Improving Project Outcomes with Interface Management: A Case Study

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Introduction

As capital projects grow in scope and complexity, there is increasing demand for improved cost efficiencies and strict adherence to safety requirements in heavy engineering construction. As such, prefabrication and modularisation are becoming preferred modes of construction, allowing project components to be fabricated anywhere in the world by the most qualified and cost effective suppliers and then assembled on-site. However, this new method of construction brings a number of key project management challenges, including:

- Coordinating stakeholders across various geographies, languages, and time zones
- Unique planning, logistics, and project management needs, including interface management
- Ensuring hook-up and commissioning occur in the most logical sequence

With so many stakeholders involved and extremely complex projects to build, interface management (IM) aims to keep all involved stakeholders aligned in order to ensure the safety and integrity of each project subsection, as well as the integrated performance of the project overall.

This case study examines how the assembly of a gas turbine generator (GTG) package was completely derailed by the mismanagement of interface dependencies within that project’s scope. As a result, the construction and launch of an offshore platform went grossly over time and budget and ended up costing the owner potentially hundreds of millions of dollars in production revenue. This study also identifies how interface management could have been applied to this project in order to reach successful completion of the GTG package as well as the offshore platform project as a whole.
Failed Project Background Information

This study examines the installation and delivery of an offshore project that was delayed by more than one year due to non-conformity issues associated with 3 gas turbine power generation (GTG) packages. These GTG packages were originally designed to be installed in the top deck of the platform at the fabrication site before the topside module barge sea fastening and load out could occur. This delay caused major end product shortages for the client, resulting in massive financial losses in the hundreds of millions of dollars.

Investigation into the issues of this project revealed there was significant confusion with the GTG scope requirements between the package supplier, the EPC contractor, and the client (company). The overall project scope for the EPC contractor was limited to the engineering and provisioning of procurement documentation of the GTGs and did not include the purchase of the GTGs. The client was responsible for the purchase. The 3 GTG packages were provided by the client to the EPC contractor as free issued items and were to be installed on the top deck of the offshore platform at the EPC’s fabrication yard.

The GTGs were designed to be run on diesel or gas. Diesel fuel was to be available in the event it was needed for a black start, as well as any times the gas pressure may not be sufficient to run the gas turbine. The expected back pressure of the diesel fuel in the intersection (i.e. tie-in point) of the GTG was 1.2 Bar and the system required a minimum of one full day fuel consumption rate of the diesel to be available in the GTG day tank.

In the original design, the GTG day tank was expected to be located at an elevation of 15 meters above the platform top deck and the supply pipe to be run to the GTG tie-in point. By this design, the liquid fuel would be provided at the tie-in point of the GTG at a pressure greater than the pressure provided by gravity.

During the early stages of the detail design, the EPC contractor realized the structure planned to support the big day tank did not comply with the overall structural safety design of the platform. To accommodate this safety compliance issue, the EPC proposed relocating the day tank into the same level of the top deck where the GTGs were located, as opposed to the original design of 15 meters above, and the client approved this change. Unknowingly to all stakeholders, this new design would now require a booster pump system to provide the required liquid fuel pressure to the GTG for it to operate.

The newly required booster pump was not properly reflected within the scope supply of the GTGs used in the bidding documents for purchasing these items. As such, the package supplier was not requested to add the booster pumps within the original scope. Even within the late stages of package delivery, none of the parties realized they had overlooked the new system requirements needed to ensure adequate liquid fuel pressure would get delivered to the GTGs.

Once the booster pump issue with the GTG packages was realized, it was late in project execution. Accounting for the change at such a late stage in production ended up being very costly for the client and was not considered in the original project budget. The three booster pump kits were very expensive and the resulting overall changes involved much rework to meet the new requirements and arrange all parts within the platform fuel system and piping design.
The problem was eventually resolved, but the resulting process caused additional issues later on in the project schedule that further jeopardized the project and delayed start-up. The additional impact included:

1. Significant additional costs for the new fuel supply system.
2. Additional time and resources to determine the problem’s root cause and solution.
3. Considerable time and resources required to reschedule the project.
4. Considerable changes to the launching plan due to timing of the new platform completion date (e.g., vessels, crane barges, and marine aids were not available at platform completion and scheduling of these resources needed to occur during favorable seasonal conditions and cyclone-free periods necessary for offshore installation).
5. Additional cost and schedule time to rework and redesign the affected area and systems within the platform.
6. Additional cost for project management team engagement due to extended period for project delivery.

