



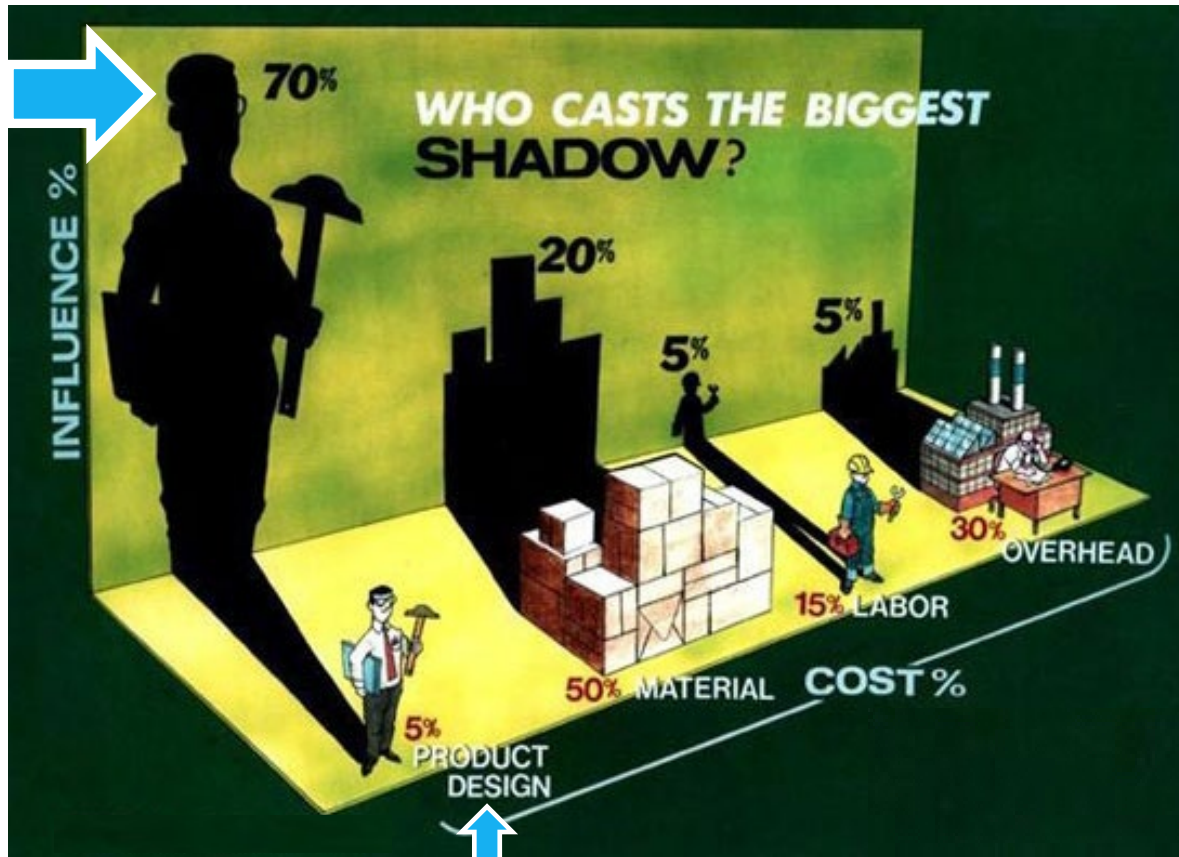
Build4Scale

Mod 0 Course Introduction

Motivation

Why is design important?

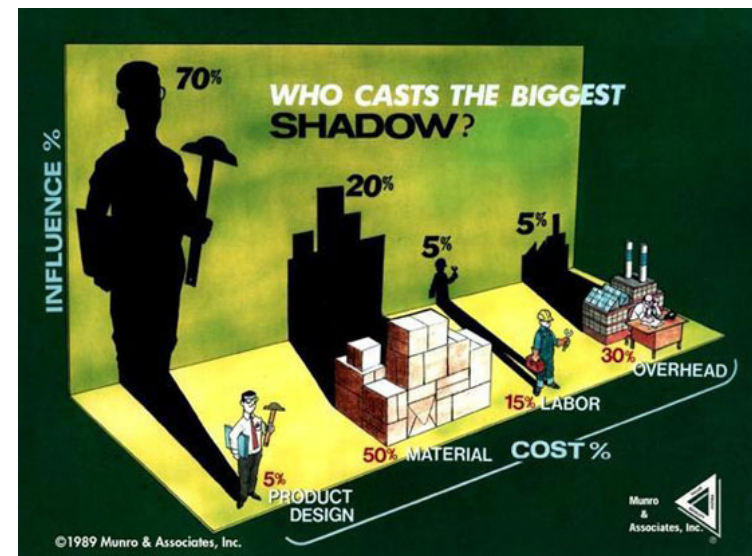
*Decisions made during the **design process** have significant effects on the success (or failure) of your product*



Why Use Build4Scale?

