Interface Management (IM) in Liquefied Natural Gas Projects
Lessons Learned from Today’s Capital Projects

By: Dawn Fiander-McCann
Industry Consultant, Coreworx
# Contents

Glossary .......................................................... 3
Executive Summary .......................................... 4
Background ...................................................... 5
Introduction ..................................................... 6
Lessons Learned in LNG Projects Using Interface Management ........................................... 7
  1. Define Interfaces as Early as Possible .............. 7
  2. Governance: Agreement on Common Reporting Measures ........................................... 8
  3. Create and Distribute a Communications Plan ......................................................... 8
  4. Include Shared Ownership (Players and Roles) ....................................................... 10
  5. Manage Updates During the Project Execution Phase ............................................. 10
Conclusion ....................................................... 11
About Coreworx ................................................ 12
About the Author ............................................... 12
Bibliography ..................................................... 13
## Glossary

| Term                                           | Definition                                                                                           |
|---|---|---|
| Asset | The capital asset or facility that is constructed and/or expanded through a capital project or significant parts of it. |
| Contractor | For purpose of this paper, Contractor includes Contractors, Engineering Procurement and Construction (EPC) companies, Vendors, Suppliers and Manufacturers of project deliverables. |
| Data | Data is defined as both:  
• loosely-structured electronic content (e.g., Word documents, PDF files or drawings that may or may not be accompanied by metadata)  
• highly-structured electronic content (e.g., rows and columns of a data sheet, asset data that can be directly loaded to an asset management system with minimal transformation). |
| FEED (Front-End Engineering & Design) | The front-end loading, planning phase of an engineering mega-project. |
| Interface Point | The point or boundary where the responsibility for a physical connection or system transfers from one party to another. |
| IM (Interface Management) | A collective Project Management term used for capital projects to denote a contractor or management program for intersecting or dependent scopes of work or interface points. |
| LNG (Liquefied Natural Gas) | A term used to denote natural gas that has been liquefied for purposes of storage and transport. |
| Metadata | Attributes describing the associated project information. Examples of metadata include: document ID, due date, title, discipline, etc. |
| Operations | The Owner’s department responsibility for ongoing facility operations and maintenance. |
| Project | The organization responsible for a capital project, including planning, design, procurement, construction, commissioning and handover activities. |
| Project Information | All documents and data that are considered project records. This includes asset information, project execution information, vendor data, interfaces and compliance information. |
| PIM (Project Information Management System) | A full service project lifecycle information tracking system. PIM Systems are characterized by their ability to integrate and track project activities. PIM systems define and track multiple stakeholders, the history of activities and project decisions and deliverables using such infrastructure tools as document management repositories. |
| PM | Project Management |
| Vendor Data | All data deliverables collected in a project that support project deliverables, typically assets. |
Executive Summary

Matters of communication and status are often taken for granted in a capital project environment. There is an expectation that sufficient communication and information sharing will simply occur. For years, email was the de facto ‘record’ of activity, but has quickly lost credibility in capital projects and during litigation as the preferred, auditable business communication method.

Projects require consistent, accurate and single-message communications as much as possible. This is primarily driven by the human element - the project stakeholders - who have little to no time to develop a comfort level with project knowledge sharing with the pace of capital project execution. One of the most pronounced examples of this need is in the discipline of interface management, where a well-defined and managed process is essential.

Administration of interfaces without an overall view of the Project, as seen in stand-alone Excel or Access-based Interface Management (IM) tools of the past, is an insufficient response to the risk associated with interfaces in Liquefied Natural Gas (LNG) Projects. These projects require an IM tool capable of evolutionary interface management in the context of the Project’s activities. Lessons learned show that Projects must allow interface definition to evolve within a defined scope, within a defined change management process, and provide a collaborative environment for stakeholders.

In addition to a collaborative IM tool, lessons learned show that key project activities including purchasing, construction and quality acceptance testing are inextricably tied to project interfaces. As such, the Project is best served when the IM tool is fully integrated with the Project Information Management (PIM) system. This allows the Project to track and maintain the relationship of project interfaces with all key project information.

