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Advanced Enterprise Platform for the Engineering and Construction Industry

SAP for EC&O Solution Portfolio—Setting New Standards in Business Practices

A Frost & Sullivan White Paper

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Integrated Software Environment for Creating Business Value 3

SAP's Enterprise Solution - Transforming Business Practices 3

Engineering and Construction Industry - Review of Internal and External Challenges 5

Key Performance Indicators (KPIs) for the Engineering and Construction Industry 8

Overview of Competitive Enterprise Solutions 9

SAP for EC&O Solution Portfolio versus Top 2 Competitor Solutions 12

Distinct Advantages with SAP for EC&O Solution Portfolio 14

Concluding Remarks 15

INTEGRATED SOFTWARE ENVIRONMENT FOR CREATING BUSINESS VALUE

Reliance on state-of-the-art technology is evidently so powerful for any business today that project success is often linked to the level of technological sophistication achieved by that industry. The engineering and construction industry is no exception, where business value is largely determined by the ability to capitalize on opportunity in the most timely, accurate and holistic manner. This aspect is further corroborated by the fact that this is, by far, one of the worst affected industries, faced with an arduous mix of economic restraints during the recent recession. A centralized technology deployment approach is the answer to the need of bringing together strategic functions and objectives of service delivery, generating efficiencies and facilitating enterprise-wide adoption of streamlined processes for measurable cost savings.

In such intelligent environments, information can be collected from a multitude of functions and processed in an integrated manner to generate quick responses. The results are profitable projects that ensure organizational growth and business value enhancement. This white paper focuses on the benefits of using such integrated technology platforms to seamlessly bring together enterprise and business processes and the importance of having holistic visibility over operational performance in the engineering and construction business.

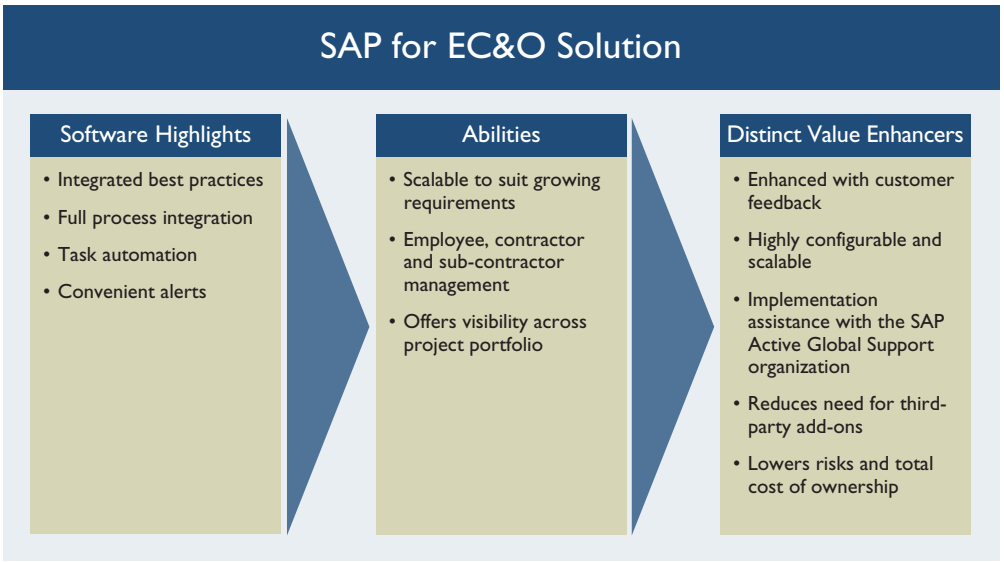
SAP'S ENTERPRISE SOLUTION TRANSFORMING BUSINESS PRACTICES

SAP has more than 30 years of active involvement in the construction industry, working with more than 2,000 construction businesses globally. The company's success lies in the strength of its solution portfolio that is specifically designed to reduce the struggle of construction companies in dealing with multi-vendor legacy systems, and inaccurate and untimely information, hindering their ability to adapt to business changes. The SAP for Engineering, Construction & Operations (SAP for EC&O) solution portfolio is a well-integrated set of applications encompassing every aspect of the construction business.

