# [2. BUSINESS CASE ANALYSIS FOR INDUSTRIAL MODULARIZATION (FR-396)](https://www.construction-institute.org/business-case-analysis-for-industrial-modularization)

**Report Summary:** This study investigated the appropriate time for modularization planning and ways that a company should develop a business case to support its modularization decision. The study’s recommendations are as follows:

* Standardize modular terminologies and definitions.
* Understand modularization barriers and barrier breakers.
* Follow recommended modularization timing points.

Three tools were created to support the use of modularization for industrial projects:

* Modularization Business Case Analysis Tool for Opportunity Framing. This tool helps users make informed decisions by reviewing key modularization drivers and considerations during early project phases. This tool also helps users understand the enablers and barriers related to modularization and addresses new drivers, such as environmental, social, and governance (ESG).
* Modularization Business Case Analysis Tool for Assessment and Selection. This tool identifies the optimal extent of modularization for projects during the later Project Assessment and Selection phase. It provides comprehensive analysis of costs and savings that are linked to various percentages of modularization to help users identify the optimal level that will result in successful project completion.
* ESG Modularization Assessment Tool. This tool helps users determine an appropriate modularization strategy that aligns with ESG principles and practices during the Project Assessment and Selection phase. It generates impact scores by assessing the potential impact of the modularization strategy on numerous ESG factors.

**Key Takeaways:**

## (1) Standardize modularization terminology and definitions.

## (Project Phase: Prefeasibility through Construction)

* Develop clear definitions for key modularization terms to ensure consistency of understanding among stakeholders. For reference, note that RT-396 developed Definitions of Key Modularization Terms (see [FR-396](https://www.construction-institute.org/business-case-analysis-for-industrial-modularization), Appendix A) and a list of Module Types by Size (see [FR-396](https://www.construction-institute.org/business-case-analysis-for-industrial-modularization), Table 1 on p. 14).
* Establish standard terminology across all project phases to facilitate effective communication.
* Identify industry-recognized standards or best practices for defining modularization concepts.
* Create a centralized repository for storing and updating modularization-related documentation.
* Regularly review and update the standardized terminology and definitions as needed.

## (2) Identify modularization barriers and barrier breakers.

## (Project Phase: Prefeasibility through Detailed Design and Procurement)

* **Barrier:**

Early scope and design freeze are required.

**Barrier breakers:**

(a) Understand that the business case for modularization includes the benefits of an upfront design cost with the overall benefits of modularization, i.e., a minimal upfront cost for maximum modular benefits.

(b) Invest in thorough design during the early project phases prior to detailed engineering.

(c) Freeze the design after the basic design phase to avoid changes during the engineering process.

(d) Choose proven licensors and technology.

* **Barrier:**

Vendor data are not available to support modular project execution.

**Barrier breakers:**

(a) Strategize alternative contracting methods to meet the early engineering requirements. (b) Identify critical vendor data that are necessary for a modular design.

(c) Involve vendors in the early stages of the project and establish data availability expectations.

(d) Understand the value of implementing a high-priority vendor data management program.

* **Barrier:**

No compelling business case for modularization is evident.

**Barrier breakers:**

(a) Collaborate with experienced modularization subject matter experts to develop a project modularization business case that uses RT-396 tools.

(b) Understand the benefits of modularization and ways that those benefits align with the project’s business drivers.

(c) Understand ways to execute and design a modular project effectively, as the execution and design of a modular project differ from those of a traditional stick-built project.

* **Barrier:**

Modularization is not part of the project design.

**Barrier breakers:**

(a) Consider modularization as the standard execution strategy for a project until and unless the business case states otherwise.

(b) Highlight the value of the modularization business case to the management team.

(c) Engage modularization experts and assess the modularization concept, strategy, and options in the early stages of project planning (i.e., during the Opportunity Framing or Assessment phase).

(d) Provide project and company-wide training on modularization execution and design.

* **Barrier:**

The project delivery method prevents effective modularization planning/execution.

**Barrier Breakers:**

(a) Educate the management, including both the owner and the engineering, procurement, and construction (EPC) contractor, about the benefits of the modularization project delivery methods and contracting strategies, and help them understand the impacts of each of these factors on the project’s modular execution and design (and ultimately on the project’s cost and schedule).

(b) After the decision is made to modularize based on the business case, and prior to deciding which contracting strategies to use, align the project delivery method with the contracting strategy that supports modular execution.

(c) Evaluate and update the contract terms and conditions to ensure that they suit modular execution.

(d) Revise internal and project contracting and supply chain work practices to align with modular execution objectives.