Without an integrated PIM and IM solution, tracing back a decision record for an interface, or investigating the details of a technical interface to support safe and efficient Operations once the facility is commissioned can be like finding a needle in a haystack. Investing in a fully integrated PIM and IM solution is a proven approach to address interface-related risk, and achieve more complete and accurate data for handover as commissioning and startup occurs.
**Background**

Interface management in capital projects require all stakeholders in the facility delivery to share information about the status of their interfaced deliverables, including where their deliverable interfaces lie and, therefore, impacts another stakeholder’s deliverable. For example, in the construction of an LNG facility, there are ships that extract the gas. The ships dock to an LNG facility, and pipes take the gas to the treatment plant so that it can be cooled sufficiently to store it. The facility itself treats the gas for storage and transport.

One of today’s largest LNG projects, Ichthys, an LNG project with major onshore and offshore scopes in Australia, has at least 30 stakeholders include Engineering, Procurement and Construction (EPC) contractors, manufacturers and Operators\(^1\). Among the awarded contractors, KBR, Technip or the tank EPC, Kawasaki will work together, delivering to different but interfaced timelines for Operators INPEX and Total. KBR may design the facility; Technip may design cooling systems for the facility while Kawaskai is building the tanks. Each has a specific role and tight, budget-constrained delivery times\(^2\). Interfaces will exist between these companies and quite possibly have nested interfaces within their contracted scopes, i.e., interfaces within interfaces.

Given the volume and technical complexity of LNG interfaces, how are LNG project stakeholders not to be preoccupied building and delivering to their siloed scopes? An integrated direction or view is often left to the Operator to assemble, monitor and manage. The Operator, therefore, becomes the driver of how overall interface communications will occur. Inter-stakeholder communications do not often flow freely unless they are intentionally planned and measured. This leadership falls squarely in the lap of the Operator to establish. The Operator is relied on as the hub, with the contract entities acting as the spokes. Spokes typically do not communicate independently without the hub. However, contractors are the responsible party for an interface and must have a means of communicating independently without always going through the Operator. Expecting the Operator to participate in every interface-related communication is unrealistic, but acting in an oversight role for all of the spokes to promote cooperation is achievable.

Cooperation in interface communication is difficult. Key factors contributing to this challenge include information sensitivities around engineering design, differing cultures, expectations for delivery times and varying communication styles. Some parties work to dates, some do not. Projects typically prefer a more formal, written style of communication, while existing Operating facilities may tend to rely more heavily on verbal communication\(^3\). Some cultures are also more comfortable and reliant on hierarchical management environments that drive communications than others. Therefore, change is inevitable and should be tracked.

Overall, from an Operator perspective, interface management nirvana means there exists a point where stakeholders act as an integrated team and where reporting is consistent across all silos and geographies. Looking at the model set by project information management systems, the Operator’s interface management tool should mirror the work processes, roles and enforce due dates by leveraging a technology foundation that is also capable of reporting change and risk.

---

Introduction

Industry experts indicate that Interface Management issues can account for up to 20% of a project’s cost\(^4\), and the larger the project, the more interfaces and the greater the project risk to both the asset owners and the contractors. LNG facility construction encourages efficiencies in managing interconnecting scopes of work, making interface management a critical discipline in successful project execution. The huge scale of these projects require a robust set of tools to provide sufficient information to paint a singular, clear project picture throughout the project lifecycle. Of the many published lessons learned from LNG projects, there are five key lessons that relate to interface management and should be considered:

1. Define interfaces early and in as much detail as possible during the project planning or FEED\(^5\) phase using a governance model that can be replicated in a tool to manage Stakeholder communication, workflow and respective deliverables.
2. Establish a governance model, where the project team agrees to common reporting measures for different silos and geographic locations.
3. Jointly create communications plans to accompany the project’s interface management program for how contractors will communicate and how conflict will be resolved.
4. Develop a culture of shared ownership. A culture of collaboration should be established early on and maintained throughout the project.
5. Manage updates during the project execution phase so that Interface Management is an integral part of the project’s overall information management strategy and can be included in handover.

