

Project-driven supply chains: Repeating the unrepeatable

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Necessity is the mother of invention, as the saying goes. In the supply chain domain, there is no better example of this than project-driven operations in the chemical business.

Manufacturers are frequently called upon to build supply chains that support a single project. These one-off ventures can be subject to volatile demand, and sited in remote locations where the climate is extreme. Take, for example, a project that involved the transportation of 20 truckloads of chemicals per day within a tight delivery window to a site in the middle of a desert.

The highly uncertain nature of these temporary supply chains requires managers to be extremely inventive as they strive to meet customers' changing expectations.

If every project is unique, how can a chemical manufacturer develop a common methodology for building and managing supporting supply chains that minimizes cost and maximizes efficiency? Researchers at the MIT Center for Transportation & Logistics took on this challenge. Sponsored by a multi-national chemical company, the project called for the development of a repeatable template that could be applied to project-driven supply chains. The lessons learned can be applied outside of the chemical industry.

Variability as the norm

In the words of a manager responsible for creating project-driven supply chains for the sponsor company the challenge of these unique projects is succinct: "It's a fire drill all the time."

One example was a project to build a solar-thermal power plant. The manufacturer was contracted to supply chemicals to this large-scale construction site in a desert within a very narrow time window. Meeting this window was demanding enough, but the supply chain also had to flex with the project's variable construction timetable. Moreover, the chemicals were classed as hazardous materials with special handling and storage requirements. Other examples include mining and oil-field operations, where multiple orders that vary in size and timing have to be delivered to hard-to-access locations in the Gulf of Mexico or the Alaskan North Slope, where weather conditions are extreme.

In addition to physical and scheduling constraints, the company has also had to contend with an increasingly competitive landscape over the last decade that has been accompanied by eroded margins. This is even the case for specialty chemicals, many of which have become commoditized by the intense competition. As a result, manufacturers are under incessant pressure to be more cost effective.

Operational constraints

Our researchers carried out extensive interviews with managers and studied practices to paint a more detailed picture of the demands on project-driven supply chains.

During the planning phase, the biggest challenge is time pressure; there is seldom enough time to fully plan these projects once a contract has been awarded. Unfamiliar regulations and physical barriers—operating temperatures can be sub-zero or searing depending on the location—add to the pressure. In the execution phase, a key challenge is coping with variable conditions. The variability can come from a number of sources such as arcane regulations in host countries, inadequate infrastructure and climate constraints—as anyone who has watched "Ice Road Truckers" knows, Alaska's ice roads are only open certain times of the year.

The researchers drilled down further and identified 11 challenges faced by supply chain managers. These included business-specific challenges such as customers who delay the delivery of materials, cross-border snafus including differences in transportation regulations and challenges associated with the last mile, such as a lack of suitable storage facilities.

The interviews yielded specific details: One

manager described a project site that was accessed via tunnels: "This was a project where all chemical products and equipment had to be broken down to a certain size to fit through [a] tunnel."

Multiple solutions

Having mapped the challenges, the researchers sought solutions to the vexing problem of how to introduce an element of repeatability to these extremely diverse projects.

One potential source of answers was the practices of other industries that experience similar issues. The level of complexity and diversity involved is unusual, but the researchers found two types of organizations that are used to coping with the demands of temporary supply chains: the military and humanitarian agencies. These organizations are routinely required to create unique, short-lived supply chains on relatively short notice, and often in adverse conditions. Chemical companies can learn much from these players, and should make efforts to establish cross-learning opportunities.

The researchers also developed solutions for three main categories of challenges faced by the chemical industry's project-driven supply chains: business-specific, cross-border and last-leg issues. In all, 17 solutions were proposed. For example, the use of flexible contracting including pre-approved supplier agreements, could offset some of the demand uncertainty. A central database of relevant experiences could ease the challenges of dealing with regulatory and customs-related bureaucracies.

While this laundry list of solutions is a valuable resource for managers, it does not solve the overarching problem of how to develop a repeatable model for executing project-driven supply chains. To meet this goal, the researchers developed a mobilization template for the chemical industry.

Mobilization template

The standalone template encapsulates the challenges and solutions identified by the research. It can be used as a high-level checklist for mobilizing project-driven supply chains in the three main categories of challenges referenced previously: business-specific, cross-border and last-leg. (See Figure 1.) The template is both a guideline for planning a new supply chain and a validation tool for confirming that the mobilization process has been thoroughly completed. To ensure that the template is used effectively, the researchers recommend a three-step process for mobilizing chemical industry project-driven supply chains. The process is managed by a contract manager. The three steps are:

- *Planning.* Determine the mobilization requirements, and include these in a plan that details the necessary actions, deadlines and responsible parties.
- *Execution.* Ensure that the mobilization is completed within the required timeframe.
- *Gate review.* Submit project documents to an executive review team. The team reviews the documents in terms of 17 sub-areas in the mobilization template. Each one is given a "pass" or "fail" grade.

Companies should keep in mind that the template is a living document that should be updated regularly.

Other applications

The analysis of project-driven supply chain execution and planning, along with the mobilization template, represent a first step in developing a repeatable methodology for improving the efficiency of project-driven supply chains in the chemical industry.

As the methodology is refined and integrated into company operations, there is much potential to expand its use beyond the chemical business.

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This article is based on research carried out by Sze Xin Mok and Ruggero Moretto for their Supply Chain Management program master's thesis titled "Mobilizing Project-Driven Supply Chains in the Chemical Industry." *The project was supervised by Dr. Roberto Perez-Franco.*

FIGURE 1

Last-leg section of the project-driven supply chain mobilization template

Area	Sub-area	Mobilization-related questions
3.A Transportation, storage and delivery within the last-mile	**3.A.1** Centralized-logistics solutions provider	• Is there a centralized department offering transportation solutions? If, so, has it been contacted? • Is there a logistics strategy in place based on the project site's location and quantity of product to be delivered? • Have suitable logistics providers been identified and engaged to navigate the constraints of last-leg delivery?
	3.A.2 Local expert presence	• Has the most experienced ground personnel been identified and assigned to the project? • Is such personnel going to be based in loco?
	3.A.3 Relationship-building and asset-sharing	• Have trusted organizations operating in the area been identified and screened for logistics capabilities? • Has the company ever collaborated with any of them in the past? • Do such companies own any asset or expertise that may support the execution of the project?

Source: Authors