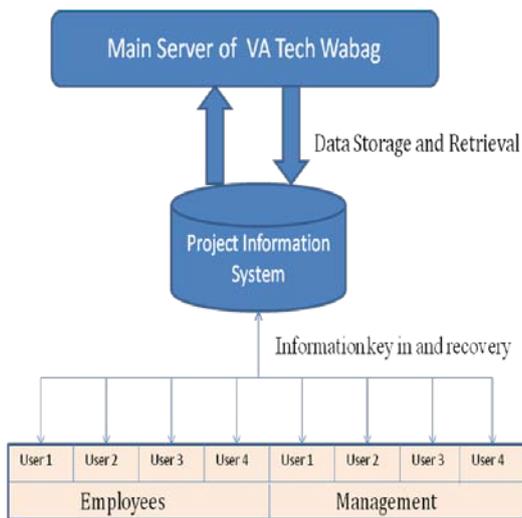


Fig. 2 Overview of Developed System

4.2.1 Design of Project Information System

The PIS has its storage of information in form of tables. All these tables are stored in a single database. PIS has been designed using Structured System Analysis and Design methodology along with VB.NET as front end programming language and Microsoft Access 2007 as the back end database.

4.2.1.1 Data Flow Diagram of PIS

Figure 3 shows the dataflow diagram of PIS which consists of two main entities that input data to the database and many entities that use the database for operation. The information stored is mainly used for the tendering process. For preparing a tender, the co-ordination of all departments is very necessary since it requires various details about the project.

The main departments that have the major work are marketing, sales and proposal engineering team. The management has a part to play in getting the business opportunities for the company and also to track the progress of the work through reports.

The information stored in the database can be retrieved according to project type. This feature is added in the project for the benefit of the marketing team to

view details of the project with respect to the time period of a project.

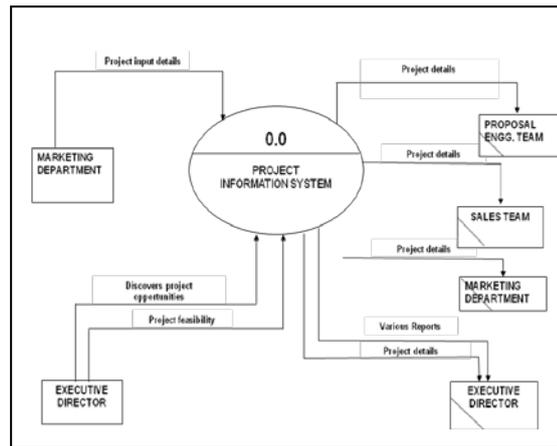


Fig. 3 DFD of PIS

4.2.1.2 Data Flow Diagram of Project Details

Figure 4 represents the project details that are entered by the marketing and management team. The details maintained are the histories and present information about the projects. The main entities are shown in the figure which can be updated at any time. The marketing and management department can view, edit and update the project details.

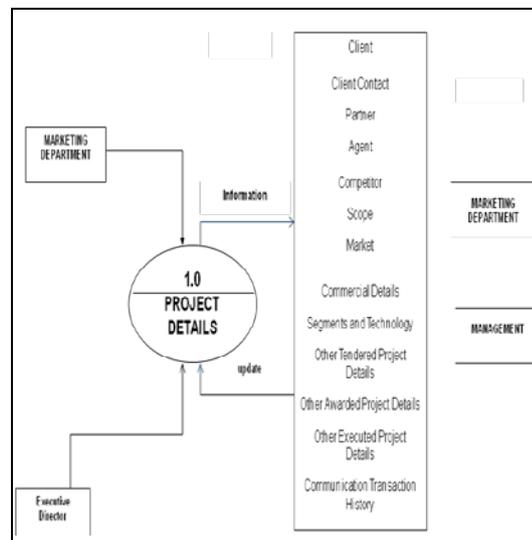


Fig. 4 DFD of Project Details

4.2.1.3 Data Flow Diagram of Project Type

Figure 5 represents the data flow diagram of project types. The projects are classified into five major types. They are Universe, Target, Tendered, Awarded and Executed. These are given in order to segregate the project according to the time. Universe represents the projects which are anticipated after some years. Target denotes the projects that are being targeted by the company for the tendering process. Tendered type represents those projects that are submitted. The Awarded projects are those which are won by the company for the project execution and finally, the executed projects are the ones that have been completed by the company.