The goal is integrated knowledge management during project delivery and through to the handover to the Operator. Interface definition can be achieved in various ways. Operators can minimize interface-related risk with up-front planning and due diligence supported by a high-quality interface management solution framework\(^6\). Interface management surprises will always occur. However, whenever possible an attempt to identify most interface points during FEED and share the details during the bid process should be undertaken before contracts are awarded.

\(^5\)FEED, Front-End Engineering and Design
\(^6\)Author, History Does Not Repeat Itself but It Does Rhyme, FLNG
Lessons Learned in LNG Projects Interface Management

1. Define Interfaces as Early as Possible

LNG projects typically define interfaces such as:

- space efficiency,
- hull conversions,
- topsides weight estimates,
- piping weight estimates

By representing each of these interface scopes in an IM tool, the individual interfaces can be isolated for purposes of monitoring, control and risk identification. At the same time, the attributes tracked for an interface can be used to aggregate up to a project level for reporting and dashboard creation purposes.

For example, a hull conversion interface may have an impact on an EPC stakeholder, the shipbuilder and the Operator. As part of the overall project, that interface can have due dates and a schedule with it. Using a responsibility matrix, a project information control tool can attribute roles to the interface for inbound and outbound transmittals, enabling restricted access to the interface status on a need-to-know basis from the point of first identification of the interface. If changes are made to any of the interface components, participating roles defined for that interface may be electronically informed. The interfaces can exist as predefined entities whose changes are recorded and auditable.

It is important for projects of the scale of typical LNG projects that all participant stakeholders have a singular, integrated view of each of their deliverables and their respective impact on the overall project. An LNG facility has complex infrastructures that have both land and sea implications with multiple feeds coming into one processing plant. All levels of information are important as they impact:

- Overall project scope control
- Safety procedures (during and after the project)
- Intra-project stakeholder deliverables
- External stakeholder deliverables
Operator’s participation in project communications oversight is effective as it provides a basis and methodology for interface definitions. Interfaces generate a tremendous amount of information which quickly becomes unmanageable if the governance, reporting and collaboration models are not supported electronically. Where there are no such support tools, and multiple project stakeholders spread out over multiple time zones with differing priorities, sharing information is nearly impossible to manage manually, e.g., chasing email threads and spreadsheet versions. Stakeholder collaboration can only occur when interfaces are defined early and consistently reinforced (through reporting) throughout the project lifecycle.

2. Establish a Governance Model that Includes Interface Management

The activities of a project, including purchasing, construction and quality acceptance testing are inextricably tied to project interfaces. There are dimensions of these activities that are also necessary to capture as they trickle up or down to impact project deliverables. As an example, engineering design decisions made regarding pump flow are related to purchasing, as any delay in a pump flow engineering decision may impact a manufacturer in the pump’s lifecycle, and ultimately impact the interface.

By focusing on a governance model for interface management, commonly-defined reporting metrics and project controls can be reinforced electronically. This is most easily achieved when the IM tool is fully integrated with the PIM system, resulting in a single governance model for that includes IM project controls.

The model must be capable of evolutionary interface management in the context of the Project’s activities and not revolutionary interface management with no overall Project view or consistency of control. This means that Project change is inevitable and should evolve within a defined scope with defined reporting and change management processes. However, change anarchy that revolutionizes a scope, i.e., change gone unchecked and off track with no overall project, would be unmanageable for an Operator.

As an example, if two project stakeholders sharing the same interface deliverable in Perth, Australia decide to track activities against due date, and another pair of interface stakeholders decide to track activities against percent complete, rolling up reports to a common IM status report will be difficult. Reports thought to contain the same content would be compromised, risking confusion and ill-informed decision making. Where priorities for reporting are common, management level reporting will be more consistent and there will be fewer report content conflicts on the project.