Ask the right questions at the right time

- Key considerations so you will make better decisions earlier, saving you time and money
- Knowing what to expect when moving from prototype to operating at scale means you will be more prepared
- Materials can be followed consecutively or ad-hoc depending on your needs



Build4Scale Teaches Manufacturing Fundamentals



Now that you've built a successful prototype, you want to begin mass producing your product



Source: Don Resisinger April 2016 Fortune Magazine
Inside a Flextronics factory in Fort Worth, Texas. Courtesy of [The Wall Street Journal](#)

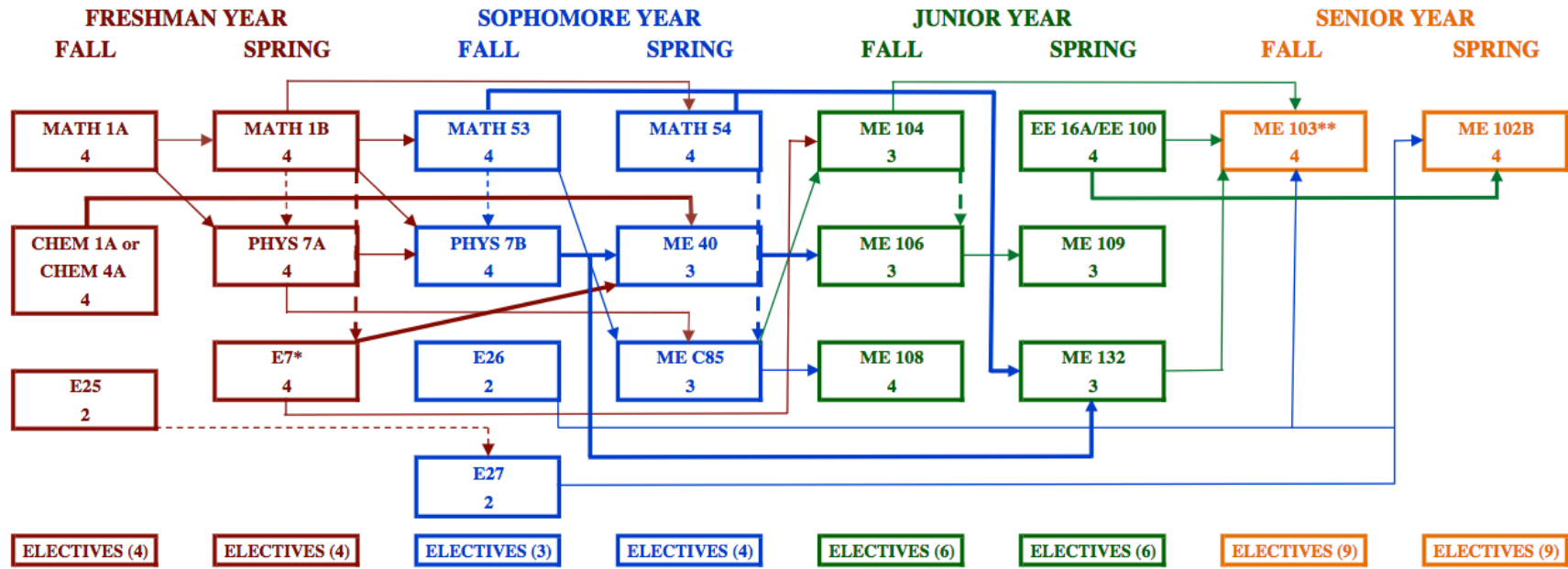
Introduction

U.S. DEPARTMENT OF ENERGY • OFFICE OF ENERGY EFFICIENCY & RENEWABLE ENERGY

Build4Scale Teaches Manufacturing Fundamentals

Except, you didn't take that class.....