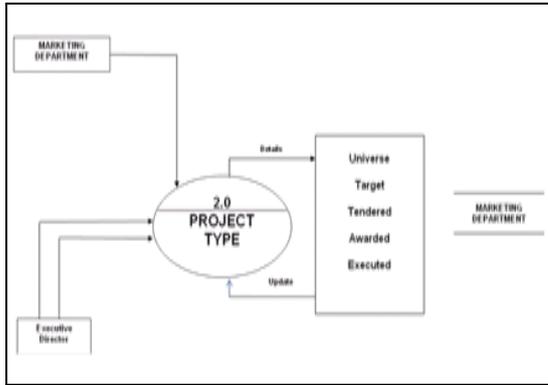


Fig. 5 DFD of Project Type

The details can be added and edited based on the project type. If the project has some details when the project is universe and when the project type changes to target, the details can be added further more. The advantage is that the details that were present during the universe stage can be viewed separately and when it changes to target the details also changes accordingly. This is because the project has different details for each stage of the life time.

4.2.1.4 Data Flow Diagram of Project Status

Figure 6 represents data flow diagram of project status. The project has different status during its tenure. It is based on the project type. When the project is in universe stage then the possible occurrence of the project status are Pre-enquiry, Deferred and Cancelled stage. When the project is in Target type then the same status of universe type will exist. When the project type is tendered then the project status can be bid, No bid, won or lost. The awarded type can have only the won status and lastly, the executed type can have won, deferred or cancelled. The project details wholly depend on the project type and project status.

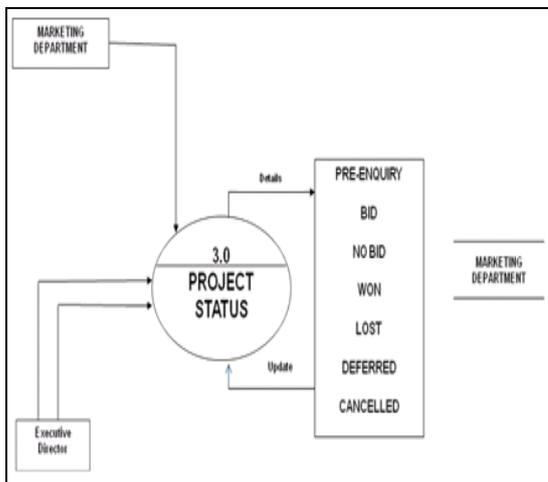


Fig. 6 DFD of Project Status

4.2.2 Entity Relationship Diagram of PIS

The above entity relationship diagram in Figure 7 shows the design and operating profile of the entities in the project information system. It starts with the marketing employee where the information about a project is entered in the other entities. The projects entity has the one to many relationships with the project

details, project types and project status. The project details have relationship with other entities like Client, Stakeholder, Partner, Agent, and Competitors etc. The project types have entities like universe, target, tendered, awarded and executed. These entities are filled up by the marketing employee for each project and it changes as the project progresses. The status of the project has seven entities and they are pre-enquiry, bid, no bid, won, lost, deferred and cancelled. The status of the project also differs according to the project types.

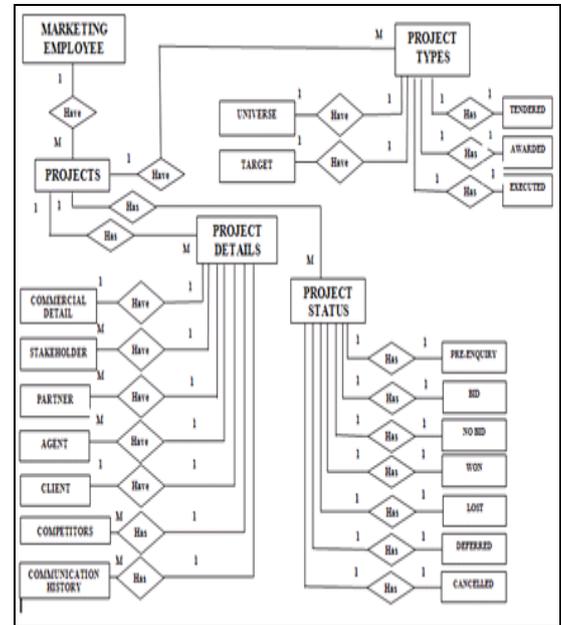


Fig. 7 ERD of PIS

5. DESIGN AND IMPLEMENTATION

Project Information System is a web based application software, where multiple users can access the application software. Login facilities for the multiple users are based on the user level category for which they can have access to various functions of the application. Valid user name and password are given to members to allow the computer for operational usage for entry, edit, view, delete, report generation and other operations in the Project Information System.

