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Management Information And Communication Technology In Construction Engineering Of Structures Using Primavera

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Abstract

Although communication is an essential value in construction projects, the construction industry is confronted with the importance and use of information and communication technology (ICT). As most firms in developed countries have increased and will increase further their investment in ICT, this has raised productivity within their construction industry and resulted in an increase in the quality and speed of work, financial controls, communications, and access to common data. In our project discusses the scope of research on the application of information technology in construction (ITC). A model of the information and material activities which together constitute the construction process is presented, using the IDEF0 activity modelling methodology. The main use of IT in construction is office software, computer aided design (CAD), tools software and communication networks. Tools software includes cost evaluation software, quota management software, quantity calculation software, steel quantity calculation software. Internet based communication is the area that grows fastest. Application of IT in the construction industry remains weak because managers are not aware whether high levels of capital investment directed to computer systems and communication networks can guarantee significant gains in productivity and economic returns. The software tools tend to be general purpose tools like spreadsheet and text processing software or specialized, discipline-specific tools, in our project we use primavera for cost estimating and scheduling.

Keywords: Management Information And Communication Technology, Construction Engineering, Structures, Primavera

1.INTRODUCTION

The development of construction projects includes several stages during which a large number of human resources of different specialties interact and cooperate. An important element in this interaction is the information management and communication process which constitutes a determinant factor for the efficiency of human resource cooperation. Enhancing communication among project participants, however, proves to be a challenging task due to the extended fragmentation of the construction industry and the huge amount and wide dissimilarity of the information involved in the construction process.

The wide variation of specialties, expertise, educational background, professional skills, computer acquaintance, and working environment among the project participants impedes the information management and communication of the project team. The distance between the construction company headquarters and the (often remote) construction sites renders the communication even harder. The information types and volumes associated with construction projects are such as to make information management a difficult task while the uniqueness of such projects makes the effort for information standardisation arduous. Effective information communication requires the existence of structured and reliable information. As construction projects become larger and more complex, an efficient way to provide such information is through the use of information management systems.

1.1 The Forms Of Information Technology For The Construction Industry

1.1.1 Cloud Computing

Cloud computing has a strong appeal in the construction industry, with many benefits due to the constant change of workers and setup of new job site locations. Often, construction workers require access to company data to provide timely decision-making and reporting ability while working in the field.Construction companies benefit from the cloud's ability to offer increased freedom and easy access to information at any time, from any location, such as job sites, customer locations, and satellite offices.

1.1.2 Project Management Software

Project management software allows contractors to manage complicated business processes with planning, organizing, and managing the various resource pools available. Construction companies are required to deliver projects on time and according to budget.With project management software, the construction industry has the ability to execute projects more efficiently, while delivering high

quality results and increasing their overall business profitability.

1.1.3Mobile Device Management

In the construction industry, employees use mobile devices as their main line of communication during a project. Whether it's emails, texts, or phone calls, the smart phone has become the construction industries primary tool of communication. With the ever-growing amount of mobile devices and applications, mobile device management is increasingly important. With mobile device management software, the construction industry can optimize the functionality of mobile devices, while protecting the configuration settings and data for mobile devices in a network; thus lowering the overall business security risks and support costs.

1.2 ICT

ICT in construction can be broken down into different segments for its better understanding and its role in construction. The word Information, communication and technology can be understood from different perspectives as well as towards an ICT view, as a whole new meaning of its own. ICT may be adopted by specific groups of users within an organisation. For example, use of computer aided drafting (CAD) by architects or estimating software used by engineers or project managers. Different literatures have described and broken down information and communication technology in relation to construction and a study of these different approaches.

1.2.1 ICT Applicatons And Platforms

Computers: hardware and software technology in the construction industry have gone a very long way and is fast developing every minute of the day. Computer systems for building and architectural purposes are so much faster now than they were when they first came in the 1970s (Howard (1998). Specially configured systems can even be purchased specifically for different purposes ranging from speed to its ability to higher graphics.

1.3 Information And Communication Technology In Construction Industry

Combination of site positioning, design requirements, materials selection, budget constraints and the availability of specialized skills makes each building project absolutely unique. Also, the construction industry is well-known for its highly fragmented and competitive environment. Nowadays the majority of building projects are hardly treated without traditional communication means, such as face-to-face meetings and the exchange of paper documents. Despite it there is a huge potential for increasing of volume, speed, quality and efficiency of information transfer.

The Architecture/Engineering/Construction (AEC) industry shows huge interest in accepting of new technologies in the sphere of nD visualization, data analysis, information sharing, communications and collaboration. Following this way it is possible to improve communication, increase client satisfaction, reduce coordination errors in construction, provide a greater understanding between project participants, create fewer ambiguities and discrepancies in documentation and generally increase awareness and recognition of issues and requirements by all project participants.

The main destination of Information and Communication Technology (ICT) is providing construction stakeholders with information and analytical tools for the best control of the construction delivery processes. ICT include computer hardware, software, and communications devices which give access and allow communicating easily at local and international level. An nD model has been defined as "an extension of the building information model, which incorporates multi-aspects of design information required at each stage of the lifecycle of a building facility".

2. EXAMPLES OF MULTI-DISCIPLINARY DESIGN AND COORDINATION

To illustrate the issues outlined above and to set up the role and scope of IT in construction we will consider two examples of multi-disciplinary design and coordination from recent projects.

