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New Generation Well Project Management Application Improves Cycle Time, Workflow Efficiency, Corporate Compliance, and Knowledge Sharing (and people like it!)

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Abstract

A web based system has been developed to improve workflow optimisation, collaboration and the communication of a business process. This new generation project management application greatly enhances the ability of an organisation to comply with external standards and implement consistent internal systems. It helps people of all levels of experience to share information across geographical and organisational boundaries, can reduce cycle or reactivation time and helps to implement controls such as stage gates. The user interface displays the workflow and current status of single or multiple projects with unparalleled clarity.

All companies have management systems or work processes, some more formal than others, to help maintain consistency and quality in their business delivery and to ensure compliance with corporate and regulatory requirements. There is a common need across industry sectors and disciplines to define a way of working and then ensuring that this “business process” is used. Management systems may be inefficient or may even fail for a number of reasons, including lack of detail or too much detail, poorly defined requirements or inadequate information technology.

The simple but highly innovative web based system described in this paper was completed and implemented six months after coding began. An existing process had been mapped to the new software so users were immediately familiar with the task descriptions and terms used. The application delivered on its basic promise; improved process visibility, consistency and compliance with defined standards.

This paper contains a summary of the system attributes that led to a successful launch in Talisman Norway (TENAS) and suggests that a high degree of commonality exists between processes in different organisations. This paper will be of interest at all levels of an organisation - Managerial, Technical and Administrative.

Introduction

Repeatability, visibility and quality control of their work processes are common goals of many corporations aiming to improve the efficiency, consistency and cycle time of their businesses. Unfortunately, many do not realise these goals, battling with outdated, cumbersome, unpopular, or even ignored systems; this is especially true of many project management systems and software.

The Gantt chart has long been the *de facto* tool for presentation of progress against plan and many task based corporate systems have used this as the backbone for their process software or systems. While the Gantt chart has unquestionably a place in any project management system, it has limitations on screen or in printed form; systems based on a Gantt chart can be time consuming in their administration and inflexible in their use.

This project was conceived to provide usable, flexible software to improve Talisman Energy Norway’s (TENAS) Well Delivery Process, to solve inconsistency problems and to provide a new look project progress output, featuring greater flexibility and visibility of progress against schedule and, importantly, the opportunity to input and display the quality of the work completed to date against corporate expectations.

The experience of the development team was primarily in well construction, though colleagues from other disciplines within the oil and gas industry recognised every systemic difficulty faced by the drilling department. Outside the oil and gas sector it was confirmed that, irrespective of the industry, there are numerous common problems to be addressed in project management, including the limitations of existing software systems or system implementation. This paper concentrates on the Well Delivery Process by way of example.

The project and ultimately the software produced were given the name “Eikos” from the ancient Greek word used to mean “likeness to truth” (Bernstein, 1998).

The resulting software is remarkably simple in its concept and use. When populated with a fit for purpose business process it has proved popular with engineers and management alike.

Business Process

A business process is a collection of interrelated tasks which are prescribed to achieve a minimum level of control over work. A good process will benefit the corporation, the people who use the process everyday and improve the integration of other less frequent users within a project team. In this paper the business process is the collection of interrelated tasks that are used to organise well construction projects -- the "Well Delivery Process".

High Level Commonality

All active operators have a Well Delivery Process in some form irrespective of the size of the organisation. The detail of the process may or may not be documented and in most cases the process will be a combination of documented standards, comparable project history and the know-how of staff. A characteristic common to virtually all business processes is that it is possible to divide the tasks into groups by chronological phase. There is even a broad consensus (Fig 1) that within project management, five phases are the best way to show these groups.

In addition to the common presentation of phases, there are task groups (i.e. such as risk, regulatory compliance, duration & cost, technical programme) within the process that we know will be common between operators and that will apply across any well project life cycle. A final universal need is to present the process to people in a way that it can be understood and used; in this paper the map of the process is referred to as the project “storyboard”. The differences between the processes of companies operating within the same industry sector will arise in the detail, not in the general requirements. One of the reasons for developing new software was to design an application that would provide a basic structure within which the detail of a particular process could be mapped. The software would give TENAS the ability optimise the process within the drilling and wells department, scale it for other business units and extend its use to other discipline processes if required.