The employees are given a Login and Password. The employees with a valid login and password are allowed to access the system for entry of the project details. This helps in a security of the data and will prevent from stranger by restricted entry. The project information system contains information that is very valuable and it is high risk for it to be maintained. The project was completely carried out with the concern of maintaining the information very confidentially.

5.1 Login Form

The user with a valid User Login ID and Password is given access to user form as shown in Figure 8. The user can enter their individually registered user name and password to enter into the application. This application is to restrict unauthorised entry into the application. Once the user is logged into the application they are eligible to do operations like add, edit, view

and delete information. Other advantage is that multiple users can access and modify the database at a time.



Fig. 8 Login Form with User Name and Password

5.1.1 Home Page of PIS

Figure 9 shows the home page of PIS. The home page form has two main options namely Masters and Settings. In Masters Menu, the master forms of the application and the main project master forms are present. The data entry for the forms that have many relationships has to be done here in the master form. The Project option in the master menu takes the user to the main project list page. The settings menu has the options like Users, Database and the option to exit the application. The Users option has the function of setting the level for accessing the database. Through the Database option the user can check the back end database of the project for viewing and editing.

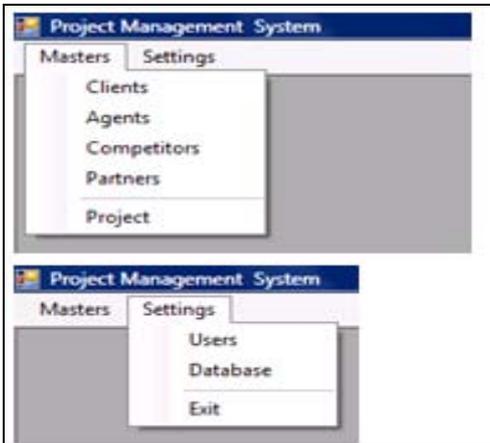


Fig. 9 Home Page of PIS

5.1.2 Project Details Form

The main project details form in Figure 10 shows the overall details of a project at one place. The details of the project differ according to the project type selection. The Project details form consists of details like Client, Client contact, Competitor, Segment and technology and Market etc. For the master form namely Clients, Competitors, Agents and Partners, the details are added and edited in the master form only. The details of the other entities can be directly entered in this main project detail form. For the master entities the user can only view the detail in the main form.

The form contains fields of all types like attachments, multi selection and text fields. Other entities of the project are given in tabbed control in the form. The details of all forms in the tab cannot be

entered in the form. Some of the form's details can be entered only in the master's form.

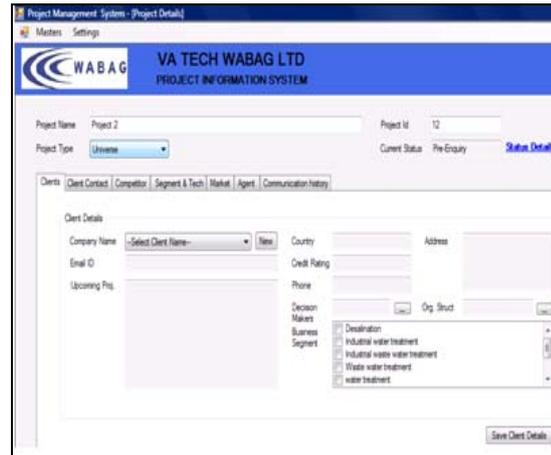


Fig. 10 Project Details Form

5.1.3 Master Client Form

Figure 11 shows the master client form. The details of a client in the project are entered through this form. The clients are listed in the grid above and the user can enter the details in the fields below and save it. Once the details are saved, the client details get updated in the grid above.

There are attachment fields in the client form. For example, the organisation structure and decision makers are attachment fields. It has the capability to store a word or excel file in the database. The details can be entered in a word or excel file and then can be attached to this fields.