SAP for EC&O solutions provide one of the most complete set of integrated construction specific applications available from a single vendor.

SAP for EC&O encompasses the entire project life cycle, from business conceptualization, design, procurement, construction, and final handover. This set of solutions offers utmost visibility across a company's entire project portfolio and allows informed decisions to be taken on a real-time basis. Key highlights of the solutions are depicted in Figure 1.

Figure 1: SAP for EC&O Software Overview



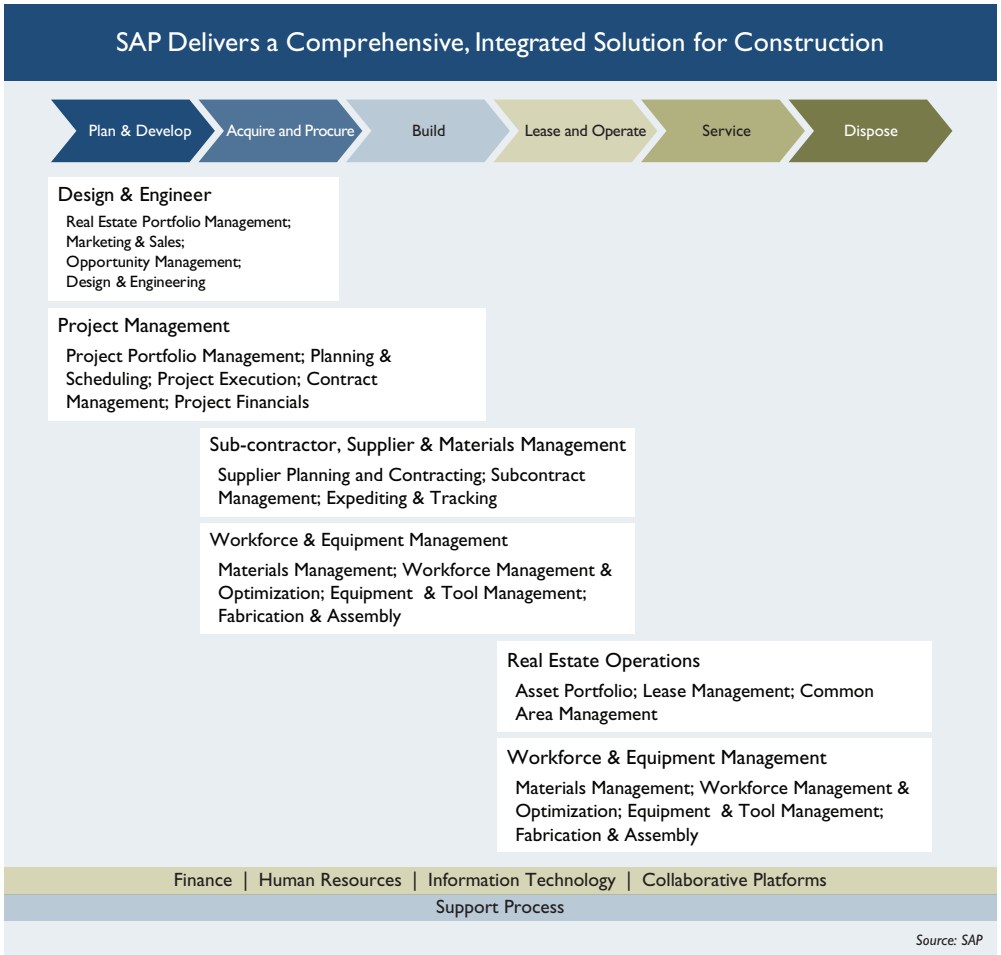
Source: Frost & Sullivan Analysis

The above offers project managers the ability to maximize asset utilization, and manage suppliers, subcontractors, and employees more effectively for improved business performance. The software platform is designed keeping customers' needs and feedback in mind, thus ensuring that a highly scalable and configurable solution is offered that fits the requirements of an organization's growing business.

Customized implementation assistance with the help of the SAP Active Global Support organization further ensures that the requisite training, deployment, or ongoing support is available to customers as needed. A key distinguishing feature of the software platform is that it reduces the need for third-party add-ons, which helps lower a customer's risk and total cost of ownership.

