The CEN ORCHID Roadmap

Standardising Information in the Plant Engineering Supply Chain

Direction & Framework
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The ORCHID Vision

The ORCHID (Orchestration of Industrial Data) Group is a network of European companies and consortia dedicated to standardising information across the process industry engineering supply chain to build competitive advantage. It is sponsored by CEN – the European Committee for Standardisation. The ORCHID Group Vision is focused on achieving information interoperability as stated below.

**Vision**

“Companies in the process industries shall be able to share and/or exchange electronically the information needed to design, build, operate and maintain process and power plants using internationally accepted standards.”

This ORCHID Roadmap brochure provides a framework for companies to progressively build capability to achieve interoperability internally and externally across the engineering supply chain. The specific goals of the Roadmap are to help businesses:

- Understand the key principles and business requirements for progressing information standardisation internally and externally.
- Assess the information maturity of their business as well as that of industry competitors and partners.

- Work individually and with industry partners to improve information management with emphasis on standardisation of information internally and across the engineering supply chain.
- Work with industry standards consortia to assure the required set of standards, tools and services are available in a timely manner.

The ORCHID Group has also produced a step-by-step Implementation Guide for the Roadmap which is available on the CEN ORCHID web site.

Information Standardisation

Benefits and Barriers

**Why invest?**

The speed and cost of designing and engineering facilities are hampered by a lack of verifiable information and unclear definitions of equipment between parties exchanging information. There is an even greater impact during operations and maintenance phases where inconsistent information can compromise health, safety and environment (HSE) and asset integrity. The benefits of standardising information to build common understanding across the supply chain include:

**Reliability and HSE**

Reduced chance of misinformation across the supply chain, which is crucial for reliability and plant integrity. It is also an opportunity to source better-quality goods in terms of safety and environmental performance.

**Faster Delivery**

Work is completed more quickly and efficiently because of the accuracy and consistency of information available internally and obtained or exchanged externally.
The most important action for all companies involved in the process and power industries to achieve information standardisation is to adopt a common dictionary of classes and their definitions. This would support the creation of any number of product model dictionaries. This collective standardisation action would remove the biggest barrier to interoperability internally and between parties.
The ORCHID Roadmap has eight levels of information maturity in a company – four internal and four external, as described in Figure 1. The bars indicate a phase of improving (or increasing) maturity level within that bar.

**Figure 1: The ORCHID Roadmap Information Maturity Model.**
Internal Information Maturity Phases

Internal organisation and standardisation of information is critical before considering exchanging information with external parties. How well internal work processes are standardised and the corresponding information integrated is a measure of how far a company has progressed in maturity. The higher the level of process integration internally, the better information will be defined for exchange.

The “Work process standardisation” phase is focused on a single repetitive work process within a certain group or discipline. A company will strive to achieve the demonstrated process improvement via best-practice teams or other means. Other typical drivers for a company to standardise work processes are globalisation and multi-office projects. This phase is typically bottom-up, pragmatic and not necessarily focused on international standards for lifecycle information.

The “Sub process optimisation” phase is still focused on relatively isolated work processes but tries to achieve higher efficiency by eliminating overlapping or unnecessary steps and/or automating steps. This is often associated with the introduction of standard packages or other IT tools. A strategic direction and work processes are typically being developed to fit in to the overall picture of the organisation. The role of international standards is often still limited.

The “Internal process integration” phase aims to integrate isolated work processes, reducing information overlap and achieving the next level of efficiency. The information interdependencies become very clear at this stage, and the lack of information definitions makes integration difficult. The requirement of information standards, preferably international, becomes evident at this stage. People recognise that exchanging information with external parties will be very difficult without international or commonly used definitions.

The “External process integration” phase focuses on exchanging lifecycle information by integrating external parties work with the internal work processes. Since most internal processes and information are now fully integrated, the next efficiency gains can be made by addressing the “missing external links” as well as the application of available international information definitions. In the ERP world, this move has started with B2B and similar initiatives. The high level of internal ERP process integration resulting from implementation of packages like SAP and Oracle has been one of the big enablers behind B2B. Similar tight B2B integration is expected between internal lifecycle information warehouses of equipment suppliers, engineering contractors and plant owners in these phases.