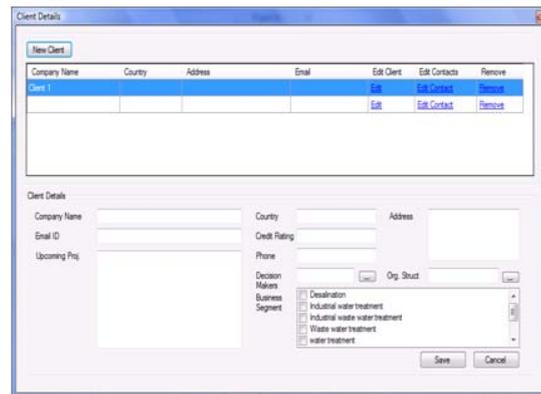


Fig. 11 Master Client Form

5.1.4 Master Competitor Form

The competitor form in Figure 12 has the details about a competitor. The user can enter data, view, edit and can save it in the form above. All the data are entered here and can be chosen from this list of competitors to assign the competitors of a project.

5.1.5 Master Agent Form

The Figure 13 shows the Master Agent form where the details of agents are entered. The form contains the details of the agent like name, country, capability etc. The user can add, view, edit, and delete data.

Fig. 12 Master Client Form

Fig. 13 Master Agent Form

5.1.6 Master Partner Form

Figure 14 contains the details of the partner of the project. The partner form has multi option categories. The options like joint venture, main contractor, sub contractor, system supplier and consultant. The histories are stored as per the selected type in the database.

Fig. 14 Master Partner Form

5.1.7 Segment and Technology Form

Figure 15 contains the list of segment and technologies from which the user can select one or more options. These forms are under the tab control in the project details form. The user can enter data directly in these forms and save it under the project detail form.

Fig. 15 Segment and Technology Form

5.1.8 Commercial Details Form

The commercial details form in Figure 16 has all the financial information of the project. It contains the commercial details where the users can input data into it directly. The form is inside a tab control of the main form.

Fig. 16 Commercial Details Form

5.1.9 Communication History Form

Figure 17 shows the entry form of communication transaction of project information system. Here all the details of the communication transaction occurred between the company and others are captured. The details of the communication history can also be directly entered in the form and saved.

Fig. 17 Communication History Form

5.2 Information Management through PIS

In the existing system, the company's data storage was not uniform which lead to lot of problem in the operation of the marketing department. Tracking the information was time consuming. The problem for employees to get track of a project was also very difficult. All these problems have been resolved with the use of PIS. The information is available at one place as a single database and so the employees are much more benefited by the application. The project has been a real success in the company because the actual users (employees) are more satisfied with this project. The work carried out here is mainly for the marketing department of the company which in turn covers only a part of the company's activities.

5.2.1 Sample of Project list

Figure 18 shows the list of all the projects in the International Business Group of the company. The details are stored in the project list form of the application.

Project ID	Project Name	Project Type	Project Status	Edit	Remove
101	Rp Thermal power plant	Tendered	Won	Edit	Remove
102	Manila Water Treatment Plant	Universe	Pre Enquiry	Edit	Remove
103	1,70,000MTPA S-PVC Plant, China	Universe	Pre Enquiry	Edit	Remove
104	Warshire Waster water Treatment Plant	Executed	Won	Edit	Remove
105	Philippines Desalination Plant	Awarded	Won	Edit	Remove
106	Hong Kong Water Treatment Plant	Executed	Won	Edit	Remove
107	JETS Sewage Treatment Plant	Target	Deferred	Edit	Remove
108	Jakarta Desalination Plant	Tendered	Lost	Edit	Remove

Fig. 18 Project List with Sample Data

5.2.2 Sample of Client Data

Figure 19 shows the client data. Some of the fields of the client data are showed in the above figure while others can be viewed through the edit client option.

Company Name	Country	Address	Email	Edit Client	Edit Contacts	Remove
BGL	India	Munaga Road, Chennai	info@bgl.com	Edit	Edit Contacts	Remove
Hyunda Engineering	Japan	Bel's Street, Tokyo	contact@hyundae.com	Edit	Edit Contacts	Remove
Manila Water Board	Philippines	144, Orchan St, Manila	info@mb.com	Edit	Edit Contacts	Remove
Pentec	Saudi Arabia	Ar-Rasmaniyah, Jeddah	main@pentec.com	Edit	Edit Contacts	Remove
Jacobs Engineering	Austria	Harland St, Vienna	contact@jacobs.com	Edit	Edit Contacts	Remove

Fig. 19 Client List with Sample Data

5.2.3 Sample of Client Contact

Figure 20 shows the contact of the client company. The client's contacts are divided into contact person, Influencer and Key decision maker. The contacts can be selected from a list of contacts and then stored in this main project details.

