White Paper 2018-03

How to Build the Systems Architecture Project-Driven Organisations Need

A proper Information Systems setup and architecture is increasingly a major differentiating factor for organizations dealing with the execution of Large Complex Projects. The challenges of digitization increase the strategic importance of Information Systems. In a series of White Papers, based on our extensive experience in this area, we will cover challenges of Information Systems in project-driven organisations: from the overall architecture to systems implementation, development and ongoing management. In this first White Paper we cover the overarching systems architecture.

The systems that are required for project-driven organisations

The basic Information Systems (IS) that are absolutely required to run a large, complex project are:

- A document and correspondence control systems (including advanced workflow management for review and approval, and project control features regarding measurement of physical progress),
- A collaboration infrastructure that works across project locations (including instant messenger, audio and video call and other document sharing capabilities),
- A centralized action-tracking tool,
- A cost control system (which is different from the accounting system, and needs to be more robust than an Excel spreadsheet for Large projects),
- A robust Purchase-to-Pay system coupled with an accounting system that is enabled for global transactions,
- A Supplier Management System (to gain instant supplier visibility, reduce risk across the Supply Chain and drive continuous improvement),
- A number of commitment registration and approval systems, which shall include approval workflows and be captured in a centralized database system to allow tracking, reporting, further analysis and benchmarking, and Business Intelligence capabilities:
  - A timesheet system (not just an HR/payroll tool but a system that allows to capture actual man hours spent on project according to the WBS),
  - A Supply-Chain Management system (allowing tracking of material and systems from engineering Material Take-Off up to on-site receipt, warehousing and issuance; including expediting and the management of complicated subcontracts),
  - A logistics commitment system,
  - A construction / operation reporting system,
  - A commissioning system.
- A scheduling tool.

> **The implementation of a sound IS governance is essential.**
> **All decisions to procure systems in the company should be carefully reviewed and evaluated before being authorized. The issues of security, data management and backup can then also be addressed.**

In addition, the following systems may provide additional value:

- A Business Intelligence Suite to make sense of information and develop advanced dashboards that are updated regularly to reflect the latest status of the project,
- A risk analysis system using Monte Carlo analysis (for both cost & schedule risks),
- A project internal social network system to allow focused discussion and collaboration.

For organizations that have not dealt previously with Large, Complex Projects, the investment to setup those systems properly is substantial. It needs to be anticipated several months prior to the start of the project.

Architecture challenges for project-driven companies

Dealing with remote locations

Information Systems must work seamlessly in all project locations. Large Complex projects often involve offices across countries and continents and sometimes involve very remote locations with limited bandwidth or connectivity (using for example satellite links). Depending on the situation, reliable replication of part of the databases might be required. This is particularly the case for document control systems that involve heavy files: replication is mandatory for satisfactory usage and response time. Replication needs to be performed with sufficient reliability. On-site documentation and information must also be properly synchronised to ensure that the latest updated data is always used for construction.

Implementing easy interfaces with third parties (suppliers, Clients, independent verification bodies, others)

Large project execution involves many interfaces with third parties. Information must be transmitted and then processed using robust workflows to maintain control. For example, supplier documentation must be reviewed and commented; and possibly sent to another third party like a client or an independent review body for further

commenting. Other interfaces may involve data. Interfaces with third parties must be automated as much as possible and link directly into the project processes as much as possible. This avoids substantial manual intervention, lowering cost and also avoids risks of mistakes and oversights.

This topic is an issue where legacy security policy enforced by IT departments may be a hindrance. Secure gateways and proper user rights management can be set in place to allow information to be exchanged without jeopardizing the security of the project data. At the same time it is essential to recognize that:

- Many large, complex projects are run in partnership or Joint Venture, requiring de facto access to the system for people from the partner,
- Most of the value of modern technology lies in facilitating transactions with third parties; therefore, the implementation of traditional approaches where the systems are not accessible from any third party is obsolete.

This issue relates to governance and it is essential that business needs be considered and imposed on too traditional security approaches.