2.1 Renovation Of A Large Office Building

A large public owner recently needed to plan the renovation of one of its largest office buildings. Several functional units of the owner (e.g., real estate, operations, human resources, project management, and facility management) as well as an external design team consisting of several consultants (e.g., architect, various engineers, construction manager) considered several options for this renovation. In one approach, all the tenants in the building moved out temporarily while the building was going to be renovated. This approach gave the design team maximum flexibility and opportunity to redesign the layout, structural and mechanical systems, etc.

The building and organize its construction. In another approach, only half the tenants moved out in the first phase to make room for the renovation of half the building. After the completion of the Renovation of the first half the tenants in the second half would move into the new part to make room for the renovation of the second phase, which, upon completion, would then be occupied by the tenants who had moved out originally. This approach provided significant savings in the cost of leasing temporary facilities and minimized the impact of the renovation and move on some building occupants.

However, it required the careful coordination of the spaces and various building systems into two self-contained parts and the careful planning and coordination of the renovation work with the remaining tenants.

2.2 Large Retail Development

On a retail development that suffered a two-month delay due to unforeseen site conditions, the develop of the project asked the general contractor (GC) to develop a

recovery schedule so that the project could still finish at the originally scheduled time. Together with its subcontractors the GC considered various acceleration options and analyzed their resource and other organizational needs along with their schedule and cost impact.

Together with the developer and some of the subcontractors the GC also evaluated several options to redesign parts of the project to enable partial opening or faster construction.

2.3 Opportunity For It Support Illustrated In The Examples

These examples illustrate that many situations and decisions in construction require the involvement of several parties and trade off between scope, schedule, and organizational issues under consideration of cost, safety and other criteria. In the case of these projects the involved parties considered many of the tradeoffs in their heads, using some computer-generated descriptions of some of the aspects of an option, such as 2D and 3D drawings, cost estimates, schedules, or 4D models. However, virtually all decisions were made without formal predictions for the expected performance of a particular option with respect to decision criteria and business objectives. These brief examples also highlight the challenges every company faces with respect to its physical capital assets. To provide the physical infrastructure for its own business, every company needs to:

- Understand the performance of physical assets and related organizations and processes in light of business objectives, over time.
- Predict engineering and business behaviours
- Evaluate predicted behaviours with respect to clearly articulated business objectives
- Manage the construction projects and the business to maximize measurable business objectives, e.g.,

1. Safety
2. Schedule
3. Cost
4. Delivered Scope
5. Sustainability

We suggest, therefore, that the principal role and scope of IT in construction should be the support of predictions of the anticipated performance of the design of a project's scope, schedule, and organization with respect to the business objectives of the projects' main stakeholders.

3.ABOUT ICT

These days, information and communication technology (ICT) is responsible for the entire construction process from information being generated, transmitted and interpreted to enabling the project to be built, maintained, reused and eventually recycled. The everyday life of individuals is increasingly relevant of information technology and communication. This has totally transformed individuals and organizations to its wide spread use. According to Sun and Howard (2004)) "The impact of IT on modern society is profound", and its growing speed has enabled globalization especially trough the introduction of a global system of interconnected computer networks known as the 'INTERNET', used for communication between individuals, companies and institutions for sharing and exchanging information and data. The construction industry is faced with the ongoing challenge of changing and improving current work practices in order to become more client-orientated; more competitive as well as productive trough adoption of ICT as an integral part of the construction process. Much effort has been directed toward improving construction productivity and the use of information and communication technology (ICT) in construction and this is an area worth concentrating upon because it can decrease the time for data processing, communicating information and increase overall productivity. Modern structural design software applications, such as 3D modelling and Building Information Modelling (BIM), provide an example where designing complex structures and organising the electrical mechanical, site, structural and quantifying of a project can be achieved in minimum time and increase the efficiency all in one data framework.(Figure.1)

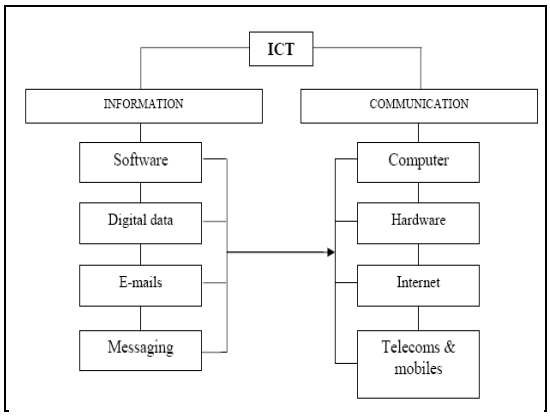

Figure 1 A simple diagram showing the flow of information trough a medium of communication

3.1 Information Analysis In Construction

Information systems that involve database development require a thorough analysis of the information that is generated and exchanged throughout the construction process, Project information and information flows in construction, mapping various types of information against the documents that typically provide the information and the construction management functions that provide and access the information.

3.2 Electronic Document Management Systems

The term EDM has a vague meaning and, as a result, no exact definition can be found in the literature.

- A document management approach tries to manage existing and ready to use documents. A typical approach of this kind is the one that defines and stores documents, indexes them by single or multiple content, and supports retrieval by index. Documents

are not necessarily in electronic format; they can also be shelved hard copies.