The breadth of support and depth of functionality offered by the SAP EC&O solution portfolio is clearly the most comprehensive in the industry, as shown in Figure 2.

Figure 2: SAP for EC&O Solutions Portfolio Coverage



ENGINEERING AND CONSTRUCTION INDUSTRY REVIEW OF INTERNAL AND EXTERNAL CHALLENGES

A tough mix of internal and external challenges has affected the engineering and construction industry over the last decade. However, the impact of these challenges has been more pronounced over the last three years as the economic downturn hit. Consequently, firms have taken steps to control costs, including drastic actions such as salary cuts and staff reductions. In order to compete and win in the current climate, construction companies are streamlining practices and rethinking their business goals and strategies. Many recognize that the support technologies they adopt can significantly impact their ability to meet their end objectives.

"The construction industry's unemployment rate of 20 percent is the highest of any industry. Construction spending continues to drop by 6.8 percent over the past 12 months to a seasonally adjusted annual rate of $761 billion. By far, this is the lowest level recorded since October 1999. Shrinking totals for construction spending and jobs, along with rising construction materials costs, threaten to limit broader economic growth. "
—Quoted by Associated General Contractors of America (April 2011)

External Challenges

As construction projects got shelved at the height of the recession and continue to be delayed with persistent paucity of funds, business and employment uncertainties still figure prominently in the agenda of engineering and construction companies. With little ability to change the external environment, the need to look internally for potential changes to help mitigate persistent revenue loses has become most apparent.

The challenge here lies in the inherently diverse revenue and business mix of the construction life cycle and the EC&O firm's opportunity to take advantage of it. A significant portion of the revenue of these companies can be attributed to pre- and post-construction services offered, such as design assistance services and facility life cycle maintenance. The ability to provide a diverse service mix to project owners can make an EC&O firm more agile in responding to a difficult market. Likewise, the ability to accurately track cost and profitability of all core and ancillary services within the mix offered is therefore key in determining what business processes can effectively drive growth in turbulent times.

Maintaining profitability, which depends upon effective management and ability to analyze business processes, is significantly restrained for most companies, given the traditional nature of process management followed and the limiting nature of tools at their disposal to institute changes.

Internal Challenges

The internal set up of most engineering and construction companies is often characterized by structured practices that have been established over the years. This proves to be more a challenge than asset when external forces start to dictate changes that are critical for maintaining competitiveness and growth. Such structured environments tend to breed a lot of process inefficiencies, leading to uncontrollable cost increases that could imminently threaten survival for some companies.

Often executives turn to the information technology (IT) departments of these companies to help automate and streamline business processes with a strong technology platform in order to improve efficiencies and reduce cost. However, many IT professionals face the problem of finding the appropriate technology solution that can keep pace with changing business dynamics.

As a result, the standard practice has been to use legacy technology, primarily for job-costing purposes, to address the majority of the problem. Additionally, a patchwork of technology applications is used in conjunction to meet other needs. With no meaningful integration between these systems and applications, the organization cannot share data across the enterprise. In cases where companies have built significant and meaningful integration between their systems, often the costs and limitations of those integrations pose a problem to sustain it well.

These factors greatly reduce the visibility decision-makers need to anticipate delays, forestall cost overruns, and effect process changes to meet changing business or market requirements. Consequently, the effort of maintaining and enhancing multiple IT systems drives internal costs even higher.

To overcome the economic and industry challenges that compromise profitability and competitiveness, construction company executives need to look closely at internal operations and business systems. The key questions that need to be answered include:

- What business processes and technology solutions need to be changed?
- What are the key impediments to adoption of these changes?
- What technology solutions should be adopted to overcome these challenges, improve cost control, and strengthen business performance?

Myriad growth inhibitors are known to negatively impact the engineering and construction industry in their bid to maintain competitiveness. Whether it is maintaining organic and inorganic growth or adding new service aspects, these factors pose a critical challenge for these companies.