* **Barrier:**

The owner is reluctant to apply modularization.

**Barrier breakers:**

(a) Develop a modularization business case process to gain approval from management and/or the project execution team.

(b) Explain modular project execution and its benefits and methods to the owner’s management team and the project execution team.

(c) Identify a key advocate and/or team within the owner organization that is experienced with modular execution and design and can effectively promote the benefits of modularization.

(d) If no one within the company has modular execution and design experience, consider a third party to help with the modular project business case and further develop the company’s modular execution and design methods.

* **Barrier:**

Major financial or business drivers necessary for modularization are lacking.

**Barrier breakers:**

(a) Develop a project modularization business case estimating method to identify the financial drivers that are needed for modularization using the RT-396 tools and historical modular project metrics.

(b) Identify the estimating factors and metrics for quantifying the benefits of modular execution and design using the RT-396 tools and historical modular project metrics.

(c) Highlight the benefits and drivers of modularization at the executive management level.

* **Barrier:**

Early fabricators and supplier involvement are lacking.

**Barrier breakers:**

(a) Develop supplier involvement, module fabrication, and assembly contractor agreements for early engagement prior to the full purchase order or contract award.

(b) Create long-term agreements with module fabrication and assembly contractors and suppliers to establish a stable and efficient partnership.

(c) Establish a clear interface responsibility matrix for all project phases to ensure that all stakeholders, including the supplier and module fabrication and assembly contractors, are engaged throughout the project lifecycle.

(d) Partner with an EPC contractor with a proven track record of experience in module design, fabrication, and assembly to ensure successful modular project execution.

* **Barrier:**

The project is customized, with no standardization or repetition.

**Barrier breakers:**

(a) Explain to company management and project teams that custom, nonstandard projects do not necessarily preclude the use of modularization or limit the extent of modularization.

(b) Explain to company management and project teams that modularization can complement the standardization of components, equipment, packages, and/or facilities. Refer to RT-UMM-01 (CII, 2020).

(c) Establish a standardized execution and design strategy across the portfolio, program, and/or project.

* **Barrier:**

A guide or process to execute modular projects successfully is lacking.

**Barrier breakers:**

(a) Develop industry standards and practices for modularization.

(b) Collaborate with experts in modular execution, design, and construction who can provide their knowledge to the company and project teams.

(c) Implement a modular execution and design training program for internal program and project teams.

(d) Establish a modular execution and design team within the organization to support modular projects.

(e) Study modular execution, design, and construction methods to ensure up-to-date knowledge.

## (3) Review the recommended timing for activities and decisions that are related to modularization.

## (Project Phase: Prefeasibility through Detailed Design and Procurement)

* Early decision and assumptions around key factors
* Minimum information required to make informed/quality decisions
* Site selection and associated infrastructure requirements
* Modular concept development
* Modular concept selection
* Modular execution and design strategy development – execution decision starts to be “locked-in” or frozen
* Basic design matures and time to implement modularization, without execution and design recycle, reduces as the end of the Basic Design phase (FEL3) approaches.
* Implementation of opportunities identified by the EPC contractor
* Basic design complete

## [(4) Tool: Modularization Business Case Analysis Tool for Opportunity Framing](https://www.construction-institute.org/a-business-case-analysis-guide-and-tools-for-industrial-modularization)

## (Project Phase: Prefeasibility through Concept)

* Leverage this tool during the early project phases to determine whether a project should be modularized.
* Review the expected results, details, and recommendations provided by this tool to inform business case analysis discussions with stakeholders.

## [(5) Tool: Modularization Business Case Analysis Tool for Assessment and Selection](https://www.construction-institute.org/a-business-case-analysis-guide-and-tools-for-industrial-modularization)

## (Project Phase: Prefeasibility through Detailed Scope)

* Leverage this tool to inform decision-making about the optimal extent of modularization for a project. This tool provides comprehensive analysis of costs and savings that are linked to varying percentages of modularization to help users identify the optimal level that will result in successful project completion.
* Review the expected results, details, and recommendations provided by this tool to inform business case analysis discussions with stakeholders during the Assessment phase.

## [(6) Tool: ESG Modularization Assessment Tool](https://www.construction-institute.org/a-business-case-analysis-guide-and-tools-for-industrial-modularization)

## (Project Phase: Prefeasibility through Detailed Design and Procurement)

* Leverage this tool for guidance in finding an appropriate modularization strategy that can mitigate issues and maximize benefits related to Environmental, Social, and Governance (ESG) principles.
* Use the assessment results to inform decision-making about the optimal extent of modularization that aligns with ESG principles.