Table. 2: ICT Supported Technologies In Construction

NEEDS	ITEM	ICT SUPPORTED TECHNOLOGY
Information processing and management	Project	Document management, product and process models
	Company	Data warehouses
	Country	National construction information systems
	world	Global ICT networks
Interaction facilities	Man with man	E-mail, video conferences
	Man with application	Visualization, Virtual reality, graphical user-interfaces
	Man with machine	Indirect contact using computers
	Application with machine	Robotics, Remote sensors
Time saving	Just- in- time	Database look-up, internet search
	Just-in-case	Subscriptions to customized content, distance learning

- A model-based approach aims to generate or retrieve documents through data models. A usual case of this approach is the automatic production of documents through a query. This occurs by selecting the desirable pieces of information to be contained in a document.

An information management approach attempts to organize and handle all information circulated in the construction process in an integrated and effective way. Electronic document management systems (EDMs) have been developed to track and store electronic documents, providing storage, versioning, metadata, security, as well as indexing and retrieval capabilities. Table. 2 shows ICT Supported Technologies In Construction

3.3 Technology In Construction Engineering

3.3.1 Computer Aided Drafting (CAD)

The major output of any architectural and engineering team is drawings and these drawings are now mostly generated on computers. Like any other CAD software, construction oriented CAD are based on the same principles but may differ to some extent in their designing and application methods. CAD systems provide drawing entities with powerful construction, editing and database techniques to produce drawings and models of what buildings will look like when finished (Dace (2007). They are based on the foundation of drawing primitives (2D/3D lines, arcs, curves, 3D surfaces, text etc.). Its data can also be read and stored in by other applications software and hardware for analysing the output information. For example, a CAD system could be used to generate 2Ddrawing, and can be linked to another or same software as the case may be and generate the 3D model. It can be stored for future references, printed, projected, edited modified, etc any number of times. A common requirement in architectural and engineering design is to produce a drawing which is a schematic layout of components, and which accurately reflects the relative sizes and relationships of these components.

The speed and ease with which a drawing can be prepared and modified using a computer have a tremendous advantage over hand-based drawing and techniques. For example in an architectural CAD, walls, beams, Columns, slabs etc are common tools in the application and these can simply be added on by simply clicking and dropping or drawing along a surface. The drawing can also be shared by a number of designers over a computer network who could all be specialists in particular design areas such as, landscape, structural and mechanical designers and these people can be located at different geographical points. Drawings can also be linked into databases that could hold material specifications; material costs etc., this helps in providing an ample examination from design through to construction phases. There is virtually no limit to the kind of drawings and models that can be prepared using a CAD system if it can be done manually using the hand (Howard (1998). Most CAD models can be enhanced for further understanding and presentation by the use of advanced rendering animation techniques (by adding material specifications, light sources and camera motion paths to the model) to produce realistic images and interactive motion such as flythrough and walkthroughs.

3.3.2 Spread Sheets And Word Processors

Spreadsheet, word programs and microcomputers have transformed information processing in construction organizations. They are used to solve problems and get round the long delays encountered in dealing with the traditional manual way of getting office works done (Sun and Howard (2004). Spreadsheets like Microsoft excel, word and PowerPoint are very important office tools as they stand for the every day to day running of worksheets. They are frequently used for financial information and presentations as they can be used to create and edit charts, graphs and tables. They are a very important ICT tool in the construction industry as they are designed to perform general computation tasks using spatial relationships. Most documentation, letters, calculations and presentations are been done on spread sheets and they are usually compatible to the CAD software and firms may independently operate small-group ICT innovation such as planning and scheduling applications using spread sheets and word processors.

3.3.3Building Information Modeling (BIM)

In the construction industry computers are used to automate and stimulate hand drafting methods, and 3D models have assisted in showing what building will look like by the time they are built. BIM software have the ability to directly and interactively present concepts of design in a form which represent physical and real images of the building to allow designers to identify clients needs, and to promptly and effectively provide solutions to these needs and to promptly and effectively provide solutions to these needs. They

involve more people from design, management, construction and operations the lead to design improvement. They have the capacity to simulate time function by linking it to other personal computer-based construction planning packages such as spread sheets and CAD. They can build a project from the beginning to the end and be able to detect unclear flaws on the computer screen before actual field construction. It is a tool to assist in improving communication and collaboration for a successful overall productivity by designer and contractors states that BIM must exhibit these characteristics

Digital – enabling simulation of design and construction

Spatial – 3D, to better represent complex construction conditions than 2D drawings.

Measurable – data that is quantifiable, dimension-able, and query-able.

Comprehensive – encapsulating and communicating design intent, building performance, constructability, and sequential and financial aspects of means and methods.

Accessible – data made available to the entire project team through an interoperable and intuitive interface, including architects, engineers, contractors, fabricators, owners, facility maintenance, and users

Durable – data that reflects as-built conditions and remains usable through all phases of a facility's life, including design and planning, fabrication and construction, and operations and maintenance
BIM has enabled us to increase understanding, confidence, communication, quality, and safety, while decreasing cost, time, and rework in construction.

3.5 Integration Of Subcontractor And Supplier

Models: BIM is able to incorporate detailed data from subcontractors, suppliers, and vendors. For example doors and windows in a design can be incorporated subcontractors or suppliers specifications or a manufacturing company's pre fabricated specification.

Systems Coordination: BIM coordinates all building systems incorporated into it, all equipment, fixtures, pipes, ducts, conduicts, structural members, and other building components can be checked through using tools and commands to discover and resolve conflicts before systems are installed in the field.