Mechanical Engineering Undergraduate Curriculum



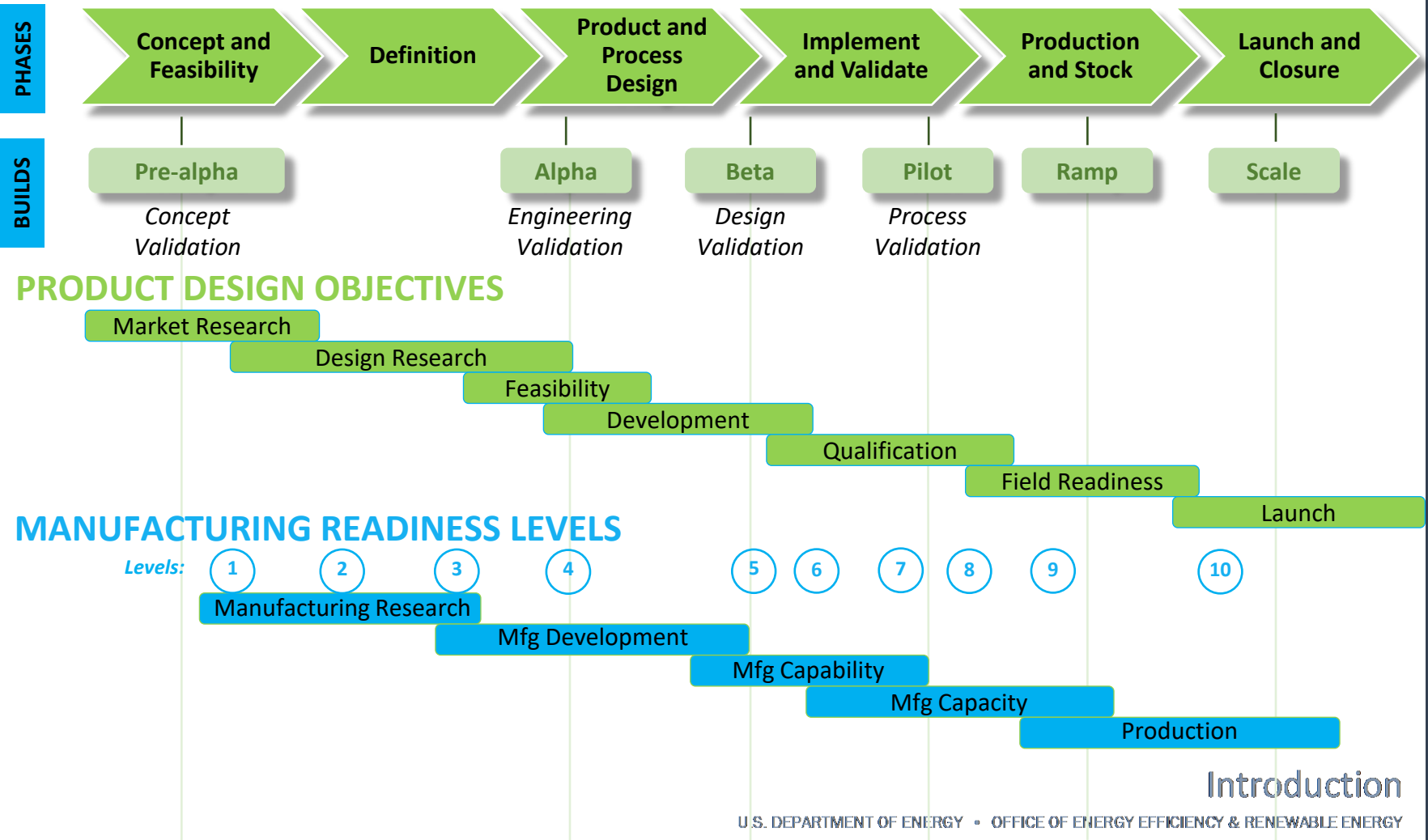
Module Outline



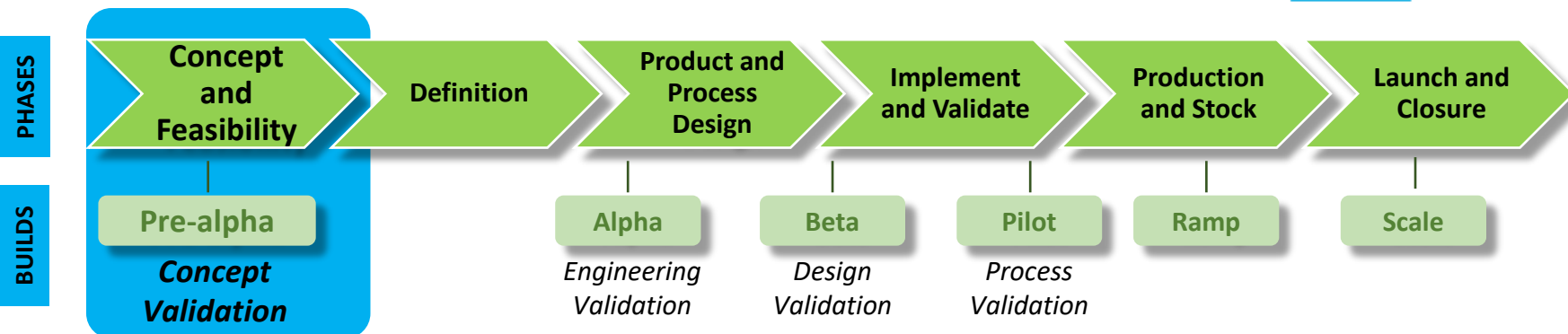
- Product design versus manufacturing level
- Where you should be: Module 1
- Where you are going: Modules 2–7

Product And Design Process

Versus manufacturing readiness levels (MRLs)