Common Business Problems

A business process is put in place to maintain consistency, help avoid common operational problems and to meet applicable regulatory requirements.

Organisational problems can be categorised into two broad groups; common project management issues and issues associated with the perpetual need to match personnel to project requirements.

Common project management problems

- Inconsistent project planning and performance.
- Accelerating and / or shortcutting the planning process.
- Inability to quickly retrieve the most relevant comparable work.
- Change management.
- Legislative compliance.
- System (BSI, ISO etc.) implementation & auditability.

Resource-based problems

- Problems with getting new or transferred staff up to speed.
- Integrating multi-disciplinary teams.
- Variable qualities or abilities within work teams.
- Issues with project handover, at various planning stages.
- Staff shortages.
- Unclear roles and responsibilities within project teams.

A well structured business process, especially one that is easy to use, can help mitigate all these problems. Of particular interest in Norway due to legislation, but equally applicable everywhere for good management purposes, is a clear understanding of staff roles and responsibilities and the standard to which they are expected to work.

A conclusion of this paper is that the initiative of TENAS to commission and use the new software has mitigated all the problems described to some extent, some quite dramatically.

Quantified Benefits

Several authors have quantified the incremental value of a business process within other organisations. Sullivan (1998) quoted total project cost and scheduling improvements of 10 to 13% when a rigorous business process was used at Chevron. Sawaryn et al (2001) reported a web based project management application had contributed to a 19% drilling and completions performance improvement at BP. Clay and Hatch (1999) identified that 70% of deficiencies in well delivery lay in the lack of project definition and planning. In the period 2005-7 upstream capital costs have almost doubled (CERA, 2007) and the forecast is for high rates to be sustained in the near term. The application described in this paper was developed at a cost to the Operator of less than $200,000 which would be repaid many times over in a single year on the evidence of any one of the authors cited.

Existing Systems

Engineering Software

Much excellent software exists for the well engineering community. Applications are available from many vendors to address discrete technical issues. Within most drilling departments applications are supplemented with certain standard documents, many of them created internally. Managers prefer a degree of standardisation so that two projects share familiar documentation; it makes reading easier and ensures that separate teams are applying comparable rigour to their work.

Intranet Libraries

Many larger organisations with an intranet have used it as a repository for technical standards. This digital repository improved on the previous system of printed manuals. Bulky, printed manuals were difficult to maintain and to be effective organisations had to create an elaborate system of registration and control. The intranet provided a repository of practically unlimited size that was very easy to administer; documents could be added or revised whenever necessary, users knew that the current version of a document could be found from their own computer.

Gantt Charts

The Gantt chart is probably the most commonly used graphical display of business process information. This chart type is good for presenting information related to schedules; start & stop times, milestones and concurrent activities. The databases supporting these charts can be very detailed, providing resource and completion information for example. For all its merits however, the Gantt chart often does not present a compelling storyboard; with above 30 or so tasks the chart becomes unwieldy on a computer screen or in printed form. Standard applications may include include extraneous data fields while also lacking the ability to record essential information about the requirements for a task. Applications designed for standalone use can, in some cases, be configured to share across the web; however this is not always straightforward or satisfactory. These were additional factors to justify the development of new software; to improve the existing graphical methods of presenting the project process, to make sure that collaboration with colleagues was very easy and to provide access to supporting information for every task.

Legacy Systems

Talisman Energy Norway (TENAS) had a documented well construction process which like many other operators combined an intranet based library of standards with procedures and templates. Progress was reported using a combination of spreadsheets and Gantt charts. In common with other companies the TENAS intranet document library provided standard information to download and was not designed to create a comprehensive project-specific record or to link process and reporting.