External Information Maturity Phases

These phases are based on the capability of companies to exchange plant and product lifecycle information with external parties in the plant engineering supply chain.

The first phase, “One to one exchange of information”, is defined for a specific project specified by a plant owner and carried out by an EPC contractor. Typically, the customer dictates the format and structure of electronic information deliverables. This also includes their information needs for maintenance and operations. Standard tools are often specified instead of specifying detail on every information item. The information deliverables specified depend on the internal information maturity of the customer.

In the “Closed communities” phase, a small group of organisations agree on a common but limited set of generic definitions and exchange information according to these rules. These agreements are often made to improve the procurement process. Examples are: suppliers standardising their catalogues, and exchange of information with piping subcontractors or project alliances between a number of partners. Common definitions are not always based on international standards and differ from those used in other communities.

During the “Open communities” phase a higher level of integration is required as more parties are involved, including some not known at the start of the project. Information definitions become more complex and international standards become important. Examples in this area include: clients reviewing online designs from an EPC, the exchange of standardised information sheets between equipment suppliers and engineering contractors, and the exchange of spare part information between equipment suppliers and plant owners.
The “Maturing supply chain exchange” phase is when exchange can be done “cradle to grave”, from front-end engineering, EPC, operations, maintenance and revamps to demolition. All the different parties can pass the information, and international standards have matured such that this process is supported. Many-to-many integration and a high degree of collaboration is typical in this phase.

The Key Principles of Standardisation (available on the CEN ORCHID web-site) are crucial in the four external information maturity phases of the Roadmap. This includes agreeing a common dictionary of classes, agreeing common attributes as well as common collections of attributes per class to be used in any one project. It also includes the use of internationally accepted standards wherever possible and a common delivery “envelope” (e.g. XML).

Steps taken in external maturity need a prerequisite step in internal maturity. However, a step in internal maturity does not necessarily require a step in external maturity. This is because improving internal efficiency is relatively easier for a company than agreeing a common approach with a third party. This process is depicted in Figure 2 below.
Assessing a Company’s Information Maturity
A company’s position on the Roadmap will vary depending on the extent of investments made in information management, its experiences, initiatives and projects undertaken internally and externally. A company can be operating at a number of different maturity levels at any one time. The objective should be to progress both internally and externally as well as moving from left to right and from top to bottom for external phases, and bottom to top for internal phases on the Roadmap. The ORCHID Group has defined the following five dimensions to characterise the phases. The level of achievements in these respective dimensions determine the position within each bar/maturity level.

- Business processes
- Strategic alignment
- People & Organisation
- Plant Lifecycle Information
- ICT Technology & Infrastructure

Industry Progress to Date
During 2002-2006, USPI carried out “data readiness assessments” measuring the maturity of six large companies covering Owner/Operators, EPC contractors and Equipment Suppliers in the plant engineering supply chain.

The assessments as shown in Figure 3 demonstrate that the average internal information maturity of those companies was between Phases I-2 and I-3 on the Roadmap. Externally, the industry average was between X-1 and X-2. There were significant variations of maturity between the best in class performers and the less advanced companies, in particular for external information maturity. It is expected that these companies will have progressed further in the time since the study was conducted.

When the roadmap was first published in 2002, the actions required to attain the vision lay almost entirely in the “future” as few lifecycle information standards were available and this limited the adoption of other actions. The situation today is quite different, with a range of standards now available, including ISO15926, ISO13584, ISO15288 and ISO10303. Industry experience of implementing these standards has also improved. This is reflected in the estimated industry position on the ORCHID Roadmap in 2010 which is shown on Figure 1.

In addition, an increasing number of companies are now successfully adopting standards to benefit their business, for example:

- BASF and Endress+Hauser implementation of NE100 for specification, purchase and engineering of instrumentation equipment.
- Siemens Energy & Oil rationalisation of their product class libraries using ISO13584 and eCl@ss.
- Shell’s use of ISO-15296-4 to define its internal engineering information standards for use in ERP and project specifications.
- Croon TBI Techniek use of ISO15926-4 and Gellish to integrate information in tunnel projects such as the Coentunnel and Westerschelde tunnel.