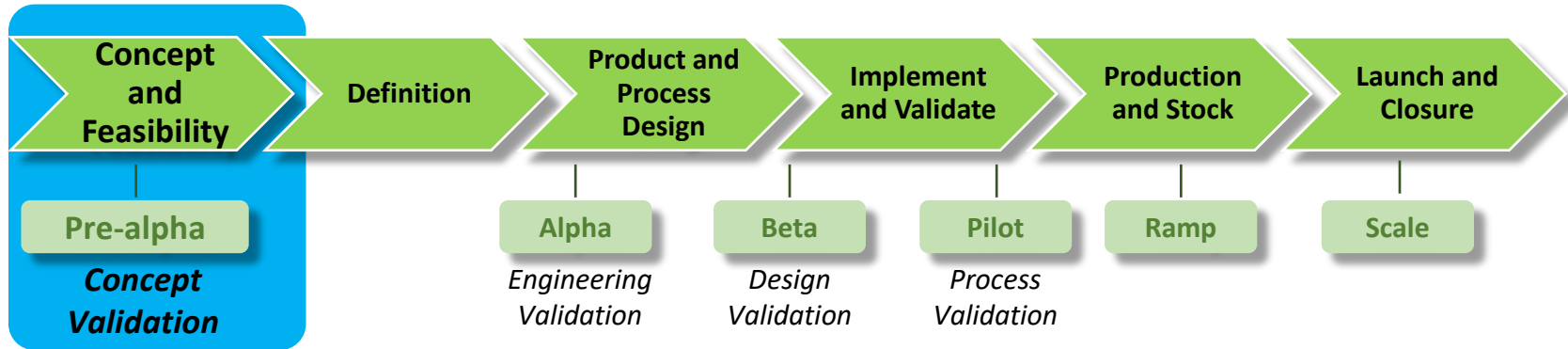
Where You Should Be



- At this point, you should have a clear understanding of your customer and your market including the customer's needs and your value proposition
- You should also have a prototype that looks and functions like your proposed product; not all components will be production-ready, your prototype should allow customers to see and understand your value

The prototype should confirm the feasibility of your concept

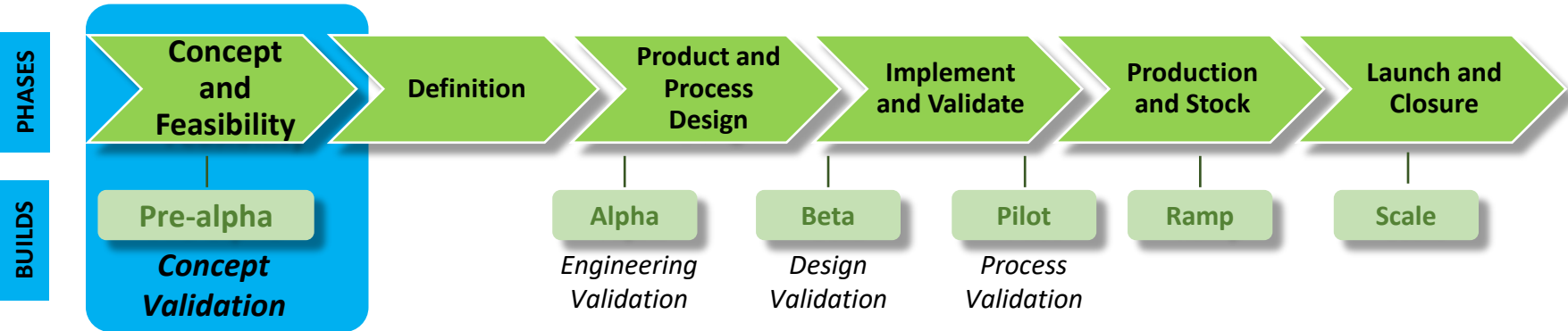
Where You Are Going



- ❑ Now you're ready to move along the path to product launch
- ❑ Decisions previously made for expediency now need to be re-examined for their suitability at scale
- ❑ Solutions that worked in the lab need to be evaluated for their production time and cost at higher volume

Self-Assessment

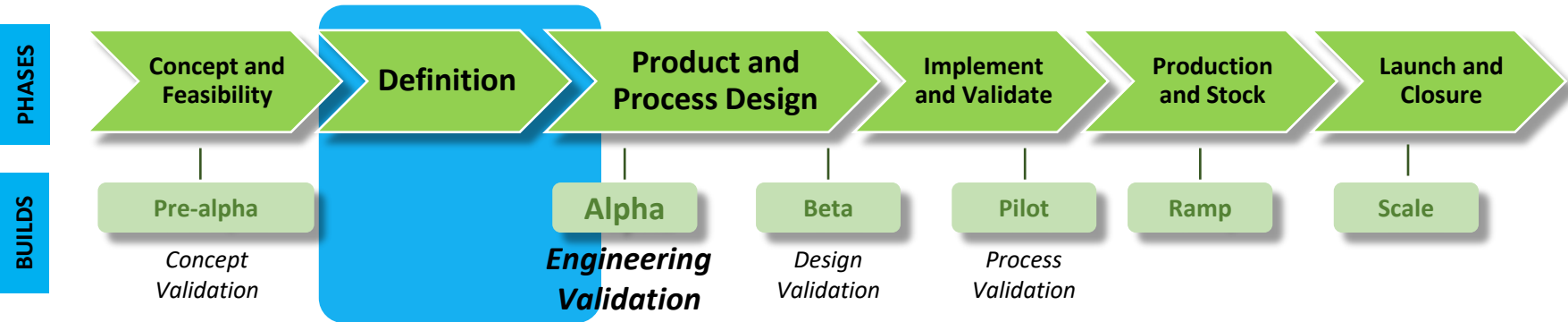
Module 1



- Module 1 allows you to assess your needs and determine where you might want to start in the Build4Scale training