As a result of this major issue, a great deal of blaming and conflict between project parties occurred. Several months of negotiating between the three parties were spent figuring out who was responsible for the mismatch and ultimately, who was going to pay for the associated costs. The client believed the EPC contractors were at fault for not reflecting the proper changes within the PO documents. The EPC contractor believed the client had been informed and had approved the change, therefore should have checked the PO documents to ensure the requirements were met and the package supplier was aware of the change. The supplier, working based on the original design, believed their scope did not include the supply of the booster pumps.
Interface Management

Looking at the root cause of this failed project, it is certain that had an appropriate interface management process been in place, all of these issues could have been avoided. With a properly implemented and executed interface management procedure, the mismatch of parts would have been avoided; in turn avoiding the subsequent delay on the project’s delivery and the additional rework required. Some of the items that would have been addressed if interface management had been used include:

1. The effect of the interface changes would be recorded and reflected in the project plan.
2. The design change would trigger a scope review by the interface management team to ensure all details of the changes are identified and all stakeholders are properly notified.
3. The project integrity would be reviewed by all parties due to new changes identified by interface management team coordination.
4. The interface management team would review all scope limits of all parties and all parties would be informed of the revision in their scope limit and interface supply.
5. All parties would communicate to ensure everyone understands the requirements and limits of each party’s scope, including their own.
6. Regular interface meeting progress reviews would be planned and managed by the interface management team.
7. The project schedule would be linked to the interface management plan and appropriately updated if there is a new change on interface delivery milestones.
8. The EPC contractor’s offshore logistics plan would be revised and updated to reflect the change of installation period and the booking dates of the vessels, barges, cranes, and installation aides would be updated accordingly.

Overall, the project’s final cost, schedule, and plan could have been properly managed if the progress and integrity of project interfaces were monitored and coordinated by a specific project interface management team.

Setting up a proper interface management process with appropriate tools and systems will include additional upfront costs and resources, but can potentially save in the excess of hundreds of millions of dollars by avoiding rework, delays, and production loss.
Improving Project Outcomes with Interface Management

The following sections detail how a proper interface management plan could have been applied to the GTG project to result in better coordination and management of all scope packages and interfaces associated with the offshore platform and resulted in a positive project outcome.

4A – Defining the Project Scope for the GTG

The scope for this portion of the platform included the supply of a gas turbine power generator (GTG) package for an offshore application. The GTG package was one of several projects or scope packages making up the overall offshore platform. Within the GTG project scope itself, there was significant complexity due to the many interfaces spanning many stakeholders. The GTG scope included, but was not limited to, the following activities:

1. Engineering
2. Procurement
3. Fabrication
4. Assembly
5. Testing
6. Delivery
7. Customs
8. Storage
9. Installation
10. Pre-commissioning
11. Commissioning
12. Start-up
13. Handover
14. After-sale support

A challenge for all major projects with so many complexities and activities, like the GTG project, is to clearly define and communicate the scope and objectives to all stakeholders and build a cooperative, well-functioning team to manage the entire project lifecycle. Alignment of key stakeholders is critical to ensuring everyone is committed to and working towards the same goals. The key to this alignment is a well planned and executed interface management process. As you will see in the following paragraphs, had the GTG project followed a process with documented interfaces and strong communications to align and inform contracting parties and establish clear lines of responsibility between the parties, they would have avoided the poor outcome that resulted in substantial expense, rework, and delay.
4B – Identifying Stakeholders

Part of the complexity of the GTG project resulted from the required participation of many stakeholders. One of the key components of an interface management program is to plan how communications will be conducted between various parties. By breaking the stakeholders into specific groups, interface managers can identify and align the strategy appropriately for each stakeholder. Stakeholders need to know what information to communicate, how to communicate this information, and when to communicate it – this is the who, what, when, and how of effective interface management. Looking at the GTG project, the stakeholders would be broken into two distinct groups – external and internal:

**External stakeholders** are those not directly responsible for delivery of the package, although they play an important role in the successful delivery and should be kept informed when decisions or changes are made.