Goals and Objectives

The proposed management “system” comprised software and a remapped business process. The overall goal of improving the system was subdivided into objectives (a) for the software and (b) for presenting the well delivery process. The overall goal was also to create a system with a high level of acceptance; one that people actually wanted to use.

A) Software objectives

Eight critical objectives were identified for the software that addressed the project management problems listed above;

- The application must be "zero-install" and must run in common web browsers.

- The status of any single project must be evident from a single screen.
- Users must be able to report the status of each task within each project.
- Users must be able to view multiple concurrent projects.
- Provide web logs to allow users to upload ad-hoc comments.
- Create a single, central repository for support documentation.
- Provide a project specific record of documentation.
- Provide a repository for documents created during work on the project.

The key objectives were used as the basis for a development contract. This contract provided a robust series of acceptance tests and a minimum level of guidance to the development team.

B) Process objectives

Within this system "Task" is used to describe a discrete component of a phase which itself represents a period of the project life cycle. In parallel with the software development work the existing process needed to be mapped to tasks within the 5-Phase model. The objectives for task design included;

- Tight definition – the task must have clearly defined boundaries, input and output.
- Order – each task must fit into a project phase, indicating when it should be done.
- Responsible party – every task must be the responsibility of someone to complete.
- Added value – the task must have obvious material benefit to the project.
- Embedded – tasks should be designed from existing documents and work methods wherever possible.
- Cross-functionality – the tasks needed to be identifiable by discipline.
- Quality standard – specified for the output of the task.

Certain myths are prevalent in the well construction industry (Fig. 2). Two among these were particularly relevant to the initiative. Firstly not everyone would necessarily accept that there is a common well construction process. Secondly, the target user group would not automatically be excited by the introduction of new information technology. The introduction of software alone was never going to be a panacea for all the identified problems; the key was to produce software that was visibly better than the systems it replaced and to present a process with this software that addressed the other legitimate concerns of the users.

Production

TENAS committed to the development of a web-based system to improve their business process after a business review within the TENAS Drilling and Wells department with input from a team of existing suppliers.

Development Team

The development team comprised (a) IDS with an extensive history of providing web-based software for operational reporting (b) Senergy, who provided well engineering, project management services and well delivery process expertise and (c) EPSL who brought the conceptual design and prior experience of software development. Prior to the go-ahead the development team presented a user specification and a spreadsheet based emulator demonstrating certain principles including the interface and details of the proposed mapping process. The development team committed to a six month delivery deadline, leaving very little room for error; a prototype demonstration was scheduled after three months to prove that the user interface was acceptable. A key element in both motivating the development team and minimising the project risk to TENAS was the decision to allow the Intellectual Property (IP) to remain with the developers. In return TENAS were guaranteed extended future use of the system on favourable commercial terms.

Production Management

A project manager (with a background primarily in well construction) representing future users developed the detailed User Requirements Specification (URS) and the main elements of the Graphical User Interface (GUI). A programming manager (with a software engineering background) led the code writing team.

Production Specification

The URS specifies externally visible functions or attributes of the system (IEEE, 1998) and these are described in natural language. The URS was presented as a table to avoid ambiguities, to show groups of related requirements and was significantly more detailed then the contractual specification. Critically, the detail included in the URS did not address any aspect of system architecture and as such was a true functional specification.

The two production managers formed the most important working interface during development; every item of the URS had to be written to capture the user needs in a way that the software engineers could interpret to code. This interface was

where the translation from URS to functioning programme happened. The definitive test of the URS was always user acceptance. Some of these system tests failed due to a deficiencies in specification language; the URS was revised and re-issued (without changing the functional requirement) when this happened. Under the development agreement any revisions were done at the cost of the developers without change to the production schedule. In this way TENAS got the specified product, in the time agreed at a fixed price.

