CONTROLLING A CRISIS IN REAL TIME

In mid September 2004, Hurricane Ivan ploughed through the eastern Gulf of Mexico (GOM) oil and gas fields, smashing ashore as a Category 3 hurricane near Gulf Shores, Alabama, USA[1]. The resulting underwater mudslides at the continental shelf buried, damaged or destroyed subsurface pipelines and surface facilities, decreasing oil production by approximately 475 000 bpd of oil and nearly 1.8 billion ft^3/d of gas[2]. With approximately 25% of the GOM daily production of 1.7 million bpd offline, a massive flotilla converged on the effected area to find displaced and destroyed pipelines, and rebuild the transport infrastructure necessary to restart production[3].

Concurrent engineering response

The upstream sector and its energy services partners are good at marshalling resources and responding to crises, from oil well blowouts to fire or marine environmental incidents. This capability has developed over the life of the industry and is regarded as best in class by many. However, when a cataclysmic event happens, scarce resources become more limited and their effective and efficient use even more critical.

The industry responded to Hurricane Ivan by mobilising all available resources, at premium cost, and focused on getting production systems back online as quickly as possible. With Ivan taking more than 25.1 million bbls of oil off the world market, Herculean efforts were appropriate[4].

Simultaneous or concurrent engineering is a proven methodology for shortening the project lifecycle and assuring greater team interaction and performance. Using concurrent engineering techniques, multifunctional teams can address several facets of the project in parallel rather than simply sequentially[5].

Key to concurrent engineering is the systemic engineering construct. Systems engineering is a methodology that uses a number of software applications and tools to enable collaboration on difficult complex engineering problems[6]. This problem solving paradigm is appropriate when

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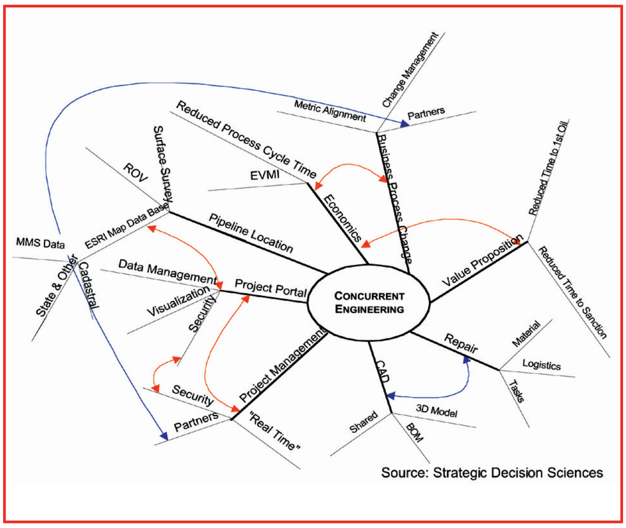

Figure 1. Concurrent engineering relationship map.

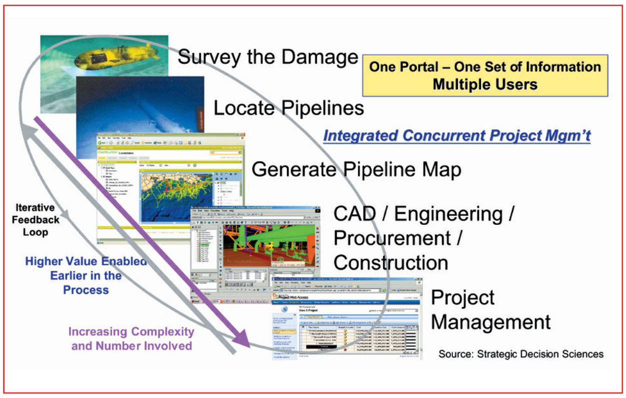

Figure 2. A common information portal can significantly improve project co-ordination.

addressing major outages as well as during normal business and engineering process integration.

The first step in any systemic undertaking is to map the relationship of all relevant variables (Figure 1). The detailed process is important for two reasons: first, it is necessary for any integrated system design because the computing engines that will enable the solution can only support known variables and workflows. Perhaps more importantly, the design process itself forces the team to test their hypotheses within the framework of the overall bounded model.

However, this design process does not and should not be a long drawn out activity. High performance teams are capable of delivering high impact solutions quickly. The team should be cohesive, yet broad enough to encompass the full context of the system under development. Moreover, team members need to be true peers focused on a common goal and not distracted by other lingering priorities or multi-tasking requirements from unrelated low impact efforts[7].

Rapid information solution deployment

The software development industry has developed the rapid application development (RAD) methodology in response to the need to deliver software products very quickly. However, not every software project is suitable for RAD. The following criteria must be met:

- The business objectives are narrow and well defined.
- Data already exists or is readily available.
- The project team is small and decisions can be made quickly.
- The architecture is well defined with crucial components available.
- The technical requirements are reasonable and clearly within the current technology suite[8].

When a software application meets these criteria, its cost of development and time to market can be dramatically and positively impacted. A RAD project is optimised for speed.

First a prototype is built as early as possible, then, using an iterative approach, it is refined against a schedule that timeboxes delivery over scope[9]. The methodology could be considered a fit for purpose project archetype.

When Hurricane Ivan devastated GOM oil and gas production, it presented an opportunity to use RAD methodology to enable the information management solution necessary to support a concurrent engineering business model during the pipeline and facilities remediation process.

The concept of a 'concurrent engineering portal' met the RAD criteria. The development of a prototype was begun in mid November 2004 and was operational within one week.