**Internal stakeholders** are those directly responsible for delivery of the package. They are involved in all decisions regarding the package and must be responsible for recording and sharing changes and decisions that have an impact on the project.

The high-level stakeholders of the GTG scope could be identified as follows:

1. The Client – for example an operating company (external)
2. The EPC or Project Main Contractor (internal)
3. The Engineering Company (internal)
4. The Fabricator & Construction Company (internal)
5. The Package Supplier (internal)
6. Third-Party Inspector (external)
7. The Delivery Company (external)
8. Customs Organization (external)
9. Pre-Commissioning & Commissioning Group (internal)
10. Operation and Maintenance Group (external)
### 4C – Identifying Stakeholder Responsibilities

Once all stakeholders are identified, the scope for each stakeholder then needs to be defined. The stakeholder scope needs to be identified during the early stages of the project to clarify each party’s responsibilities and duties based on the role that they are taking in the project delivery. To the right is a list of what the scope responsibilities for each stakeholder of the GTG project could have looked like.

<table>
<thead>
<tr>
<th>The Client</th>
<th>The EPC Contractor (The Main Body)</th>
</tr>
</thead>
</table>
| a) Financial Provisions  
b) Insurance Provisions  
c) Local Site Provisions  
d) Local Regulators & Authorities Coordination  
e) Customs Arrangements  
f) Standards & Rules Identification | a) General Coordination  
b) Bidding Arrangement & Evaluation  
c) Contracting and Technical Coordination  
d) Project Quality Control  
e) Project Integrated Scheduling  
f) Progress Overall Review & Control  
g) Engineering, Construction, Commissioning & Start-up Coordination |

<table>
<thead>
<tr>
<th>Inspector</th>
<th>Mover</th>
</tr>
</thead>
</table>
| a) Material Inspection & Certificate Report  
b) Test Inspection & Certificate Report  
c) Delivery Packing and Checklist Report | a) Road & Ship Delivery Coordination  
b) Transportation Scheduling  
c) Transportation Arrangement |

<table>
<thead>
<tr>
<th>The Engineering Party Standards and Rules Coordination</th>
<th>Customs</th>
</tr>
</thead>
</table>
| a) Technical Calculations  
b) Developing Data and Datasheets  
c) Developing the Package Specifications  
d) Technical Evaluation & Clarifications  
e) Technical Solutions and Query Responses  
f) Developing Purchase Orders  
g) Site Support | a) Checklist Review  
b) Customs Clearance |

<table>
<thead>
<tr>
<th>Fabricator</th>
<th>Pre-Commissioning &amp; Commissioning Group</th>
</tr>
</thead>
</table>
| a) Site Arrangement  
b) Installation Coordination & Arrangement  
c) Site Preparation  
d) Site Storage & Preservation  
e) Installation – Site Test Arrangement  
f) Hook-up & Pre-commissioning  
g) Sail Out Provisions and Sea Fastening | a) Installation Check  
b) Mechanical Completion  
c) Hook-up & Commissioning  
d) Package Integrity  
e) Site Test  
f) Start-up |

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Operation &amp; Maintenance Team</th>
</tr>
</thead>
</table>
| a) Engineering Detail Design & Technical Integrity  
b) Procurement of Materials  
c) Fabrication of Component  
d) Assembly and Packaging  
e) Testing and Performance  
f) Packing and Delivery Arrangement  
g) Delivery Arrangement | (although they are not involved during construction, it is good practice to involve them during detail design) a) Handover Coordination  
b) Package Integrity Check  
c) Operation Procedures Coordination  
d) Operation Team Organization  
e) Training Coordination  
f) Maintenance Procedure Coordinating & Scheduling  
g) Shut Down & Maintenance Plan |