Production scheduling and strategy

Features described in the URS were scheduled into three phases for development (a) features for the prototype (b) additional features for the final product and (c) features for product extension following delivery. Eikos was written from scratch, a demanding strategy and in sharp contrast to the development of comparable industry products (Sawaryn, BP, 2005) where existing commercial software provided 90% of the code. This strategy was chosen to give a higher degree of control over service quality, lower end user cost and to use the latest technology to create the look and feel of a local application while working in a fully online environment. It proved to be a good decision.

Process Mapping

Integration of the business process for input into the software shell continued while the developers wrote code. Tasks were designed from a series of existing spreadsheet based flowcharts and a library of supporting documents. Each of three operational project teams was consulted extensively as part of this process. The consultation led to the identification of strong and weak elements of the existing process, areas of ambiguity and divergent needs of the teams based on rig or well type. The expectation at the outset was that the requirements of each task would be defined in a formal procedure. It became obvious during this phase of work that procedures are harder to write and more difficult to understand than example documents from previous projects. Ownership of the revised well delivery process by the existing teams was encouraged by using examples of their work to support future projects. A spreadsheet was developed to begin tracking several current projects against the new task definitions. The spreadsheet included a “dashboard” style summary page that emulated the design of the final software. The spreadsheet helped to sense-check the task descriptions and to begin familiarisation of the teams with what would become the new integrated planning and progress reporting process.

System Overview

The Project View

The Project View (Fig. 3.) is the screen that illustrates the five phases of each project and every task in each phase; it’s the project storyboard. Each colour coded task box displays the title of the task. The colour code displays the status (not started, in progress, complete or exempt) of the task. The Project view contains an area for header information, a log (a web-log or “blog”) and a list of team members. The header information is used for labels in reports, for setting the spud date, selecting the rig and specifying the time zone for the project. The project log records many routine “transactions” automatically (i.e. changes to tasks, document uploads, changes to project header information) providing a very comprehensive history. Entries can also be made manually to the project log. The project team feature allows people to be assigned to roles within the project. Using roles, the system enables each project to have a unique RACI (Responsible, Accountable, Consult & Inform) chart. The project view displays the due date for the last task in each phase and icons identify exceptions such as reminders for tasks due imminently and alerts for overdue tasks.

Task Tracking

Clicking on a task box takes the user into the Task tracking screen (Fig. 4) which is divided into four areas to show detailed information. The task tracking screen is where the requirements of the business process are presented; it’s the “how to” screen and also where users report progress against process requirements. The task tracking screen defines the difference between an intranet information portal (which allows people only to download information) and this new generation application which also allows people to “upload”. In this context any user action that involves providing information to the system which is then displayed or made available to other users is called uploading.

To be effective the business process must be explained to users but to work efficiently staff must report progress against that process; the task tracking screen performs both these critical functions. As soon as changes are made in the task tracking screen the new information is available to any other user, greatly reducing the need for ad-hoc enquiries between team members. If a user in one location changes the status of a task, adds comments to the log or uploads a new document this will be updated on the screen of anyone else looking at the project irrespective of location within a few seconds.

Portfolios (Groups of Projects)

The third critical screen and the most powerful in terms of the quantity of information available is the Portfolio view (Fig. 5). A portfolio in this context is any group of two or more projects. The Portfolio view displays a single line summary of each project and has been tested with very large (>100 projects) portfolios. The single summary line indicates the number of tasks of each status in each phase and the due date of the latest task. A flag indicates exceptions such as if a task that is late, another

flag may be used to indicate deviation from a required quality standard. Clicking on a summary bar reveals the project view and a second click will reveal the task tracking screen for any task. Portfolios can be defined by users, created temporarily or saved and may also be created to capture projects sharing a resource such as a rig.

Primary Screens Recap

With these three primary screens users have very powerful insight and control over the business process. In summary:

- The project view provides a storyboard of the entire process applied to a single project.
- The task tracking screen provides "how-to" information at the Task level and allows users to report information relating to the task.
- The portfolio view gives instant access to a group of projects with the ability to "dig down" to any level of detail with 2 mouse clicks.

Using the system

The TENAS well delivery process was mapped into 42 tasks across the five project phases. The tasks were also organised into seven "task groups" to show work required by discipline.