Layout and Fieldwork: BIM data assist in layout of materials and systems in the field. This includes the creation of "lift drawings," 2D extractions in plan and section which describe the field work in detail, and integrated with pertinent quality and safety information.

Prefabrication: BIM can also be used to assist in the prefabrication of building systems, enabling faster field assembly of the building. This is a result of the integration of many of the other uses described in the above stated applications full contribution by subcontractors, full integration and coordination of geometry, and accurate registration and field installation.

Operations and Maintenance: BIM can be updated during the construction of the facility to create an "as-built" record of construction conditions. Once this is complete, the geometry in the BIM can be linked or associated with non

3.6 Building Information Modelling (BIM)

With regards to the impact of BIM, and in response to the CPSISC 2014-2015 Environment Scan, Business Review Weekly stated that: "Following a summit between the Australian Construction Industry Forum (ACIF) and the Australian Procurement and Construction Council (APCC) in 2013, the organisations have combined to develop a new online library of resources. The library places Building Information Modelling into a single repository and those associated with architecture or construction then have direct access to information on BIM.13

3.6.1 Current Training

- There is limited introductory BIM training available in Western Australia and, if available, training is at the professional high end of BIM, aimed at Architects, Engineers etc.

In response to the survey question, "Are you aware of BIM", 75% of respondents answered No, with 50% of these interested in a short practical introductory course if one was available in West Australia. This appears to indicate that there may be a need for this type of training for employers and employees unfamiliar with BIM. The introductory course would enable them to obtain a basic understanding of BIM and to decide if they would like to engage in further training. Eastern State Training Funds and Training Councils were contacted to ascertain their involvement in BIM. The Construction Industry Training Board (CITB) in South Australia was forthcoming with information on courses they have developed. A copy of "A Practical Introductory Guide to Building Information Modelling" student handbook was released to the Fund for viewing only. This one or two day course could be a suitable introductory course for WA based training providers to deliver, possibly using trainers who meet South Australia's delivery criteria. As resource materials are available for trainers, resource development work would not be required; there would however be a requirement to purchase the materials. If new technologies become widely accepted in the residential sector, then there could be a reduction in the on-site construction workforce and an increase in the manufacturing workforce. The same workers could be involved in this change but there would predictably be a reduction in the combined workforce. If, as expected, BIM becomes the industry standard then all contractors will need to develop a working awareness and understanding of BIM at lower levels.

4.ABOUT SOFTWARE

4.1 Primavera

Primavera Systems, Inc was a private company providing Project Portfolio Management (PPM) software to help project-intensive organizations identify, prioritize, and select project investments and plan, manage, and control projects and project portfolios of all sizes. On January 1, 2009 Oracle Corporation took legal ownership of Primavera. Primavera Systems, Inc. was founded on May 1, 1983 by Joel Koppelman and Dick Faris. It traded as a private company based in Pennsylvania (USA), developing software for the Project Portfolio Management market. To help expand its product capabilities, Primavera acquired Eagle Ray Software Systems in 1999, Evolve Technologies (a professional services automation vendor) in 2003, Pro Sight (an IT portfolio management software vendor) in 2006, and, in the same year, Pert master (a project risk management software vendor). In 2008, Oracle announced it was acquiring Primavera, turning it into the Primavera Global Business Unit (PGBU).

4.2 Inputs Required For Project Management Plan

4.2.1 Preliminary Project Scope Statement

The preliminary project scope statement documents the characteristics and boundaries of the project, and its associated products and services, as well as methods of acceptance and scope control.

4.2.2 Enterprise Factors

Government and Industry standards, Quality Standards, existing facilities, existing human resource, stakeholder risk tolerances, costing estimates, industry risk databases, existing information system etc.

4.2.3 Organisational Processes

Health and safety policies, Quality checklists, process audit and improvement targets, standardized work breakdown structure templates, risk templates, standard guidelines for performance measurement criteria, Communication guidelines, financial guidelines, record retention and information security system guidelines, vendor management policy, change control procedures and guidelines, document creation, approval, control and retention guidelines, project closure guidelines.

4.3the Basic Elements Of Project Management

Most projects can be divided up into five basic stages and processes. Terms that are commonly used for these are:

- Initiation ('kick-off' or start)
- Planning and development
- Production and implementation (sometimes known as execution)
- Monitoring and controlling
- Closing

All projects will use these basic elements but at a level appropriate to the size and complexity of the project.

4.3.1 Initiation

Initiation is the formal start of a project and will usually be triggered by the issue of a Project Mandate which briefly describes the purpose of the project, and gives authority to spend money on initiating the project. The initiation stage is where work is carried out to assess what needs to be done and how best to do it with whatever Resources Are Available.

4.4 Calendar

The work is carried out in 6 days per week. So the standard 6 day workweek calendar is made with necessary holidays in it. A break of one hour is given in the afternoon. Activity usage spreadsheet and resource usage spreadsheet these two spreadsheets reflect the usage of resources and progress of activities at any stage of the construction project. This is based on classic WBS layout.

4.5 Resource Assignments And Usage

The resource assignment window shows all the resource assignments, grouped by resource for the project. An approximate rate analysis was done to arrive at rates of individual resource groups, considering the various component resources. Most of the resources are taken as material. Machines are taken as non–labor and human involvement is listed as labor. The resource usage profile obtained using Primavera P6 shows that there has been a slight variation in the quantity of each resource used during the project life cycle.