Figure 3: Construction Industry Growth Opportunities

Growth Opportunity	Impact on Core Functionalities
Acquire other construction firms	Complex, costly systems integration between companies
Add self-perform trades	Inability to track costs, and manage labor and equipment productively
Add new competencies	Profit compromised by costs of billing and tracking activities
Offer pre- and post-construction services	Lack of integration between BIM, financial, and project management processes; need for optimized facility life cycle and infrastructure management

Source: SAP

As new businesses get added to core organization structures, the potential revenue generated by this change is often offset by unexpected costs and complexities, which are further made difficult to track with legacy systems. Application and/or data silos contribute greatly to a lack of enterprise visibility, preventing companies from responding in real time to issues and opportunities, thus, more often than not, defeating growth objectives.

KEY PERFORMANCE INDICATORS (KPI'S) FOR THE ENGINEERING AND CONSTRUCTION INDUSTRY

The ability to manage growth and economic challenges largely depends on how well construction companies are able to monitor the KPIs of their business strategy. Implementing an integrated software solution enables these companies to maintain a reliable and timely data flow necessary to generate KPIs on demand. It is widely agreed upon in the engineering and construction industry that there are nine KPIs that firms should invariably monitor to gauge performance accurately, as shown in Figure 4.

Monitoring the KPIs is often easily achievable with the use of a single, scalable software solution with a familiar user interface that can integrate with existing software and provide frequent updates using real-time information from a central database. The importance of such scalable software cannot be underestimated when a company's ability to remain dynamic and its long-term performance is taken into consideration. Furthermore, scalable software solutions offer greater flexibility for growing companies without tying firms to a proprietary software system, which may have only limited support and limited compatibility with other applications.

However, disparate software systems from different manufacturers may require firms to undertake laborious data compilation to judge KPIs, where mistakes and inaccurate calculations cannot be avoided. Therefore, it is critical that construction firms implement software solutions that are comprehensive and provide the ability to monitor KPIs with the objective of maintaining financial discipline and compliance with their strategic growth plan.

Figure 4: KPIs Monitored by Construction Companies

KPIs	KPI Defined	Elements to Monitor
Liquidity	Determining how much cash the work in progress is generating or consuming	Monitoring key current asset and liability balance sheet accounts
Cash Flow	Understanding whether projects are generating or consuming cash	Paying attention to cash flow; promoting timely billing and collections
Labor Productivity	Productivity problems can break labor budgets and erode profit margins	Itemizing jobs within a project to identify discrepancies between actual labor expenditures and estimates; forecasting cost to complete; establishing daily performance goals; improving future estimating and bidding accuracy

Figure 4: KPIs Monitored by Construction Companies (continued)

KPIs	KPI Defined	Elements to Monitor
Schedule Variance	Maintaining clear communication with management regarding project progress and timely completion	Identifying and monitoring schedule variance to deliver projects on a timeline; plan for factors, such as change orders and weather, that cause schedule variance
Margin Variance	Comparing gross margins to business plan objectives by monitoring overall margin variance	Paying constant attention to margin variance to make the corrective changes necessary to keep individual project margin variance to a minimum and the overall gross margin stable
Unapproved Change Orders	Standard contracts do not allow much flexibility in dealing with unapproved change orders. This poses a major risk for firms, with limited means for mitigation	Reducing financial exposure by identifying and diligently pursuing unapproved change orders
Committed Cost	With rising material prices and labor shortages, construction firms face financial exposure when suppliers and subcontractors are not yet committed contractually, particularly on longer-duration projects	Tracking uncommitted costs to increase the proportion of committed costs to incorporate factors such as price escalation and contingent cost terms into committed costs in order to limit financial exposure
Backlog	Tracking backlog and expected gross margins on backlogged work allows construction firms to avoid the problems associated with insufficient work and profit decline	Closely monitoring backlog and strategically deciding which projects to pursue to avoid downward profit pressures
Customer Satisfaction	Tracking the firm's ability to meet owner expectations by compiling and analyzing qualitative feedback is critical to stay competitive	Examination of past projects to identify shortcomings will enable the firm to address such issues in current and future projects

Source: SAP and Frost & Sullivan Analysis

OVERVIEW OF COMPETITIVE ENTERPRISE SOLUTIONS

It appears that unlike the first wave of game-changing enterprise technologies, such as customer relationship management and enterprise resource planning software, the engineering and construction industry's adoption of the latest enterprise