Ensuring this level of scope clarity and understanding is achieved by each individual stakeholder reduces confusion on roles and responsibilities and it aids in determining communication channels.
4D – Identifying All Interfaces and Interface Attributes

In the original GTG project, lack of clear scope definition and miscommunication between stakeholders were significant contributing factors to the poor outcome. Implementing an interface management process that clearly recognizes each interface and its attributes and assigns responsibility of these interfaces would have mitigated the delays and rework. If the interfaces for the GTG package were identified, they could be categorized into two major groups: external interfaces and internal interfaces.

**Internal interfaces** include any type of boundary scope associated with internal stakeholders. The internal interfaces are all the interfaces between the internal stakeholders.

**External interfaces** cross scope boundaries and may affect results of at least one other scope package outside of the GTG package scope. For example, the placement of the GTG on the platform would include external interfacing with parties outside of the GTG package.

In addition to being classified as internal and external, interfaces can be identified as physical or non-physical. **Physical interfaces** are part of the package as a material or tangible interface. **Non-physical interfaces** include the information, tasks, and actions that are not material, but must be completed to deliver the project.

**Examples of Non-Physical Interfaces**

For the GTG package, the following non-physical interfaces would be delivered by external or internal stakeholders:

1. Environmental Data and Site Condition Information  
   (e.g., Weather information, temperature, wind, humidity)
2. Regulatory Rules and Limits  
   (e.g., NOX, CO2 & H2S emission limits, waste and oily water limits, and noise level limits)
3. Site Geometrical Condition Information  
   (e.g., Site elevation, location, and installation media)
4. Fuel Information (e.g., Type and components)
5. Local Transportation Information, Customs Negotiations, After Sale Regulations
6. Approved Vendor Lists and Known Political Issues with Origin of Material Supplies
7. Engineering Specifications and Package Design Data
8. Procedures and Standards Notifications
9. Test Requirements Data
10. Installation Plan and Duration
11. Project Delivery Scheduling and Start-up Plan
12. Procurement Strategy
13. Safety Rules and Requirements
Examples of Physical Interfaces

For the GTG project, the physical interfaces would include:

1. Package Basement and Site Preparation
2. Installation and Lifting Equipment
3. Fuel Supply
4. Utility Supply (e.g., water, oil)
5. Structural Supports and Interfaces
6. Piping Tie-in Points
7. Electrical Interfaces Connection
8. Instrument and Control Interfaces
9. Safety Interfaces

4E - Identifying Interface Risks

The likelihood of interface related issues occurring in a project like the GTG package is high, as was illustrated by the actual outcome of the project. Possible risk areas associated with the GTG’s delivery could include:

1. Design data does not comply with standards
2. Wrong material used
3. Structural support mismatch
4. Piping tie-in points mismatch
5. Late delivery of fuel system from local fuel supply
6. Non-compliance of fuel system with local fuel supply
7. Electrical system and electrical network incompatibility
8. Environmental effects
9. Excessive vibration due to weak structural supports
10. Misalignment between turbine & generator due to structural issues

Given the interdependence of various delivery items, the risk of one small failure affecting many downstream items is high; and a small problem can quickly become a large problem that derails the entire project and significantly impacts time and budget. A properly implemented and executed interface management procedure ensures project interfaces are identified and managed, stakeholders are aligned and kept informed of any changes, and decisions are proactively made to mitigate the many possible interface risks before issues threaten the project’s success.
4F – Building the Interface Management (IM) Matrix

Following stakeholder identification and scope limit interface identification, the Interface Management (IM) Matrix needs to be developed. This matrix specifies the role of each stakeholder on each specific interface. The main purpose of the IM Matrix is to identify the responsible parties on the delivery of each interface.

A simplified IM Matrix is provided as a sample of this activity. A stakeholder may have one of the following roles on any interface:

1. Interface Owner (IO)
   The IO is a party who owns the interface delivery.
2. Interface Contributor (IC)
   The IC is a party who helps the IO and contributes to delivery of the interface.
3. Interface Actor (IA)
   The IA is a party who should act and make an effort to deliver the interface.
4. Not Related (NR)
   The NR is a party who does not have any effect on the interface delivery.