The challenge was to capitalise on 'commercial off the shelf' (COTS) software components, while mitigating the risk associated with using non integrated single applications packages. For example, the change to COTS is not a single simple step, but a commitment to conducting business differently. Firms must also recognise that this change is pervasive and the theory of unintended consequences is alive and well, resulting in a myriad pitfalls including unreasonable expectations or insistence that traditional development methods be used in lieu of RAD[10].

The portal

The portal project team consisted of individuals from several organisations. The portal was built around Microsoft's[11] Project Server and .Net architecture, using ESRI's ArcGIS Family of GIS[12] mapping solutions to provide location information and data attributes. Ocean bottom survey and Remotely Operated Vehicle (ROV) data were obtained from the survey company, Century Subsea[13], and transmitted directly into the SQL database supporting the portal[14].

The portal was built by Idea Integration[15]; a systems integration company based in the USA with extensive experience in geographic based portal systems. The portal is a secure system designed to be used by a large number of parties, including regulatory bodies for reporting as required.

The portal supports concurrent engineering throughout the project lifecycle. It enables all members, including subcontractors and equipment suppliers, to interact and exchange information in a secure environment.

The database and portal are inherently secure. This high level of protection enables the confidentiality necessary to assure a viable operation with global partners. Moreover, as with any project, higher value can be attained early in the process.

When the field data are directly transmitted to the database, significant time is saved because the data are immediately available to all users. The data are validated in this process and made available in the format required. This is accomplished using the enabling technology based on industry standards[16].

All the components of the portal are COTS products from different independent software firms, built upon an enabling architecture. They were integrated into a working prototype in less than one week. The business processes and required technology components were assessed and deployed using the relationship map depicted in Figure 1.

The team consisted of a small group from each of the companies with expertise in all aspects of the processes required to build this solution. The team recognised that time was of the essence and immediately focused on near term possibilities, rather than a long term IT project.

The task was to put a solution in place in the near term, much like the marshalling of GOM marine efforts that the industry was undertaking. This became the ultimate alignment of IT with business: fit for purpose solutions implemented to meet a crisis situation.

Integrated operations

The portal is a field intelligence tool facilitating concurrent operations among all stakeholders including operators, partners, suppliers and regulatory bodies. Not just a response to a crisis, the concurrent engineering portal can become a normal component or way of doing business. For example, by populating the database with current (regularly updated) pipeline geographical position and attribute data, this lessens the dependency on data providers and other third parties and places the control of operations firmly in the hands of those best able to make decisions.

Outsourcing becomes the subcontracting of enablement, not the dependency of revenue production. This also sets the stage for a faster and more effective response to future crises, most likely to occur in an era of increasing hurricane frequency and magnitude[17].

Finally, Sarbanes-Oxley, while strictly an American regulatory requirement, requires that management knows what is going on in the business. It is likely that future crisis response will have to address shareholder and governmental concerns that are embodied in this regulatory spirit.

Lessons learned

It is time for information management to become a key partner in crisis management response. Moreover, the lessons learned from this initiative suggest that a concurrent engineering solution can be enabled as part of normal business practices.

The team put this solution together in less than one week and populated the portal database with survey and ROV obtained data transmitted directly from the offshore vessels. More than a construct, however, it is a proof of concept that IT can respond quickly as part of a crisis management team and as an aspect of daily operational excellence.

In addition to the knowledge that a team of dedicated business, engineering and IT professionals can provide a solution capable of significantly reducing time to sanction, it became clear that information systems can be deployed quickly in the real world. Several companies are interested in adopting this solution.

The team also faced internal concerns: would the solution be robust enough to meet client needs and could a consistent reliable and valid data stream adequately fuel the compute engine? The prototype demonstrated that the system is vigorous and sufficient to handle operational data. Stress tests suggested that the system can stand up to normal usage.

Moreover, the solution was used in a non-oil and gas environment and was very successful. Idea Integration used this solution to map Lidar data[18] for all of the Houston,

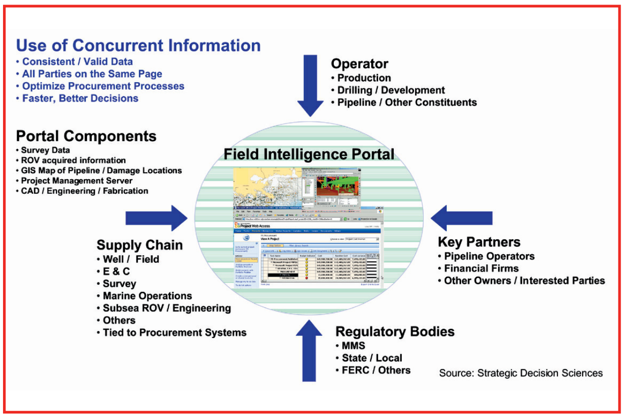

Figure 3. Integrated operations: focus on immediate high impact concerns while establishing long term value.

Texas metropolitan area following significant flooding in June 2001 from Tropical Storm Allison[19].

This solution integrated systems engineering techniques with software development RAD concepts to produce a capability that was fit for purpose in only one week. This is a new robust and effective way to respond to crises and paves the way for future business transformation.

Conclusion

The pipeline industry can now benefit from a new way of responding to immediate needs as well as using this construct as part of ongoing business process management. This solution is working and available.

Pipeline companies will continue to face manmade and natural disasters. This solution provides a robust cost effective way to manage ongoing operations as well as a tool tuned to the rapid response required in times of crisis.

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