"SAP software brought us together as an enterprise like nothing before. Today we are far more coordinated across all of our businesses, and we can compete more effectively as a global organization."
—Hal Yoh, Chairman and CEO, Day & Zimmermann

solutions is user-driven. The adoption need stems not only from the traditional organization structure, and the use of software solutions for the need of the entire organization, but also from an individual user/consumer environment. The EC&O personnel fulfilling specific tasks today demand a compatible solution that can allow them the flexibility to use it as per their changing needs. Therefore, it is not surprising that the demand profile today not only includes the conventional project and operation management features, but also the added aspects, such as:

- Mobility and on-demand access
- High-resolution data analytics
- Data unification from multiple modules
- Interactive user experience

As many EC&O professionals are already using some of these applications in a consumer environment, they are eager to apply them to their work, thus creating the need for comprehensive solutions. The need to deliver improved organizational flexibility and break down barriers to both internal and external collaboration is certainly a requirement that enterprise solutions are today expected to fulfill to create a significant positive impact on the bottom line of businesses.

A handful of established solutions currently exist in the engineering and construction industry that fulfill a partial list of capabilities with varying degree of adequacy in supporting multi-dimensional enterprise integration for this industry. Some of the key solutions available are listed in Figure 5.

Figure 5: Existing Solutions for the EC&O Industry

Solution	Construction Focus	Point Solutions	Comprehensive Offering
SAP for EC&O			•
CMiC, JD Edwards (Oracle), Viewpoint, Oracle (Primavera, Hyperion), Microsoft (CRM, ERP), CGC, IFS, Cognos (IBM), Aveva/MARS	•		
Yardi, MRI		•	

Source: SAP and Frost & Sullivan Analysis

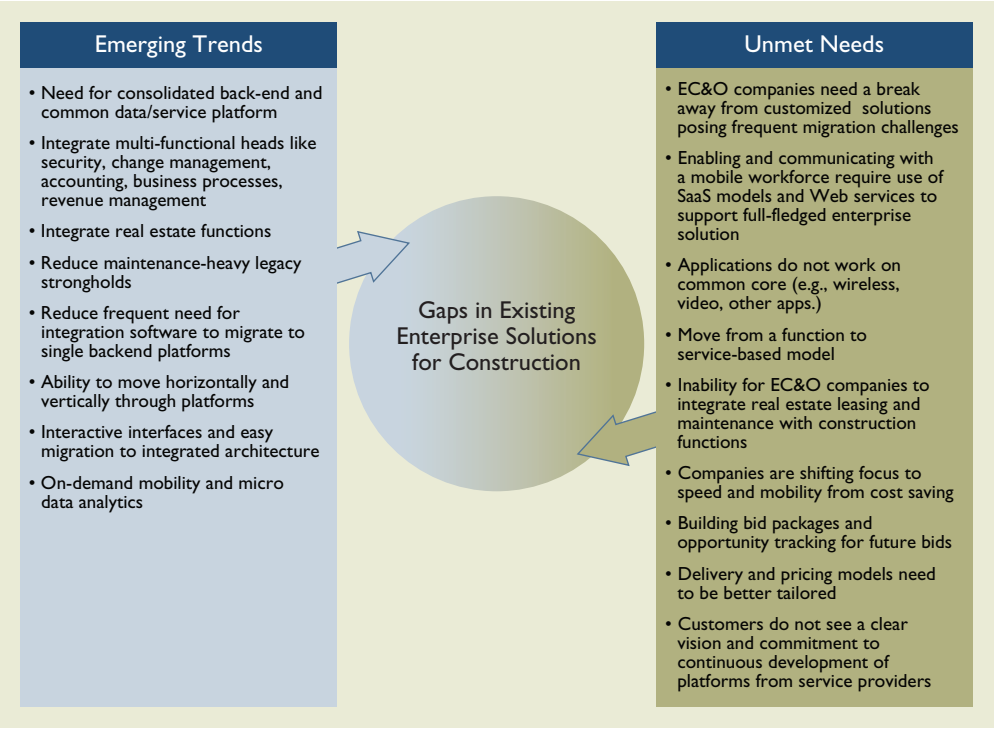
Most solutions available at present are attempting to address the dilemma associated with managing and monitoring disparate and silo-based systems with a coordinated set of monitoring tools that work across the layers of typical enterprise systems. Depending upon the solution in question, this may or may not include working seamlessly all the way up the protocol stack, through network connectivity and operating systems to complex enterprise resource planning suites. The objective is to provide a common repository for operation and performance monitoring at all levels. However, as seen from Figure 5, the ability to encompass functions beyond construction such as real estate related functions, building information modeling, etc., are virtually absent in most solutions.