4.5.1 Tracking Of The Standard Design Factory Project

Tracking a project is very important in mega projects. While updating the schedule time to time, it was reviewed and the revised allocation of resources and the budgeted cost is estimated. All the associated resources of a project are tracked and kept record.

4.5.2 Threshold Calculation

The parameter which is checked in the threshold is start day variance and finish day variance for the started activities. Threshold calculation of the factory project shows that 88 activities show start date variance and 88 activities show finish date variance. All these thresholds which fall outside are reported as issues. Hence 88 issues are identified for finish date variance and 88 issues are identified for start date variance.

4.6 Delay Analysis

The following reasons were observed during this thesis work, which can be held responsible for delays;

- Lack of knowledge about advanced tracking methods and software‘s.
- Insufficiently skilled staff.
- Lack of proper fund flow throughout the project progress
- A major portion of labor force was from West Bengal and Orissa. Regional festivals in these areas cause sudden delays in work progress.
- Even though delay due to monsoon rain was already accounted in the baseline schedule, unexpected

extension of monsoon caused further delay in project progress.

- Sand unavailability due to legal restrictions.
- Late delivery of resources.

4.7 Work Breakdown Structure

Primavera P6 recognizes the importance of the project management team keeping their "eye on the ball" throughout the project life cycle. This means that you maintain a focus on the end product or service, which is the whole purpose of the project. The WBS helps you maintain this focus on the product. At its heart the WBS is a deliverable-oriented decomposition of the project into smaller components. So the WBS focuses on the deliverables, and it is simply a breakdown of all the components making up the product in a hierarchical fashion. Primavera P6 has you create the WBS first, so that the activities on the project schedule flow from the WBS in a top down method, and not the other way around.This process is done to: Divide a project into meaningful and logical elements.

- Examine the project at various levels of detail.
- Allow summarizing project information at any level.
- Provide a road map for exception reporting and management.

A project schedule must have just the right amount of detail to show critical work but not so much that it inhibits the construction engineer or contractor in maintaining and updating the schedule.