Four methods of "uploading" information into the system distinguish this application from earlier web-based systems. User profiles determine which user has the right to upload and what they can read. The system administrator can customise profiles to provide almost any combination of read / write access to individual users.

Report Task Status

The well delivery process contains tasks that need to be done in each project. In a project of 42 tasks the minimum reporting standard includes 84 steps. Each task begins with a status equal to "not started" which is changed later to "in progress" and then "complete". Each status is represented in the project view by a colour code. Tasks may be set to "Exempt" if they do not apply to a particular project. Even this minimum level of interaction with the system will provide detailed near real-time progress reports on screen which can also be produced in a printable file format.

Track Activities

Each task is broken down into "activities" which are presented as a simple bullet-point list in the task tracking screen. This list can help both to provide the user with information and to track smaller elements of work. Users can write comments against each activity in a simple text box. The activity list and comments are a structured way to explain how much work is done and remains for any task that is in progress.

Task log

The task tracking screen also contains a task log, sometimes called a "blog". The task log allows free text entry, presents all entries chronologically and identifies the author. The log is a very flexible way of recording incidental information, general comments or background information within a task. The task log has been used quite extensively since the system was introduced; it provides a specific discussion thread within the project "forum".

Share Documents

Electronic copies of documents can be uploaded to the repository making retrieval, sharing and distribution very easy. This feature helps to substantiate that many tasks are complete; for example a signed copy of an AFE can be scanned and uploaded.

Download and Upload

The system serves two functions concurrently. Users can retrieve (download) information to help them with their assigned tasks and report (upload) information for the benefit of all users. All uploads and most information retrieval is via one interface – the task tracking screen, making navigation quite intuitive. Combining the supply of process information and the reporting tools in this way improves familiarity and compliance with the process.

Case Studies

Operator

In the nine months that Eikos has been in use across the TENAS well project portfolio two projects stand out. The TENAS drilling and wells team has run projects for Lundin and StatoilHydro. In both cases the teams were physically dispersed throughout Norway. Lundin and StatoilHydro personnel have become familiar with the TENAS business process using the system. In both these examples the project view in the system (the "storyboard") has become the electronic forum for the project. Each task is a discussion "thread" with comments and documents uploaded by the users. The traditional

communication problems of running such projects have been reduced substantially by providing a tool to allow a professional network to collaborate online.

Project Manager

Senergy have also put Eikos to use within their project management business. Here the needs of the process are different to those at TENAS. For a project management company more process detail is provided within the system as this forms part of the external service in every case, not just the exceptions. Concurrent projects for multiple clients are managed within the system, with external users having access only to their own data.

Software Developer

Within IDS Eikos has been used to strengthen the business process for software development. The development team is dispersed across three continents. To complicate matters further, key members of the team have frequent travel commitments. The lesson from this case is that a single, comprehensive and easily accessible "storyboard" per project is a very valuable addition to the project management process. The system has been proven in this application to have the flexibility to go beyond well projects.

General Applicability

In use it has been seen that Eikos is of greatest value when an organisation has a portfolio of concurrent projects with one or more of the following characteristics;

- The business process is used repeatedly and improved continuously.
- The process contains tasks specified at different levels within the organisation; some elements are shared between business units, some are not.
- The project team members are physically dispersed and from more than one discipline.
- The projects are date driven.
- Users require different levels of read / write access.
- The number of live projects is growing.

Continuous Process Improvement

The software does not write a business process but it can help to define and organise an existing one. The system "Master Task List" (MTL) is used by the administrator to map the business process into the application. Templates for project types are not used; instead each task definition contains fields that define its scope. One field is used to define if a task applies to a specific business unit or to all business units. Another field is used to define if a task applies to a specific project type or all project types. When a new project is created the system filters the tasks held in the MTL to apply only those that meet the new project criteria. The system administrator can add business units and project types at any time so this method of storing task definitions and populating projects provides virtually unlimited scope to use the same application within an organisation.