Detailed Design Package

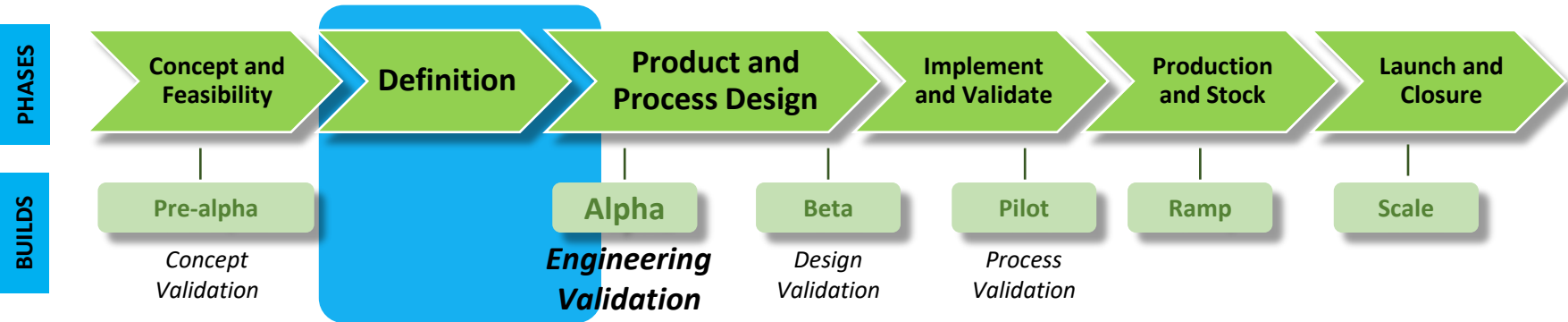
Module 2



- Module 2 provides an overview of the tools needed to turn your prototype into an actual design package:
 - Module 2A:** describes how to create a bill of materials (BOM) and bill of process (BOP), which specify the components and processes needed for your product
 - Module 2B:** discusses product lifecycle management (PLM) tools that allow you to track design documents, create the BOM, and ensure that designs communicate the necessary information

Detailed Design Package

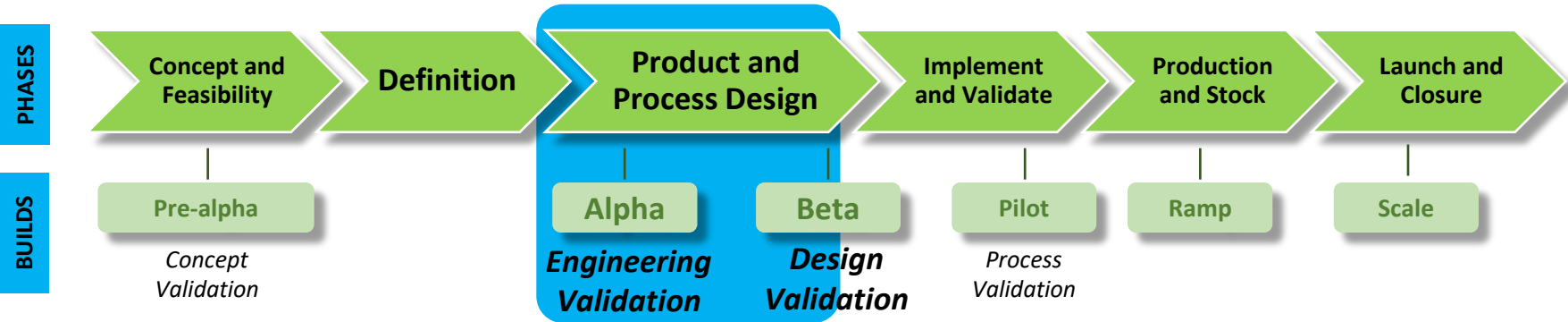
Module 2 (cont.)



- Module 2 provides an overview of the tools needed to turn your prototype into an actual design package: (cont.)
 - Module 2C:** describes how to create quality standards from customer needs and determine what can go wrong with your design (and how to fix it)