3. Create and Distribute a Communications Plan

Manageable projects are informed projects with a blend of both informal and formal communications. The former results from efforts to bridge team gaps and ensure shared project scope interpretations. The latter results from a formal communication plan designed at the FEED stage, which should include:

---

• Developing scheduled communications or status reporting.
• As detailed as possible definition of all interfaces and responsible parties.
• A plan for conflict resolution for project stakeholders.
• Implementing an IM tool with a multi-layered capacity for submitting, distributing, assembling virtual teams, collaborating and commenting on all aspects of interface delivery.
• Consistent reinforcement of the communications plan and expectations to all project stakeholders through face-to-face meetings, supported by electronic messaging and follow up.

Part of the missing piece in managing this information is that often Operators have the only view of the dependent deliverables. Contractors may be reluctant to share their deliverable statuses with those of other contractors; however, communications needs to be open\(^8\). There may be cultural hurdles to overcome in the communications plan as well. However, not knowing how a late deliverable of a dependent interface negatively impacts the overall project keeps a contractor in the dark as to the urgency of his deliverable. Properly planned, this knowledge can encourage either:

• Communication as to why the deliverable is late, whereby all parties can meet to determine possible mitigation or find creative solutions for improving the situation, or
• Formalization of the deliverable by a third party through a reporting mechanism or the Project’s IM solution.

A common IM tool should incent all stakeholders to participate, particularly if reporting and relevant project controls are all generated directly from the IM tool. Ideally this technology would have the capacity to create system-specific virtual spaces in which to track interfaces and their changes. As an example, a search that details where there is a multi-disciplined team dealing with more than one set of contractors is useful, such that the work scope contents can be viewed and grouped as needed. Using an IM tool, the “mini team” can upload and download the information needed to manage the interface and changes. In support of the Communications plan, an IM tool should have the following attributes:

1. The ability to identify interfaces, the status of those interfaces, tie dates to them, record any documentation in support of the interfaces, identify overdue tasks and report status against an integrated scope of work.
2. The ability to represent interconnecting scopes of work for the scope interfaces, both independently, and as a unit for Operator oversight and integrated reporting. The tool must be capable of managing, supporting and delivering tens of thousands of interface communication messages. It should be accessible from virtually any end user computer.
3. The ability to simplify a collaborative environment for uploading and downloading documents and creating and receiving notifications to ensure users comply with usage and content is consistent.
4. The ability to define and customize interface attributes so that reports can report on interface-specific attributes and roll up to project-specific dashboards.
5. The ability to create workflow scenarios for proactive response to submitted or changed documents and notifications
6. The system should be an integral part of the controlled information within the PIM system. IM information can then be easily transitioned to the Operator’s operational systems as part of the project handover package.

\(^8\)ibid
4. Include Shared Ownership (Players and Roles)

Poorly, or undefined interfaces impose great risk on LNG projects. There are always multiple stakeholders and multiple unknowns. Contractor conflict regarding interfaces – which should be anticipated - can impact schedule and budget and have complex supply chain implications. This can ultimately affect project deliverables in upstream facilities, liquification plants, carriers, terminals and offshore vessels.

Using the Ichthys example, where there are a vast number of project stakeholders involved in the $34 billion project, the project players and roles are numerous. The companies within those organizations contain roles in terms of the contractor but also project level roles. Given the complexity, communications challenges and roles within each of the stakeholders are understandable.

Communications plans can address stakeholder ownership, roles, communications expectations and how conflicts will be managed. An ideal scenario would be where the Operator, the Project organization and the various contractors could jointly identify project risk and interfaces early on. Tools assist and publicise deliverables, delivery dates and risk; however, the active participation of parties delivering the interfaces will encourage a shared success approach that will mirror the project’s deliverables and tracking methodologies.