The software does not make revisions to tasks automatically but it can be used to implement and track changes that are made. A change to the business process is often difficult to make for a two reasons. Firstly, everyone affected by a change needs to be told about it. Secondly, it is very important to know which projects are affected. For these reasons changes made to the MTL are recorded in a transaction log available to the system administrator. The MTL transaction log records the nature of the change and also identifies which projects were affected. Changes to tasks are also automatically recorded in every affected project log which is available to every user. Only tasks that have not started are updated by changes in the MTL; once a task has started its requirements cannot change.

Information Technology Trends

The development strategy selected, particularly the user requirement that the application must be "zero install" brings significant benefits that build on powerful current trends. Firstly "zero-install" generally means that the application is run in a standard web browser which is usually pre-installed with the operating system on the desktop computer. Most operators (in common with other large businesses) provide a level of IT security that will easily allow access by a browser to a web address, but will not easily allow users to install new software on company hardware. Web based software can normally be demonstrated and used within a company network immediately, with little or no intervention required by a system administrator. Secondly, for software updates to be made available to users, the vendor needs access to every instance of the system. When the application is hosted on a server, a single point of access is sufficient to provide updates for everyone simultaneously, remotely and frequently. Service quality should be a function of vendor support level, not the clients IT department. In the case of some locally installed desktop applications the hidden cost of internal support is a very significant component of the total ownership cost. With software provided as a service ("SaaS") the cost of ownership is much clearer, almost certainly lower and service quality better. The third trend is towards applications that "flatten" the professional environment (Friedman, 2006); software that works across physical boundaries reduces the need for a team to be physically

close. With the right system, a team can collaborate remotely using identical information and meet to take high value decisions. People will create and share content when intuitive, collaborative software is made available to them (Schmidt, 2007).

Key success factors

Functional Management Support

This was not a corporate management or IT project. The TENAS discipline management drive and support (in this case the head of Drilling and Wells) provided through the entire project was crucial to its success. This support began with a shared belief that the team could deliver a superior, entirely new product. The success of the prototype and public endorsement by the Drilling and Wells Manager gave added momentum at a critical interim stage in the development. Wider support of the finished product has provided the basis for continuous development – one of the most attractive features of web based software.

Integrate an established business process

The business process was established at TENAS before the software was implemented. New users were presented with a familiar system using a new tool. Familiarity with the process tasks was a key factor in making the system work at the start. Following implementation of Eikos, users became more critical of and involved with the underlying business process itself; this has led directly to revisions giving a more streamlined, fit for purpose process and towards a stronger culture of continuous improvement.

Alignment of developers.

Both the client and each member of the development group shared the risk of developing an entirely new application. Everyone involved had personal, prior experience of IT/IS projects and/or the well delivery process; this gave a degree of confidence in certain respects but also tempered any hint of irrational optimism. An equitable development contract provided payment in two stages; half for the prototype and the remainder for the final product. There was no facility for escalation of fees for the developer or variation orders, as this was covered by IP ownership residing with the developers.

Development Discipline.

The user requirements and product specification were not changed during the development process. The simplification of the requirements at the contractual level had a powerful beneficial effect focussing the efforts of the production team. This work method has been extended since delivery; enhancements are defined, designed and delivered in quarterly intervals.

And people like it!

Lastly, the system introduced at TENAS enjoys a high degree of “ownership” among the people who use it. The system has succeeded because the process is appropriate to the needs of the organisation and the software has made the process easier to use. It helps to reduce work and save time, rather than creating additional non-core reporting burdens. It allows more time for the key engineering and risk management processes, the high value work that is fundamental to excellent well construction.

Conclusions

Fit and reinforce an existing process

The application developed for TENAS fits their existing business process and adapts easily to changes in that process. The same software could be used for other departments and other business processes; there is very little unique about the project management process for well construction. Key business improvements included (a) greater assurance that the process was applied with appropriate rigour to each project (b) integration of the process definition and progress reporting within the same software and (c) simplification of continuous, discrete, business process improvements.