At the highest level, these tools attempt to model and monitor business systems and practices so that the overall health of a construction business or a distinct functional application (for example, finance, human resources, project management, accounting, etc.) can be determined. However, general perceptions among end users about the use of these systems are that majority of these are task-centric and capable of providing point-solutions only. They are less viewed as comprehensive service platforms.

The issue partly lies in the functionality and complexity of the solutions. Frost & Sullivan's research indicates that besides being able to handle enterprise-level systems integration and monitoring partially, in some cases there is a lack of comprehension of what these systems actually do. Lack of clear demarcation of functionalities, from one system to another, further make it difficult for both vendors and end users to work together. Figure 6 depicts some of the key trends and unmet needs exhibited in the market.

"Having a global technology platform enables us to start sharing work across boundaries without having to move people from one region to the next. . . . This is where SAP software helps us meet the challenges of today and tomorrow." —Chris Robinson, CIO and Partner in Charge of Technology, Property, and Procurement, Davis Langdon LLP

Figure 6: Emerging Trends and Unmet Needs



Source: Frost & Sullivan Analysis

SAP FOR EC&O VERSUS TOP TWO COMPETITOR SOLUTIONS

"SAP has enabled us to confidently monitor our receivables at any time, which is critical to our success in managing more than US$20 billion in ongoing programs and projects around the world." —Glenn Sakaki, Managing Director, Execution Technology, Hatch

Given the current external and internal challenges and growth inhibitors faced by the engineering and construction industry, a few characteristics emerge as critical for any comprehensive enterprise solution to be considered holistic. A review of the emerging trends in the industry and the gaps exhibited by various solutions shows a prescriptive list of crucial functionalities emerge that is imperative for a dedicated enterprise solution for the engineering and construction industry to have within its framework. An evaluation of the top two competitor solutions in the industry, vis-à-vis the SAP for EC&O solution portfolio, reveals some distinct shortcomings in their present abilities to address this prescriptive list of functionalities, as depicted in Figure 7.

Given the comprehensive and easily scalable nature of SAP for EC&O, it is not only possible for professionals using the solution to deliver projects with utmost cost and service efficiencies, but also successfully monitor the critical KPIs for continued business success. Real-time information monitoring and analytics, together with on-demand mobility, provides the construction industry a clearly unique solutions platform that is dynamic, highly compatible, cost effective and vital for sustaining growth in an uncertain economic environment.

Figure 7: Present Abilities and Shortcomings of Top Two Competitor Solutions

Functionalities	Present Abilities—Top Two Competitor Solutions Compared to SAP for EC&O	SAP for EC&O Solutions	What is Needed
Integrating HR, Accounting and Payroll with Project and Cost Management	Predominantly non-integrated, single instance and highly customized application; provides some construction project management document control and routing	✓	Standardized solution with full integration across the entire business
Enabling the Mobile Workforce	Limited integration with experience restricted to specific applications, such as handhelds and PDAs, etc., requires add-on services	✓	Use of Web services to support the ability to communicate with a mobile workforce needed
Integration of Facilities Management/ Real Estate Functions and BIM	Non-existent at present; requires other vendor applications/services to be additionally procured	✓	Comprehensive capabilities required to bring in leasing, operations and maintenance as well as energy analytics for real estate portfolio
Advanced Analytics and Real-Time Monitoring	Data quality limited to dash-boarding and flagging, corrections and linking to external third-party software packages; multi-site benchmarking capabilities exists, however, not robust across offerings; some anomaly detection but based on historic trends only	✓	More analytics and verification capability to track impact on operational changes, not restricted to time series data modeling as done presently; better prediction of future operations and anomalies in current project required
Enabling Change Management and Unified Data Management	Supported to some extent but requires additional vendor solutions to be patched; unified data analytics requires manual compilations and use of other vendor solutions	✓	End-to-end integration of new processes required; ability to seamlessly incorporate functions both horizontally and vertically; real-time data unification
Continuous Development	Future development roadmap and commitment to upgrades in the software platforms is virtually unclear	✓	Well-defined additions to present platforms; need to understand possible scalability; time to market for future upgrades