5. Manage Updates During the Project Execution Phase

Steps taken to formalize a communication plan and define project interfaces at FEED set the foundation for managing updates and keeping both internal stakeholders (e.g., Project and Operations) and external project stakeholders (Management - Public and Regulatory) informed. This sets a consistent tone that serves the Project well for all communications, reporting and information handover.

The IM tool can be leveraged to act as a record for updates for use both internally and externally. It is unlikely that the Project will include external stakeholders (e.g., regulatory or permitting authorities) in its IM tool. However, if the IM tool is sufficiently leveraged, it becomes an information asset from which all updates are generated and shared.

---

**Conclusion**

LNG projects, like other large capital projects, benefit greatly from clear communications and front end planning. They are differentiated, however, by their unique geographic challenges: both surf and turf, where a large variety of contracting expertise is required. A collaboration environment is required to properly support ongoing communication and status reporting.

Project interface points have many dimensions and without proper structured communication, decision threads will be difficult to follow and, therefore, impossible to audit. Attachments to email communications do not meet the level of reporting and auditability required to meet the information requirements of interface points on an LNG project. Investing in a fully integrated Project Information Management (PIM) and Interface Management (IM) solution can incent and empower contractor collaboration for more governable information outputs. Where Operators create a neutral, integrated IM environment for contractors and define interfaces early, they can create a communications plan, govern and audit ongoing updates and activities. They can then clearly delineate ownership and regain project oversight.

Defined interfaces and structured communications plans, however, must be supported with a tool that is flexible enough to provide a collaborative environment where change is managed, recorded and auditible for future decisions or to prove the rationale for past decisions. Operators who recognize the project risk associated with interfaces, and who are taking a more active oversight role in interface management, require integrated document management tools to support interfaces that can tie directly to the Operator’s PIM System rather than using a simple file attachment to an email.

Although PIM is not a new concept, the LNG lessons learned here provide realistic, proven approaches to addressing interface-related risk, identifying discrepancies, resolving conflict and achieving more complete and accurate data for reporting shared interface statuses.
About Coreworx

Coreworx is a pioneer in the development of interface management solutions. Its real time interface management is supported by a proven tool and does not forge new ground. Coreworx’s first commercially available Interface Management solution was developed in 2007 while working with major Engineering Procurement and Construction (EPC) companies acting in a Project Management Consulting (PMC) capacity in offshore oil & gas projects.

Coreworx’s Interface Management product is ideally suited to information collection, communication management, reporting and is fully integrated with their PIM solution. A flexible, proven collaboration environment provides the upfront planning structure an LNG project needs to support the lessons learned detailed in this paper. Recognizing the changing technology and business landscape regarding LNG projects, Coreworx is committed to continued innovation in interface management. This is especially evident in their ongoing sponsorship of collaborative research with NSERC and the University of Waterloo, and their participation in the Construction Industry Institute’s (CII) 2012 research project on interface management.

About the Author

Dawn Fiander-McCann is an Industry Consultant with Coreworx. Dawn brings clients over 23 years experience in systems and asset lifecycle project management. Her extensive mega project experience includes roles as Senior Program Manager, Project Manager and Business Analyst at four of Alberta’s leading oil producers and a major pipeline company. Dawn has also held senior positions at IBM and with IBM business partners. She is a member of a Calgary-based sustainable industrial development group and the London-based Global Association for Corporate Sustainability Officers (GACSO). She is also enrolled in INSEAD’s Executive Masters degree program in Consulting and Coaching for Change. Dawn currently resides in Paris, France.
Bibliography


Iris D. Tommelein, Kenneth D. Walsh and James C. Hershauer, Improving Capital Projects Supply Chain Performance; Construction Industry Institute Study Report 172-11, May 2003

John Fish, Front End Planning presentation, You-Tube Coreworx Inc. Channel, (http://www.youtube.com/watch?v=5hAD9AEMYlk.), June 2011

John Walewski et al, Development of a Project Risk Assessment Tool, Construction Industry Institute Study 181-11, December 2003