Design For Manufacturing

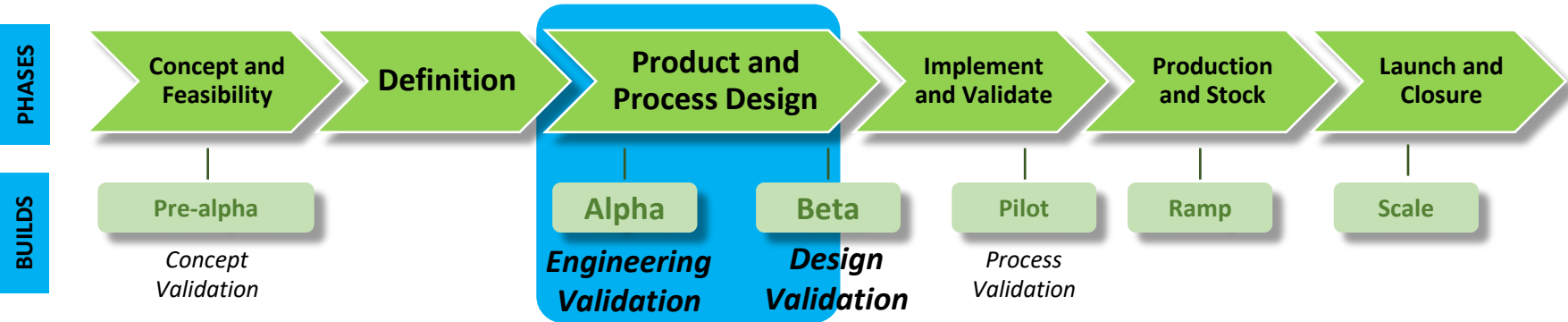
Module 3



- Module 3 focuses on ensuring that your materials and manufacturing choices are economically viable and meet customer needs:
 - Module 3A:** describes how to determine the costs for your product and ensure they are in line with the market (this serves as the foundation for other design decisions)
 - Module 3B:** provides background information on different material classes and highlights properties that ensure selected materials meet customer needs economically

Design For Manufacturing

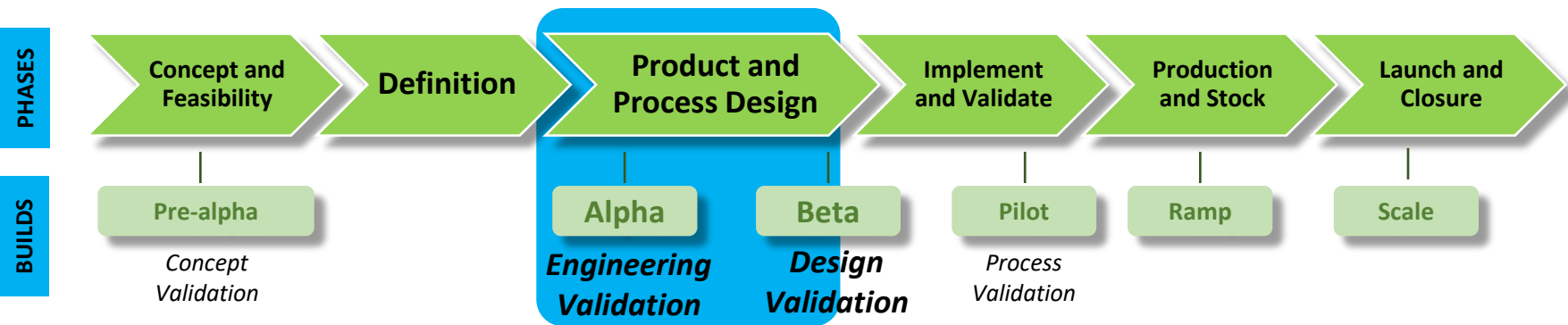
Module 3 (cont.)



- Module 3 focuses on ensuring that your materials and manufacturing choices are economically viable and meet customer needs: (cont.)
 - Module 3C:** describes alternative manufacturing processes and their cost and investment implications

Design For Assembly/Reliability

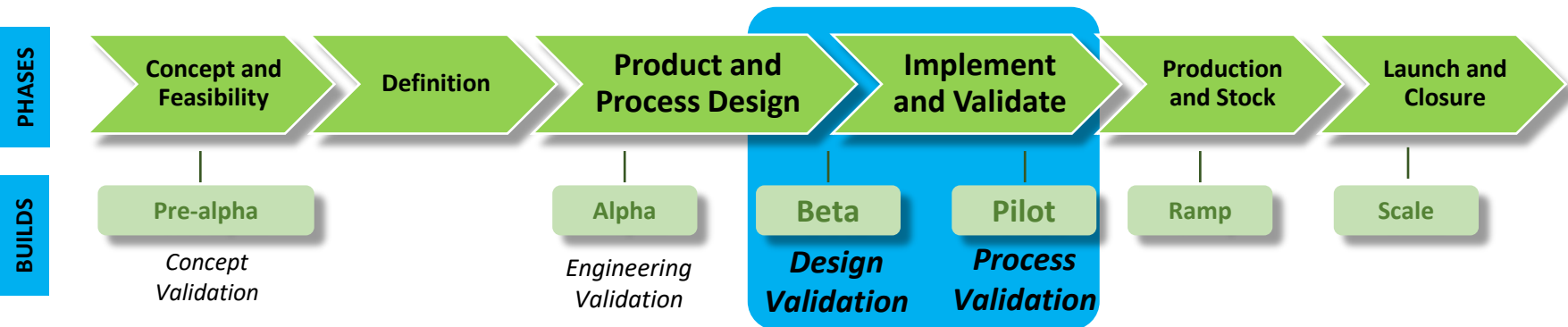
Module 3 (cont.)