For example, if we consider the following interfaces for the GTG:

1. Package Basement Support
2. Fuel Supply
3. Design Data
4. Drain System
5. Piping Tie-in

A simplified Interface Management Matrix might look like the following table. Identifying one Interface Owner (IO) who bears responsibility for the outcome of the interface point is always required.

<table>
<thead>
<tr>
<th></th>
<th>PC Contractor</th>
<th>Fabricator &amp; Contraction Company</th>
<th>Package Supplier</th>
<th>Engineering Company</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Package Basement Support</strong></td>
<td>IC</td>
<td>IO</td>
<td>IA</td>
<td>IA</td>
</tr>
<tr>
<td><strong>Fuel Supply</strong></td>
<td>IO</td>
<td>IA</td>
<td>IC</td>
<td>NR</td>
</tr>
<tr>
<td><strong>Design Data</strong></td>
<td>IC</td>
<td>IC</td>
<td>IA</td>
<td>IO</td>
</tr>
<tr>
<td><strong>Draining System</strong></td>
<td>IC</td>
<td>IO</td>
<td>IA</td>
<td>IA</td>
</tr>
<tr>
<td><strong>Piping Tie-ins</strong></td>
<td>IC</td>
<td>IO</td>
<td>IO</td>
<td>IA</td>
</tr>
</tbody>
</table>
4G – Creating the Communication Matrix

Proper communication between all stakeholders is essential to avoiding misunderstandings regarding project interface requirements. For this reason, in addition to the IM Matrix, a Communication Matrix should also be created to ensure all related stakeholders are notified and aware of changes. See section 4K for further information. The Communication Matrix identifies which stakeholders must be informed, who is responsible for information delivery, and how the data should be transferred.

In the original project, when the change was made to the detailed design of the GTG tank location, notification of the change was not passed on to all relevant stakeholders. Had a Communication Matrix been created, all interface stakeholders would have been informed of the change early in the process. Discussions to establish a solution would have occurred during the design phase and the subsequent confusion, conflict, and added costs would have been avoided.

For complex projects, in addition to creating a communication matrix to govern interface required communication, implementing an automated system that provides auditability and an online interface register with a master source of information is highly recommended. The Interface Register is an interface management tool used to track, monitor, and document all interface information exchanged between various stakeholders. When implementing mega-capital projects, the effects of missed Interface Points can and will lead to schedule delays, missed budgets, miscommunication between contractors, and errors in scope deliverables. Even the most sophisticated spreadsheet will not properly document the distribution of information to support a megaproject. The project team, including external contractors, must use sophisticated tools and processes to monitor and control communication related to interfaces. Otherwise, information is lost, forgotten, or simply not documented or shared.
4H – Identifying the Interface Management Team Structure

Megaprojects involve multiple scope packages. Clients typically assign an interface manager to each scope package to coordinate the activities and interfaces within the scope package as well as between other scope packages. In addition, each contractor should have an interface manager acting as a single point of contact.

In addition to an interface manager, an Interface Management Team (IMT) needs to be created and include all related people who are acting as coordinators between their team and other stakeholders. The IMT should be structured so that all direct acting stakeholders have the proper connection and relation to review and control the progress and delivery of all interfaces.

In this project case study, the project interface manager from the EPC contractor is the highest level in the IMT. The interface manager is the main interface contact and is responsible for coordinating, reviewing controls, and reporting to the project manager. In small projects, the project manager at the EPC contractor may act as the project interface manager.

The structure and organization chart for the Interface Management Team may look as follows:

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4I – Following the Interface Management Master Plan

Planning is the major function of interface management. For this to be successful, development of an Interface Management Master Plan is critical. This master plan is used to ensure alignment across key stakeholders. The Interface Management Master Plan defines the rules that all involved interface parties will follow for the duration of the interface lifecycle.