Some fifteen examples of successful implementation are included on the CEN ORCHID web site. These examples provide useful learning points for other companies pursuing information standardisation.
Each stakeholder in the plant engineering supply chain faces different challenges and therefore has a different perspective on the path it needs to follow in the ORCHID Roadmap. The following is an outline of key challenges and some recommended actions for each stakeholder group. As stated previously, a common dictionary of classes is the single most important requirement for all organisations in the plant engineering supply chain to achieve standardisation.

**Owner Operators**

Owner Operators employ Computerised Maintenance Management Systems (CMMS) sometimes linked to document management systems and corrosion management systems, amongst others. These systems have to be loaded with asset management master information that comes from a variety of suppliers, with a variety of classifications, in a variety of forms (paper, files, images, vendor instructions, etc); or in a variety of applications with varying degrees of overlap and consistency.

All these systems should ideally be fully loaded and operational at start-up of the plant. The biggest challenge is to extract the required master information, consistently classify it, create consistency across the attributes, link it appropriately to each other, and sort out the formats and units of measure to create the “digital” as-built situation.
Owner Operators should not look to new IT platforms as a "silver bullet". In fact, current applications already have more than enough functionality for mature information exchange – the key issue is that they are not often fully loaded with a comprehensive set of master data.

**EPC Contractors**
EPC contractors deploy a set of engineering, design, material management and construction systems which are configured to match both the EPC contractors work process and the project requirements. These are typically home-grown with tight checks and balances with internal EPC processes. In the EPC phase of the project, information is very volatile and EPC systems require a large degree of flexibility.

The hand-over requirements need to be developed early in the project, because it has an impact on how the EPC will supply the information from its internal IT applications. Owner Operators often do not have a full Operations and Maintenance organisation in place to develop their requirements early in the project.

Equipment suppliers provide their information in many different formats and combinations to cover for the variety of equipment models they can supply – even though one specific model of equipment is eventually supplied. The challenge for an EPC contractor is to manage the supplied information with the requirements of the Owner Operator. Often entire manuals rather than relevant extracts are handed over.

**Equipment Manufacturers**
The Equipment Manufacturers supply products to very different process industries, including oil, gas, petrochemicals, pulp, paper, chemicals and pharmaceuticals. The Equipment Manufacturers also supply their equipment to other industry sectors such as shipbuilding, automotive, aerospace and defence industry. The ORCHID Roadmap provides a model for Equipment Manufacturers to progress information standardisation with their customers. It is particularly important for Equipment Manufacturers to encourage the adoption of common definitions for classes by their various buyers. This would help Equipment Manufacturer SMEs to more easily bid for a wider range of projects.

**Software Manufacturers**
Process industry representatives in the software industry usually await clear demand signals from their clients before they develop application software. The Orchid Roadmap will make it easier for process industry to define its needs for lifecycle information and to communicate these to Software Manufacturers.

**Industry Groups**
Some relevant trade associations and consortia working on information standardisation for the process industry in Europe are listed on page 9. These Groups have a responsibility to work with their respective members on working towards common standards and interoperability by applying the Roadmap. It is also critical that strategies and plans on information standardisation are shared and pursued in partnership with their branch organisations feeding the supply chain.

Most importantly, these groups need to collaborate on joint programmes to pursue a common dictionary of classes.

**Engineering Consultancy Firms, Services Suppliers Training Institutes, Universities**
These companies will use the Roadmap to help develop knowledge, skills and capabilities across the process industry supply chain to accelerate information standardisation.

**Government and Regulators**
Governments and Regulators in Europe have an overall role to support and encourage standardisation to improve competitiveness of the process industry globally, and particularly for SMEs. The Roadmap is a useful tool for monitoring and supporting these efforts. It is expected that the role of the regulators the coming years will increase significantly in Europe thus giving an extra impetus to standardisation.
1. Review the full suite of CEN ORCHID Materials

www.cen.eu/cen/Sectors/Sectors/ISSS/Workshops/Pages/workshopORCHID.aspx

2. Contact the offices of the European groups involved in the CEN ORCHID Project

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