Address common problems

The significant strengths of this system are the areas in which traditional IT applications begin to struggle or fail. These strengths are typified by the intrinsically collaborative design including an exceptionally powerful GUI. Team dispersal is quite common so process and tools must allow for this. A web based tool maximises the distribution of information and guarantees that team members access the same information. The MTL contains powerful logic to maintain task requirements up to date in current projects and gives tremendous scope for handling multiple business units and project types.

Communicate across traditional boundaries

Traditional boundaries between departments and company locations can be lowered by software that encourages a professional group to form around a project. The well delivery process, "owned" by the Drilling and Wells department could easily appear opaque to people outside the department. By improving the communication of the process to everyone involved

in a well project both the tasks required and progress became very clear. Blogs have been transformational in social networking sites and have the potential to do the same at work.

Summary

All the goals and objectives defined for this project were met and the new application has delivered the planned benefits. The development team was and remains highly motivated by having an entirely new product to maintain, develop and of course, to market to other clients. The product can be easily configured to fit almost any business process and will help to implement best practices as and when they are identified. In common with other web-based software it is scalable to an organisation of virtually any size. Providing additional features is limited only by current web browser technology. In the short term incremental upgrades will be made, keeping the product simple and giving priority to performance improvements.

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		Project Phase				
Reference	**Company**	**1**	**2**	**3**	**4**	**5**
Collison & Parcell[4]	BP	Appraise	Select	Define	Execute	Operate
Dehmer[6]	Chevron	Identify	Select	Develop	Execute	Operate & Evaluate
Piantanida, Rossi & Gaudioso[9]	ENI	Evaluation	Selection	Definition	Execution	Startup
Walkup & Ligon[13]	n/a	Feasibility	Selection	Definition	Execution	Operations
		"Front End"				

Fig.1. Alternative naming conventions for the 5 standard project phases

1. All wells are different.
2. Drilling optimisation is difficult to achieve.
3. Each new project represents a new learning curve.
4. Global, regional and are expertise is not transferable, and new or different types of operations require specific high levels of expertise.
5. There is no common process for drilling.
6. Drilling engineers are excited about software or information technology (IT) tools.
7. Drilling engineers do not expect strong leadership.

Fig. 2. The Seven Drilling Myths (Holland, Pritchard and Anand 2003).