This plan describes the organization’s philosophy, as well as methods and elements needed to successfully implement an interface management program and should be an integral part of the overall project management plan. The Interface Management Master Plan defines each interface along with clear instructions on how interfaces are to be identified and managed by the client, EPCs, and other third parties. Expectations are explicitly defined for all, including instructions on how conflicts will be resolved, how contractors are expected to report on progress, as well as what the frequency of those reports will be. If all stakeholders have a clear understanding of the project’s Interface Management Master Plan, interface issues and conflicts can be reduced by providing clear guidance on how to handle these conflicts and, in turn, improve alignment between stakeholders.
In the Interface Management Master Plan, the responsibility of each stakeholder should be clearly identified. For example, the package engineering specifications and data sheets are an interface that is required for package bidding and purchasing. Not identifying all stakeholders to the interface was a key failing point in the GTG project.

**Interface Management Master Plan**

<table>
<thead>
<tr>
<th>Government/Community</th>
<th>Project Owner/Client</th>
<th>Contractors</th>
<th>Suppliers/Fabricators</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Rules and Standards&lt;br&gt; • Limits&lt;br&gt; • Local Requirements</td>
<td>• Business Plans&lt;br&gt; • Standards&lt;br&gt; • Cost&lt;br&gt; • Schedule&lt;br&gt; • Qualities</td>
<td>• Scopes&lt;br&gt; • Interfaces&lt;br&gt; • Sites&lt;br&gt; • Subcontractor Facilities&lt;br&gt; • Schedule&lt;br&gt; • Cost</td>
<td>• Scopes&lt;br&gt; • Boundaries&lt;br&gt; • Interfaces&lt;br&gt; • Delivery Points&lt;br&gt; • Transportation</td>
</tr>
</tbody>
</table>

Interface management can improve overall project performance, but success hinges on all parties being aligned with the project’s Interface Management Master Plan. While the interfaces and the owner of each interface are identified in this plan, integrating and understanding each component’s schedule impact is equally important.

**4J – Defining the Interface Register and Key Interface Milestones**

The Interface Register is to track, monitor, and document all interface information exchanged between various stakeholders. If interface management had been used in the GTG project example, the engineering specification and data sheet would have been included in the Interface Register with all related changes tracked and monitored. Using the Communication Matrix (see section 4G), all key stakeholders would have been notified of the GTG fuel pump changes in a timely manner. On top of that, if the appropriate interface documents had been included in the bid package to the supplier, the change to the pump would have been apparent to affected stakeholders and a resolution could have been implemented before the project schedule was completely disrupted.

As the Interface Register is populated with all interface information, interface deliverables and activities can be associated to key interface milestones. Dates managed and agreed upon within the Interface Register can then be compared to the key milestone dates identified in the project work schedule. With these connections and dates identified, progress can then be communicated to all key stakeholders, providing an understanding of actions that need more attention and follow-up. More importantly, early identification of misaligned dates allows teams to be proactive and make appropriate decisions to minimize overall impact on downstream activities. Integration with work schedules in this case should have and could have allowed decisions to be made to prevent or minimize the delays associated with rebooking vessels, barges, and cranes.
4K – Communicating, Meeting, and Reporting

Communication issues led directly to the failure of the GTG project and the subsequent cost overruns and delays. Setting up a communication process, including a Communication Matrix as outlined in section 4G, would have alleviated these communication shortcomings.

In addition to setting up the Communication Matrix and providing an automated system of record for this communication, regular meetings with a clear agenda occur as part of the regular interface management program and all related interface coordinators attend. These meetings allow participants to review interfaces and outstanding activities, understand what possible problems are on the horizon, and make appropriate decisions to ensure successful management of project interfaces.