Contact Person	Designation	Email	Office Phone	Mobile Phone
Dr. Manage Marketing	Chief Manager	www@bgl.com	944-2251946	9997039443
Chief Manager	Senior Engineer	www@bgl.com	944-2251944	9942209402
Senior Engineer		www@bgl.com	944-2251932	7728828283

Fig. 20 List of Client Contact with Sample Data

5.3 Report Generation

Figure 21 shows the report of the list of projects that are carried out in the company. The project information system is very user-friendly in generating reports. The reports are for the use of the management team to make periodic decision in order to carry out the operation without any interruption. The reports have been designed using crystal reports. The system has easy access to the reports and it is available for the users to access based on their security level.

ProjectID	ProjectName	CurrentType	CurrentStatus
1001	Rp Thermal power plant	Awarded	Pre-Enquiry
1002	Manila Water Treatment Plant	Universe	Deferred
1003	1,70,000MTPA S-PVC Plant, China	Universe	Lost
1004	Warshire Waster water Treatment PI	Target	Lost
1005	Philippines Desalination Plant	Tendered	Won
1006	Hong Kong Water Treatment Plant	Target	Pre-Enquiry
1007	JETS Sewage Treatment Plant	Tendered	Lost
1008	Indonesia Water Treatment Plant	Target	Deferred
1009	Kathar Desalination Plant	Universe	Won
1010	10000mid Waste water treatment pl	Target	Bid
1011	Oman Thermal Power Plant	Universe	Lost
1012	Al- Razia Water Treatment Plant, D.	Executed	Lost
1013	Jakarta Desalination Plant	Universe	Cancelled

Fig. 21 Sample Report of Projects Carried Out

6. RESULT AND DISCUSSIONS

6.1 Time Study of PIS

The time study is made for three entities namely marketing data entry, project data entry and reports generation. The comparative study of present and developed PIS was carried out as shown in Figure 22. It was observed that the marketing data entry takes 20 minutes in the developed system which is 40 minutes lesser than the existing system. The project data entry is very laborious for the employee to enter since the data are not available at a single place. The project data entry takes 30 minutes in the developed system which is 20 minutes lesser than the existing system. Finally the report generation takes 15 minutes in the developed system which is 45 minutes lesser than the existing system. The report generation gives a lot of credit to the project information system since it has reduced the time of the top management to make decisions and the marketing team to efficiently analyse the data for their operation in the project. The PIS has been partially

implemented against the existing system leading to 62% reduction of time compared to the existing system.

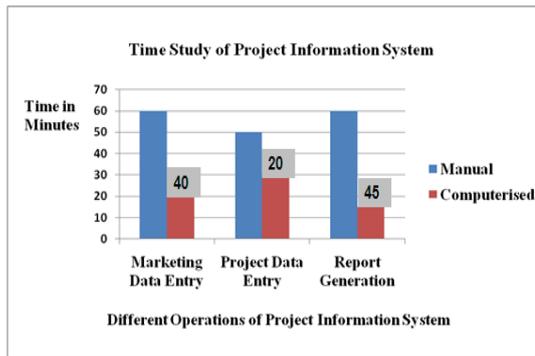


Fig. 22 Time Study of PIS

6.2 Summary

The PIS has been developed to enhance the operations of the marketing and management department in the company. The critical information is captured in a single database and hence the operations are effective for the employees.

The PIS has improved the efficiency of the working of employees in the company and the working time has eventually reduced to a larger extent. The marketing team has got a larger view of their clients, competitors, partners, agents etc. The project information system has evolved as one of the most valuable operating system in the company.

The work carried out here is mainly for the marketing department of the company which in turn covers only a part of the company's activities. The management has involved in the action of implementing the application to the whole company so that the entire departments in the company can be benefited with the help of project information system. The application has been developed to work on the improvement in the efficiency of the operation and the workability.

6.3 Recommendations for Future Work

The project information system has to evolve still to find its complete structure which can be the apt application of the marketing department. The project can be carried out for the other departments like procurement, finance, design and planning.

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