5.ANALYSIS RESULTS

Analysis results given Figure,2,3,4,5,6,7,8 &9

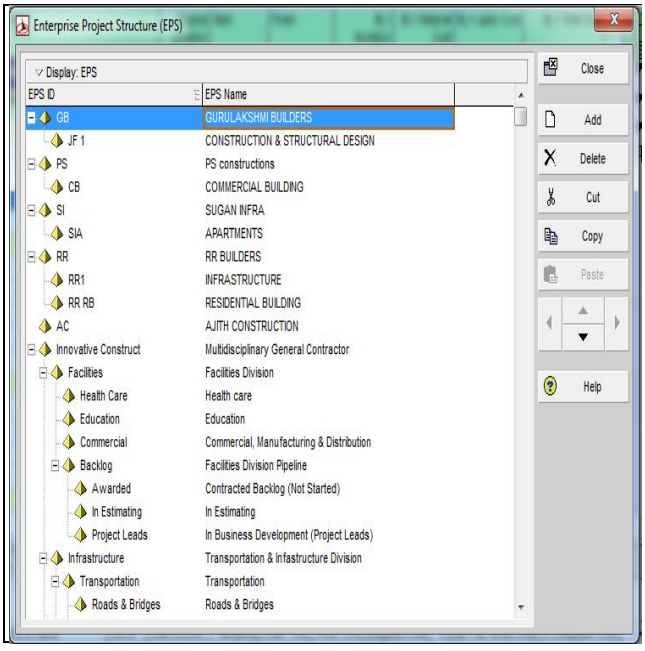

Figure. 2 Company Details Using Primavera

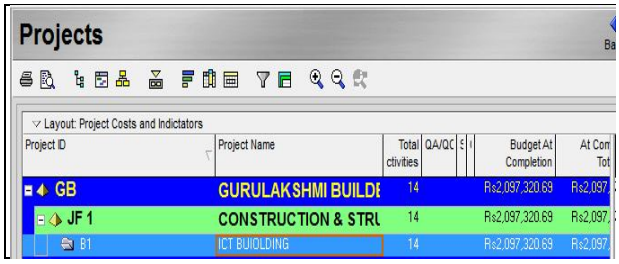

Figure 3 Project Detail Using Primavera

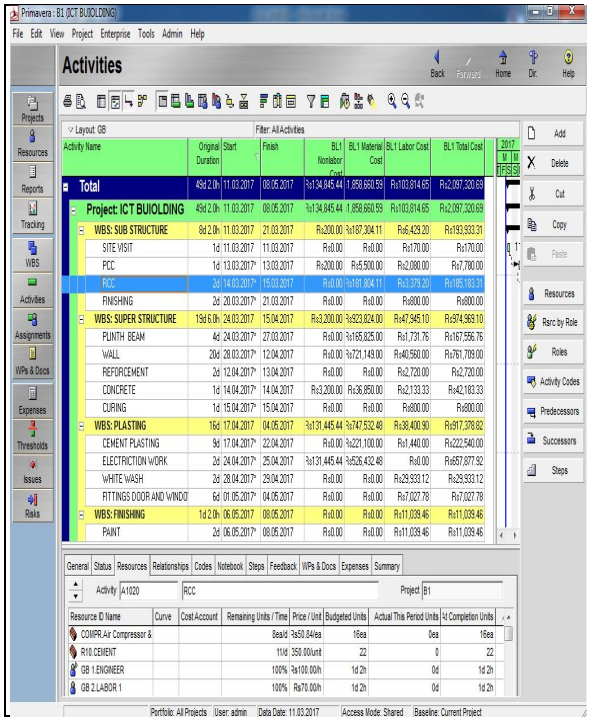

Figure 4 Activity Details Project Using Primavera

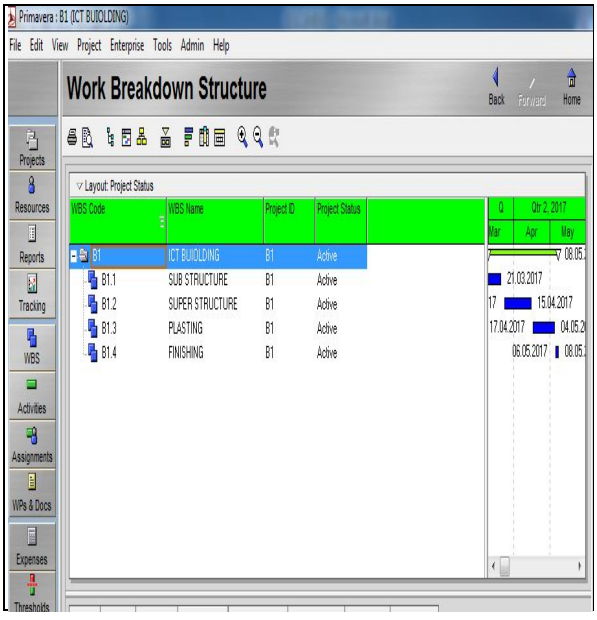

Figure 5 Wbs Details Project Using Primavera

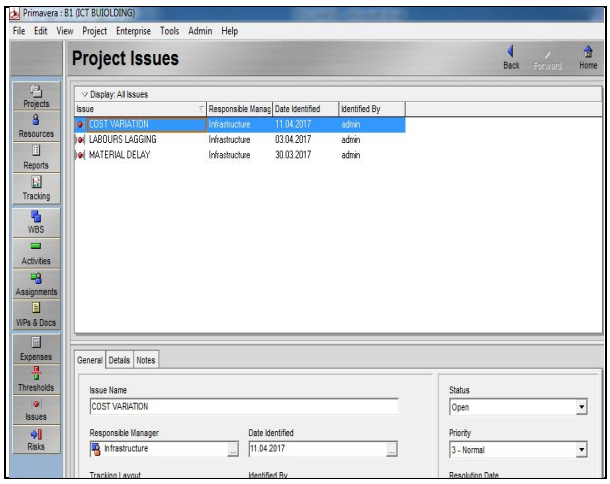

Figure 6 Project Issues Details Using Primavera

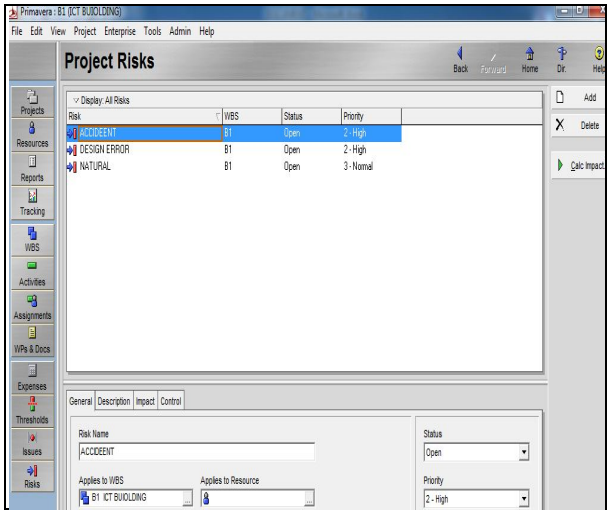

Figure7 Project Risks Details Using Primavera

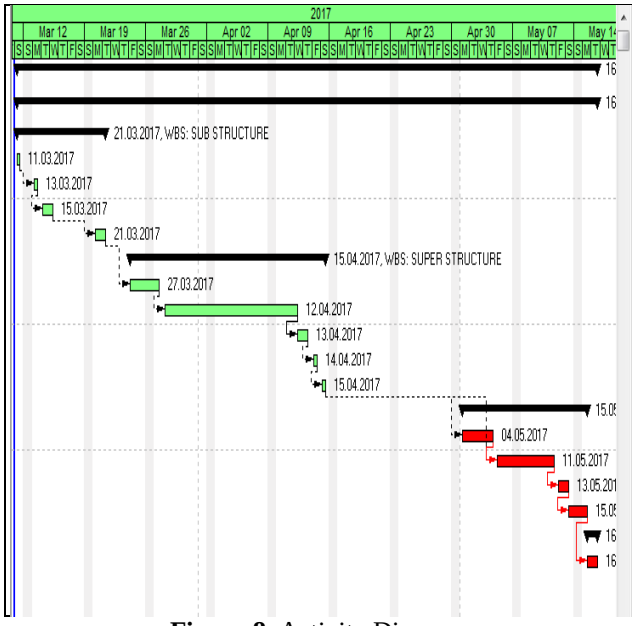

Figure.8. Activity Diagram

6.1 After Schedule (Consider Issues)

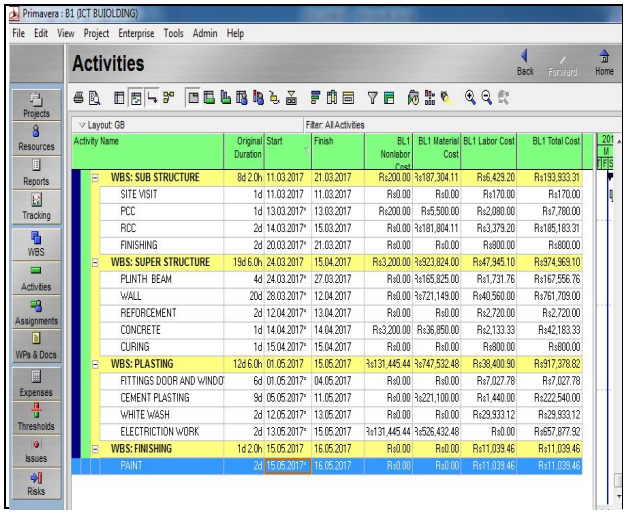

Figure.9. After schedule

5.CURRENT DEVELOPMENT AND FUTURE WORK

In late 2005, the authors have established a unique name for the current work to reflect the true nature of the underlying research and the outcomes associated with this project. ETCon (Emerging Technologies in Construction) was identified to become the future communication gateway that will generate feeds from the WWW through its intelligent web semantic technologies that have yet to be developed. The main issue associated with the semantic web in the field of emerging construction technologies is the absence of appropriate and related ontology. In this regard, developing ontology for construction technologies could be a real challenge in its own. In the Artificial Intelligence (IA) world, ontology is a set of concepts, such as objects, events, and relations that are identified by using specific natural language to create a common vocabulary for exchanging information. It is worth to mention that there were attempts at national and international levels to provide the construction industry with adequate information intensive web portals. However, the major drawback of these portals remains in the lack of their update and the speed of porting those updates once new technologies have emerged. This is mainly due to human interventions because portals need constant watch along with generous funding and resources.

Therefore, ETCon, through its specific ontology should address the issues encountered or untreated by previous attempts in order to: Eliminate or minimise the need for human Intervention to pull the information from the web as they emerge;

- Provide real time update and dissemination of information;
- Centralisation of web resources into one dynamic portal;

- Establish an international reference for the construction industry to rely on; and
- Guide the industry towards best practice references in terms of application of new technologies.

5.1 Engineered Wood Components

Engineered wood component comes in different ranges. Engineered wood products are stable, reliable, eco-friendly and high functional. Glued engineered wood products are treated as one of the supreme technologies in the construction industry which are less time-consuming and economical as compared to the walls in any new home.

The building contractors find Glued engineered wood products very flexible throughout home construction. Besides, they can be used for more long-lasting floors, walls and ceilings with comparison to the conventional methods. Engineered wood products apply less wood fibers to maintain the superior performance. Woods care collected more proficiently from faster-growing trees available in managed forests. Engineered wood components are better than non-wood alternatives relating to emissions and pollutants all through the manufacturing process.

Engineered wood products are used in a variety of ways, often in applications similar to solid wood products. Engineered wood products may be preferred over solid wood in some applications due to certain comparative advantages in construction industry are as follows:

- Engineered wood is felt to offer structural advantages for home construction.
- Because engineered wood is man-made, it can be designed to meet application-specific performance requirements
- Engineered wood products are versatile and available in a wide variety of thicknesses, sizes, grades, and exposure durability classifications, making the products ideal for use in unlimited construction, industrial and home project application.
- Engineered wood products are designed and manufactured to maximize the natural strength and stiffness characteristics of wood. The products are very stable and some offer greater structural strength than typical wood building materials.
- Engineered wood panels are easy to work with using ordinary tools and basic skills. They can be cut, drilled, routed, jointed, glued, and fastened. Plywood can be bent to form curved surfaces without loss of strength. And large panel size speeds construction by reducing the number of pieces to be handled and installed.

5.2 Panelized Home Building Systems

Panelized home building systems belong to pre-engineered wall sections developed in a factory-controlled environment and dispatched to the construction site to be assigned to the home. The panelized home building systems are weather-proof and ready for final construction in quickest possible time. The design is also very flexible for this type of building system. Several panelized manufacturers use a network of general contractors to form each individual panel. The some of the Advantage of using panelized home building systems are as follows :

5.2.1 Flexible Design

- Whether you are looking for a modern or traditional design, contemporary or rustic feel, a home can be designed to fit your needs and budget with endless options to customize your home.

Saves Time, Saves Money

- Your new home's panels can be designed and fabricated in our manufacturing facility a few days before being shipped to your home site.
- Once on site, the shell of a panelized home can be framed and made weather-tight in a matter of days, reducing labor expenses.

Quality Construction

- Each worker in a panelized facility has been trained to do a particular job and is an expert in that specialized aspect of home construction, resulting in higher quality and more consistency.
- State-of-the art machines produce panels that are built to the highest standard, ensuring your home is built precisely square and dimensionally correct.

5.3 Virtual Design & Construction (VDC)

Virtual Design & Construction (VDC) has been recognized as an effective tool to visualize, organize and plan construction activities. By enabling the development of a virtual prototype to increase certainty during the design and building process, this technology minimizes cost and labor while maximizing quality, value and sustainability. Using Building Information Modeling (BIM) as the virtual prototype to formulate the design, VDC is the process that actualizes the idea. Taken together, the objective of BIM and VDC is to improve communication through the visual medium;and for project takeholders, resultant benefits include, earlier and better informed decision-making which leads to time-savings, decreased costs, improved quality of products or services and increased site safety.More explicitly, the following benefits have been achieved using this technology:

- 50% time-savings in the design document phase
- 80% reduction in time to complete cost-estimate
- 60% fewer Requests-for-Information (RFIs)
- 7% schedule savings
- 600 total days direct schedule reductions
- Productivity increases of 25% or more
- 2.95% average direct cost reductions.