- Module 3 covers designing your product and processes:
 - Module 3D:** provides guidelines to ensure that products are designed to be manufactured and assembled at low cost with high quality
 - Module 3E:** describes ways to assess your product and ensure that it doesn't fail prior to the end of its useful life
 - Module 3F:** provides an introduction on how to design and fabricate electronic components that meet customer needs and provide robust performance

Beta Prototype And Test Plan

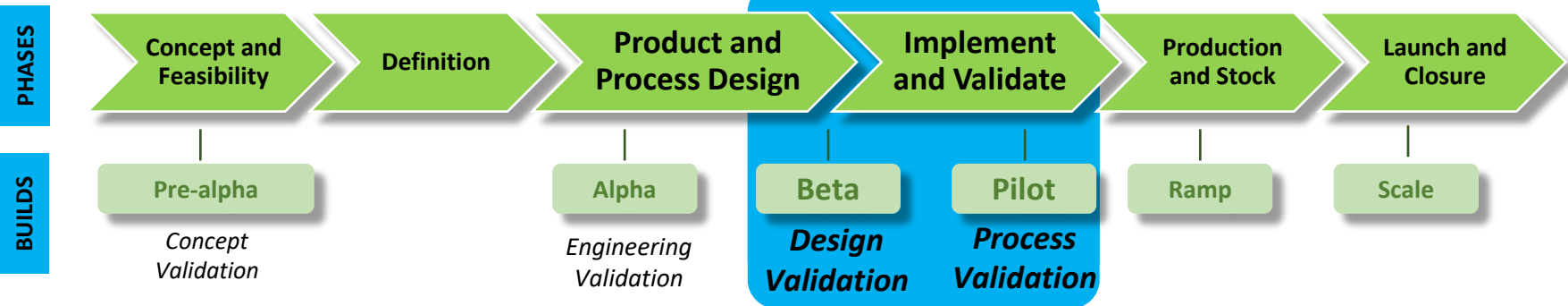
Module 4



- Module 4 describes how to use your beta prototype most efficiently
- This module helps you determine which questions you want answered, how best to get that data, and how to move forward to product launch:
 - Module 4A:** highlights questions of interest to your customer prior to scaling production and how you can use prototypes to answer them

Beta Prototype And Test Plan

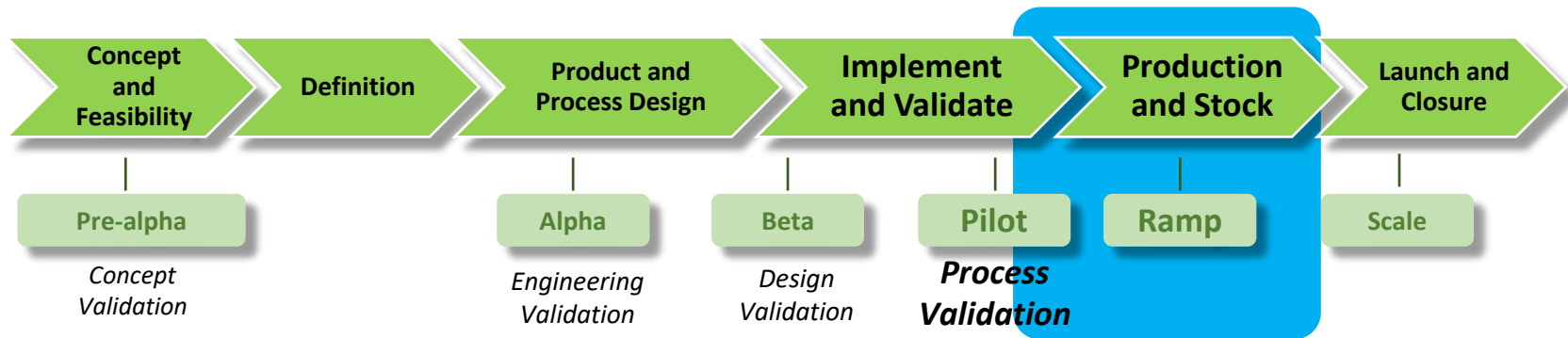
Module 4 (cont.)



- Module 4 describes how to use your beta prototype most efficiently: (cont.)
 - Module 4B:** discusses the importance of using actual manufacturing and assembly processes and how to ensure that suppliers provide the necessary components
 - Module 4C:** discusses ways to assess the beta prototype and trade-offs associated with alternative assessment methods
 - Module 4D:** discusses how to document feedback and issues associated with design changes