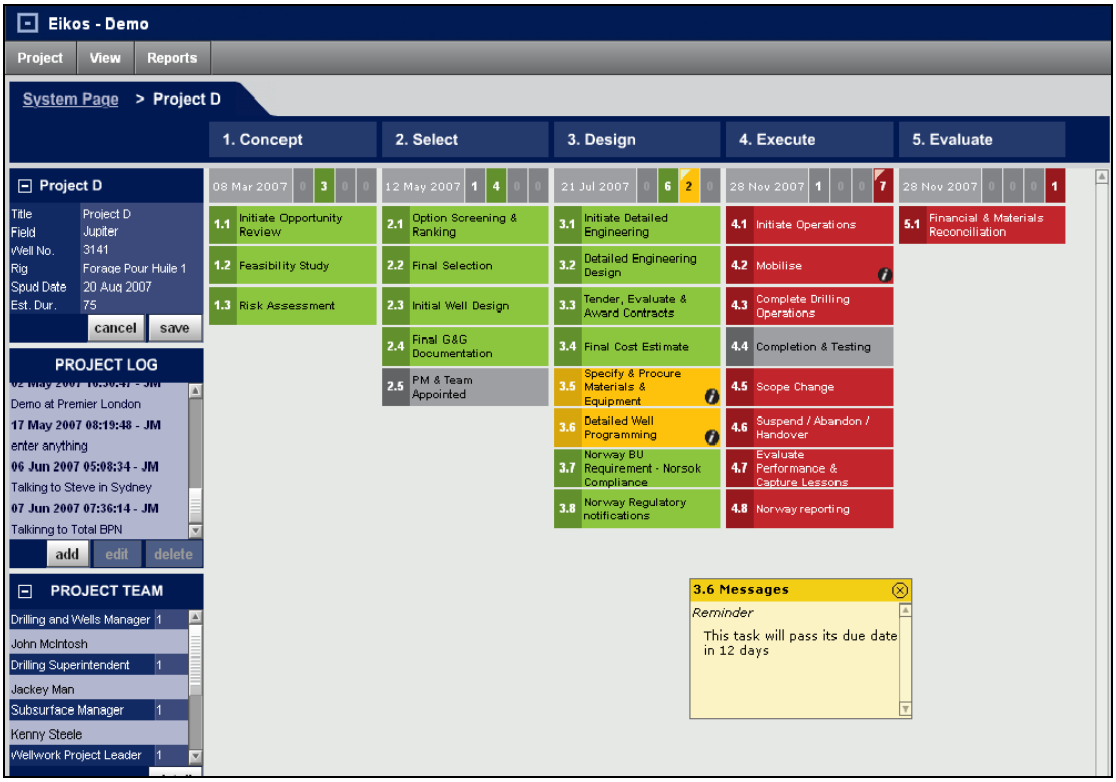

Figure 3 – single Project View

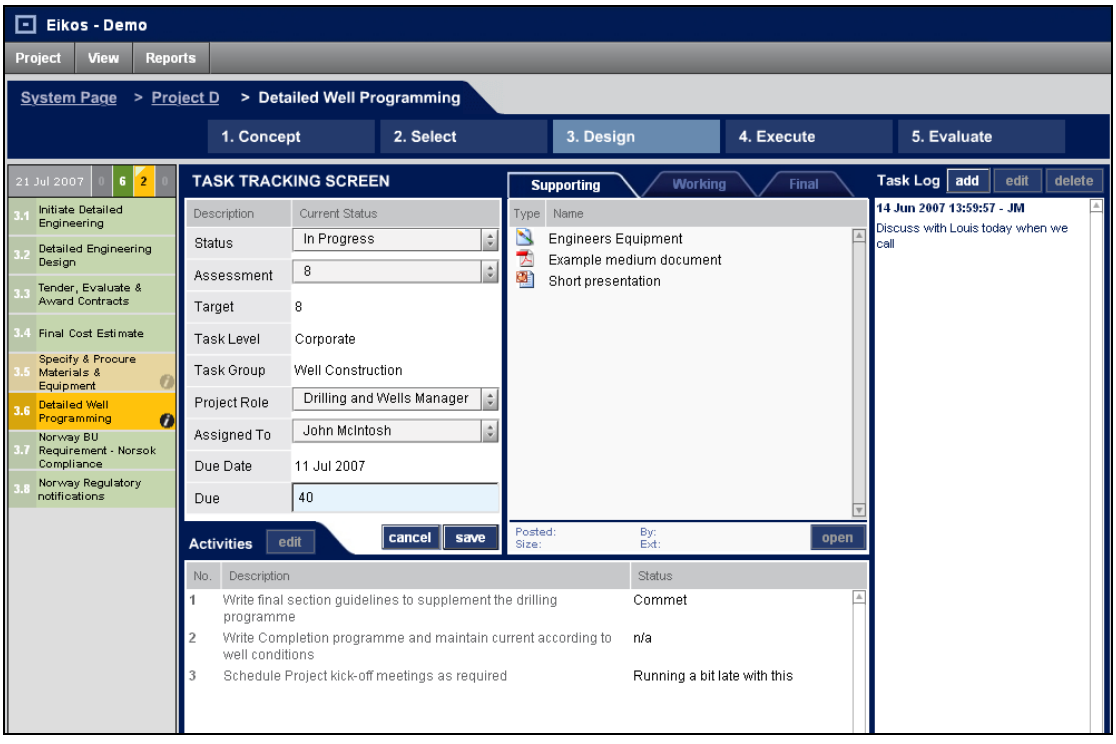

Figure 4 – Task Tracking View

Figure 5. The Portfolio View