As interfaces are updated and information is exchanged, it is critical that all information be easily accessible. A monthly progress report is the best way to distribute the main data story as well as project progress and targets for all related stakeholders over the upcoming month. The report should contain the interface milestone date summary, status, progress achieved, delays and the effect of that delay on the project’s critical path. Providing all of these details allows participants to be fully aware of work load, work progress, and potential issues (e.g., deliverables are delayed and/or contractors are not communicating). Many contractors struggle to put these reports together, digging through spreadsheets, emails, and databases to piece together the data required, and this manual process can lead to errors and omissions. Using an appropriate online interface management system to manage interfaces is recommended for these types of projects since it equips the interface stakeholders with helpful reporting and dashboards that ensure everyone is up to date at all times and can manage changes affecting their scope.
As demonstrated time and time again, poor management of interfaces will result in deficiencies in the project schedule and quality and increase the costs exponentially. The GTG project represented only one package within a much larger project and the impact was substantial. Multiply potential problems across 5 or 6 scope packages and the cost and delay of project failure could bankrupt a mid-sized company. It is important to track and monitor information flow and, if deliverables are not being met, have the ability to determine the reason for the delay, understand where the delay has occurred, and mitigate risk to the project by proactively handling the delay and informing key stakeholders.

A small project with few interfaces can be managed using a simple Excel spreadsheet to identify the interface, its stakeholders, dates, and actions. As projects continue to grow in size and complexity, the number of scope packages increase, which increases the number of stakeholders, which in turn increases the number of interfaces. As a result, it is highly recommended that project teams look for tools designed to manage and automate interface management processes for complex capital projects. Systems that offer an online and up to date Interface Register ensure all parties are working with the same information and forms a bridge between various parties involved in the execution of the project.

Automated systems also help to enforce agreed upon project processes, including, governance, risk, and compliance procedures, and improve overall stakeholder communication. A system that provides visibility and transparency empowers interface managers with the information needed to understand potential problem areas before they happen and make timely decisions to manage these exceptions. With an automated system, decision makers, whether the client or the EPC, can be as involved as required, inserting themselves into the process or acting as ‘observers’ and only intervening when necessary.

Had an automated interface management system been implemented for the GTG project, alerts would have been sent to notify all stakeholders of the resulting fuel pump changes and timely decisions could have been made to avoid the issues that arose to take this project grossly off track.
Summary

A number of conclusions can be drawn from the GTG project example regarding the benefits of an interface management program:

1. **Modularization and Prefabrication Construction Creates Complexity and Risk**
   Modular, prefabricated packaging, like the GTG package, is a proven method for constructing megaprojects. These modularized projects allow owners to take advantage of cost savings, better resource optimization, and quality workmanship from around the world. As projects continue to grow in scope, this modular prefabrication is becoming the dominant strategy for project delivery. This modularized method does, however, create additional complexity and the diversity of the suppliers, stakeholders, time zones, and cultural differences involved in supplying a modular package puts a large-scale project in jeopardy of mismatched interfaces and stakeholder conflicts.

2. **Interface Management is Key to Mitigating Risks of Modularization**
   Proper interface management is key to mitigating the risks associated with modularized projects, such as the GTG project, as well as for other more traditional complex construction projects. A misunderstanding or mismatch in engineering design will result in engineering rework, construction rework, and exponentially increase project costs and delays. Benefits of implementing interface management processes and tools for these projects include:
   - Minimizes design change associated risks that impact multiple stakeholders.
   - Resolves issues efficiently and minimizes negative schedule, cost, safety, and quality impact on the project.
   - Highlights potential conflict areas before they occur so appropriate action can be taken to minimize impact.
   - Builds and maintains stakeholder relationships to achieve the timely communication, coordination, and cooperation necessary for successful project delivery.

3. **Successful Interface Management Relies on Empowering Teams with the Right Tools**
   Interface management will improve overall project performance, but success hinges upon setting up and empowering an interface management team with appropriate communication channels, clear processes, and the right technology to enable those people and processes. With so much project data and communication to manage in order to reach successful completion, implementing a proper interface management system is essential to automate, track, and manage interfaces. With a clear Interface Management Master Plan for all stakeholders to follow and an interface management system to enable stakeholders to efficiently manage project and interface information, team members are immediately aware if deliverables are not being met and can proactively deal with the reason for the delay to mitigate risk and keep projects, such as the GTG project, on track, on scope, and on budget.