In order to effectively implement VDC technology and fully enjoy the wealth of benefits afforded through this method, an in-depth understanding of how these tools can be applied to meet organizational needs is essential. This

can be best achieved through a commitment to specialized training and ongoing consultation.

5.4 Drones

Advanced Mapping and Scanning Capacities for More Accurate Visualizations Civil engineering is ripe with applications for unmanned aerial vehicles, which can aid in scanning and mapping work sites as well as capturing photos and videos for promotional purposes. UAVs often represent a cost-saving measure for businesses that need aerial mapping, as a drone doesn't require a pilot, but rather, a programmer. UAVs are also easy to program to fly multiple times around the same worksite, which means in the future, firms will be able to capture a variety of images and videos while the project is being completed – and that will enable firms to better manage project progress.UAVs will also revolutionize civil engineering through the use of photo scanning, an image capture process that uses photos (rather than lasers) to capture images. Photo scanning captures not just the ground surface, but also buildings, plants, benches, and other nearby structures – and represents them in three dimensions. With these advanced capabilities, drones will allow for more accurate and more interactive 3D representations of civil engineering projects.The primary disadvantage of drone use in civil engineering is the initial capital expense required to purchase drones and train pilots, however, the cost is expected to decline over time. There are also potential issues involving FAA regulations, citizens' right to privacy, and how liability insurance would address drone usage.

5.5 3D Printing: Marrying Design And Construction

3D printing is gaining a lot of ground not just among hobbyists, but also in business – and with 3D printers coming down in price each year, it's not long before we'll see them used in civil engineering. 3D printing offers benefits for both design and construction, essentially tying the two processes together. MX3D's 3D printer, though, isn't like those that we've traditionally seen. Rather than a desktop 3D printer, MX3D's technology consists of a set of large mechanical arms that hold a torch-like tool for welding. These robot arms build 3D objects in an open warehouse space rather than inside a box as most 3D printers do.

However, 3D printers do pose several challenges for civil engineering. First and foremost, 3D printers are limited in the kinds of materials they can print – for instance, 3D printers that can print circuit boards are still in development and may not be ready for commercial use for several years. 3D printers also pose a threat to manufacturing jobs, and training staff to use 3D printers may require a significant capital investment.

5.6 Holographic Computers

The next revolution in wearable tech is here, and it's going to forever change information management and communication processes in the civil engineering industry. Microsoft has been promoting its new HoloLens technology for over a year, escorting the world's most respected technology journalists to a secret underground bunker at the company's Redmond campus for tightly controlled product demonstrations. HoloLens is a mixed reality headset that layers 3D holograms over physical world images in order to convey helpful information to the wearer. Using the HoloLens, civil engineers can see digital input drawn over physical objects, share that input with collaborators via Skype, fine-tune designs in 3D, and explore designs in real time. A variety of businesses are currently using Microsoft HoloLens to alter the way production happens. Volvo, for instance, is using HoloLens technology to design and configure its vehicles in completely new ways. Meanwhile, NASA's Jet Propulsion Laboratory is planning to use the HoloLens to make holographic representations of the Mars landscape based on Mars Rover images. Currently, businesses in the architecture and construction industries are piloting the HoloLens and developing innovative new processes that leverage 3D holographic models to improve the design phase.However, the HoloLens does come with certain disadvantages. The headset could serve as a workplace distraction that hinders productivity. The prototype version also has a very limited field of view, allowing augmented reality vision of only certain objects.

5.7 Contactless Security Cards: Improving To Boost Security

Site security is always a priority, and with technology evolving, site managers need more and more security measures at their disposal. The next big thing in site security is contactless security cards. These cards can be programmed with individual profile information to uniquely identify each cardholder, and can give users access to secure offices, secure parking, and even computer networks. The great advantage that these smart cards offer is that security becomes much easier to manage. Employees can check themselves into and out of the worksite with just a swipe of a card, and managers have a turnkey security solution that doesn't require their constant presence. However, security cards do present certain disadvantages. Firstly, security cards can be lost or stolen, unlike a memorized four-digit security code. That means security cards that are reported as stolen or lost will need to be immediately deactivated, which increases the amount of administration required. Card-based site access systems are also vulnerable to hacking, just as most security systems are. Hackers can copy RFID information using an RFID scanner by simply standing near people with privileged access, and site workers won't even know their card has been copied.

6.CONCLUSION

Different government and private boards within have made regulations and code of conduct in consideration of the importance and need for efficiency and the effective use of ICT. The evolution of technology which has lead to the invention and development of telephones, computers, electronic and electrical equipments are all fundamental in the present day construction industry. The value is very

important as construction projects involve a large flow of construction documentary information linking project participants during both design and construction phases. scope of IT in construction is, of course, situated in the current industrial context with projects becoming increasingly complex technically, environmentally, socially, legally, and culturally, with increasing economic pressures on facility owners and therefore on their projects, and with shorter and shorter timelines. Primavera software results will be attached this document like, WBS, EPS, Risks and Issues also considered.

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