"The budgeting software based on SAP ERP provides vital support to a key business process at HCC. It helps to strengthen the creation, review and tracking processes for budgets."
—Satish Pendse, Chief Information Officer, Hindustan Construction Company (HCC)

DISTINCT ADVANTAGES WITH SAP FOR EC&O

The SAP for EC&O solution portfolio clearly provides an edge over other competing enterprise solutions for the engineering and construction industry. With continued innovation and improvement spanning more than 20 years to its software platform, the solution distinctly lays focus on overall value to the organization and emphasizes total cost of ownership as opposed to first costs and short-term business impacts. Among the key distinctions, the following stand out as particularly relevant in the context of a fully value-driven enterprise solution:

Ability to seamlessly support cultural shifts: Given the drastic impact of economic volatility that the construction industry has to deal with, SAP's positioning of its solution portfolio as a business transformation solution (as opposed to a software platform) with all the functional capabilities built comprehensively around this notion, makes it clearly unique.

Proven growth: A steadily growing global clientele, with impressive growth in new business, confirms the strength of its solution, which is further corroborated by significant allocation in annual research and development budget for continued improvements. Extensive geographic presence and vertical industry support ensures SAP's ability to assist clients with diversification needs easily.

Alliance partnerships: A strong partner eco-system with the ability to collaborate with the likes of IBM, Microsoft, CSC, among others, allows for better handling of varied customer needs effectively.

Incorporating voice of the customer: Co-innovation is what marks SAP's continued improvement and developments to its solution. Closely working with customers to enhance their solution, as dictated by customer needs, is what makes the solution better positioned to changing demand dynamics.

A future-proof and a converged enterprise platform: Advanced planning tools with scalability, enhanced visibility, real-time data monitoring, advanced analytics and tying mobile applications to enterprise resource planning can immensely increase the effectiveness of the construction workforce. This, alone, sets SAP's EC&O solution apart from the rest of the competing solutions in the market.

Integrating the back office with core functionalities: Where economic reasons warrant a close scrutiny of all functions of an organization, monitoring and controlling the back office is no longer trivial. This is particularly so for the construction industry that is reeling under tremendous cost pressures, post recession. SAP provides significant value-added functionality with its integration of back-office functions such as payroll, accounting, human resources, etc., that provide the ultimate end-to-end visibility for the EC&O professionals. This provides customers the ability to manage complex workforce issues, including recruitment and regulatory compliance, and reducing costs with capabilities like employee self service.

A well-integrated suite of applications that capture every aspect of the construction business, both existing and emerging, is what defines SAP for EC&O as the single best turnkey solution for the engineering and construction industry. By bringing together proven best practices and unmatched functional depth, the solution portfolio helps keep projects on track and within budget.

CONCLUDING REMARKS

Capitalizing on opportunities in the construction industry has been fairly challenging over the past three years. For companies without integrated systems, this has been aggravated by the information flow issues that create a disconnect between various management and operational layers of the organization. This lack of real-time visibility delays critical decisions, resulting in increased project costs and inability to adapt to changing business and industry requirements.

Technology solutions that can deliver low total cost of ownership with effective management of multiple projects, optimized cash flow and credible return on investment are certainly poised for success. Their ability to bridge the gap left by multiple niche solutions does confirm a good trajectory for their future growth.

From mitigating operational and financial risks, to offering value-oriented project management, SAP for EC&O is by far the most fully integrated technology solution available to the engineering and construction industry. With the flexibility to enable interaction with current and future hardware systems and communication infrastructures, and the ease of scalability to include growing functional needs of this industry, Frost & Sullivan expects SAP for EC&O to set new standards in how business is executed in this industry.

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