Data Coding

The definition of a comprehensive coding system to cover all materials and systems, activities, organisational structures, cost elements is an essential element of the overall Information Systems architecture. This coding must be defined beforehand to avoid uncontrolled creation of codes in the processes covered by the system. It must cover all project and business needs and be suited to the business model of the company. For example it must include configuration management for projects involving series manufacturing, or be suited to the level of detail for the material that need to be ordered and tracked depending on the contracting strategy.

Common Architecture and Governance Issues

Common systems architecture and systems governance issues include:
- Duplicate systems with similar/overlapping functionality, often created by uncontrolled procurement of systems by projects, due to the urgent need to respond to an operational requirement or under the influence of a specific client,
- At the same time, software licenses can have been bought by projects and not departments which creates a continuity issue in terms of data access when projects are closed and license payment stops,
- Specific systems are procured due to the wish of some managers to use the same systems than in previous companies, without proper analysis of their

fit into the overall architecture or to the business needs,
- Coding is inconsistent across projects and businesses, which hinders benchmarking and statistical analysis,
- Systems allow insufficient access to external third parties that participate to the project delivery process.

Architecture best practices

When looking at the overall picture, architecture best practices for project-driven companies must follow some principles:

- One single source of truth to minimize risk of mistakes. Duplication of information in different systems must be avoided as much as possible to avoid reconciliation issues. Systems that synchronize or are shared/ accessible between different sites & worksite, and across the project lifecycle (e.g. material management) must clearly identify what is the reference information.
- Ensure shared coding (breakdown structures and consistent references) across all levels and all relevant systems. This implies for example to include certain coding in systems that do not cater for it as a standard (example: Work/Cost Breakdown Structure coding in the accounting system).
- Maximum use of database-based systems to allow automated reporting using a Business Intelligence tool to allow enhanced data visibility and analysis.

How to implement an overall architecture view and a robust governance

Only by taking a bird eye's view on the overall Information Systems architecture can the gaps and duplication become apparent, as well as whether the best practices listed above are applied.

The mapping exercise of the overall IS architecture and of all available Information Systems, which has to be performed on a template listing all basic systems requirements for project-driven companies, is often eye-opening for organisations. It is the first step towards developing a sound architecture evolution roadmap. During that exercise, it is not rare that participants mention the existence of systems unknown to the rest of the organisation (concept of "shadow IT").

Implementing a robust Governance

The implementation of a sound IS governance is essential. All decisions to procure systems in the company should be carefully reviewed and evaluated before being authorized. The issues of security, data management and backup can then also be addressed.

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This often requires some form of centralization at the executive level. Proposals for the procurement of systems are reviewed centrally by an executive committee that ensures that the overall Information Systems architecture follows the expected evolution roadmap. Decisions regarding the upgrade of existing systems can also be taken in the same location.

In addition to ensuring that future projects will benefit from an IS infrastructure that responds to their business needs, governance discipline is essential to ensure that the data from projects can be reused with value by the business in order to improve or for transverse analysis that will create value.

Integrated Systems or Suite of Specialized Systems?

Contrary to the message brought by ERP vendors, a suite of specialized systems rather than a single integrated system (~ERP) is more effective in terms of control and efficiency and less costly to implement and maintain. System interfaces at key process points can generally be designed easily provided a suitable coding system has been developed. The interest to have an integrated system is often counter-balanced by increased complication and maintenance and administration cost. This issue must be carefully examined when drafting the overall system architecture.

Conclusion

Proper mapping the overall Information Systems architecture is needed to ensure that all the needs of project-driven businesses are satisfied. Specific aspects must be accounted for in the project business such as access from remote, less connected sites and interfaces with many third parties through secure gateways.

Standard data coding is an essential piece of the overall Systems architecture and often requires substantial effort to be developed.

Appropriate governance must then be setup to ensure that the Information Architecture evolves according to the expected roadmap.

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References

White Paper 2012-08 'How To Build Quickly and Cheaply the System Infrastructure You Need to Execute a Large, Complex Project'

White Paper 2012-19 'The Economic Justification of Proper IT tools to Support a Large, Complex Project'
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