Communication And Selection

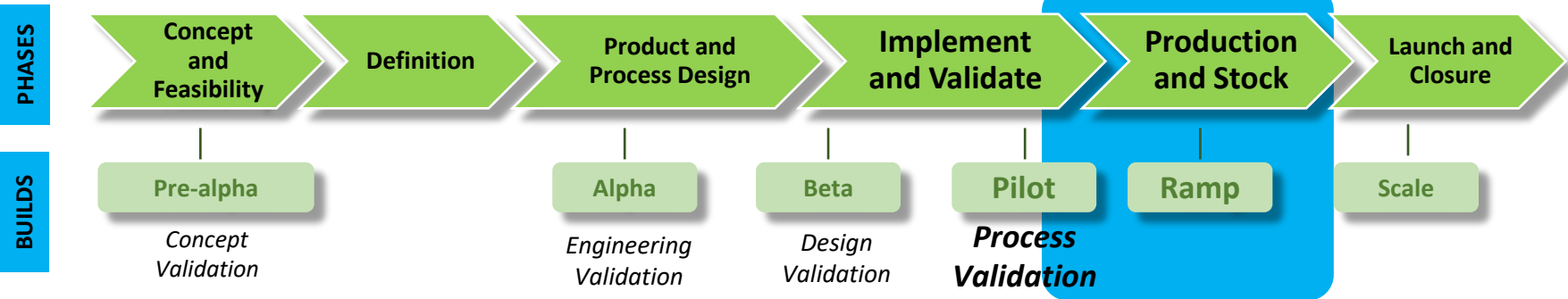
Module 5



- Module 5 describes how to build the supply-and-distribution plan for your product
- This module helps you to select and negotiate with vendors and ensure that your product reaches the customer on-time and in full:
 - Module 5A:** discusses key questions related to making or buying a component and selecting and negotiating with suppliers

Negotiation And Distribution

Module 5 (cont.)



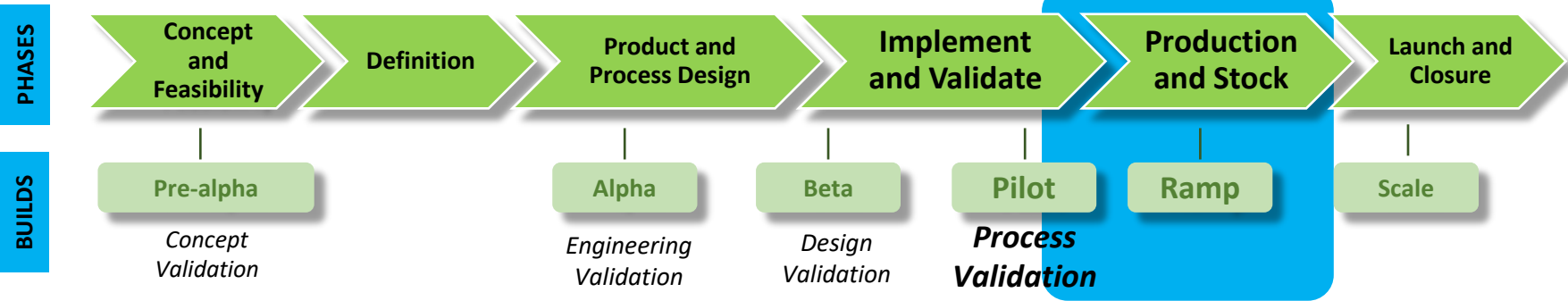
□ Module 5 describes how to build the supply-and-distribution plan for your product: (cont.)

—**Module 5B:** discusses use of enterprise resource planning (ERP) and manufacturing resource planning (MRP-2) tools and how to select the tool you need

—**Module 5C:** describes how to use alternative forecasting methods and integrate your enterprise resource planning (ERP) system to ensure that you deliver the necessary product to your customers on time

Negotiation And Distribution

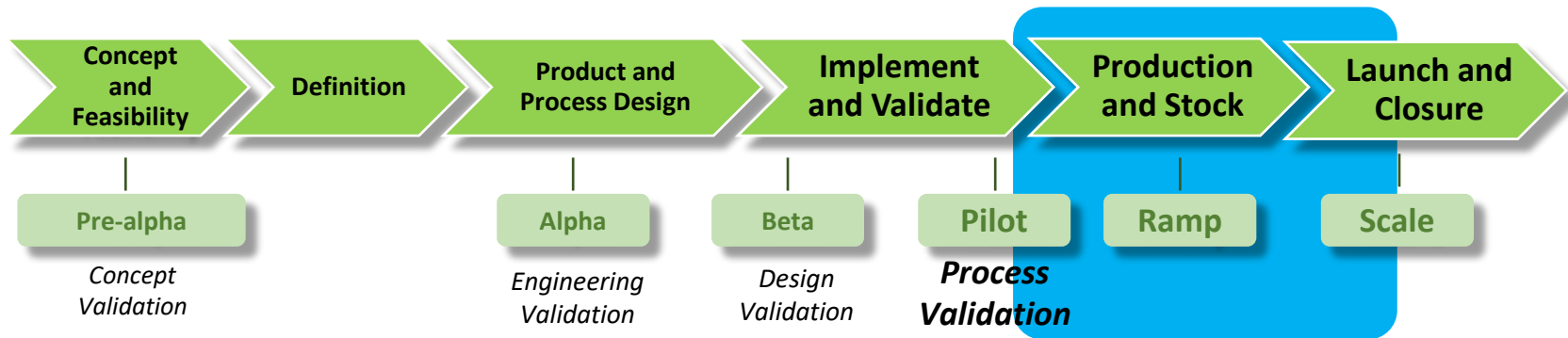
Module 5 (cont.)



- Module 5 describes how to build the supply-and-distribution plan for your product: (cont.)
 - Module 5D:** describes how to ship your product economically while meeting customer and regulatory requirements

Regulation And Certification

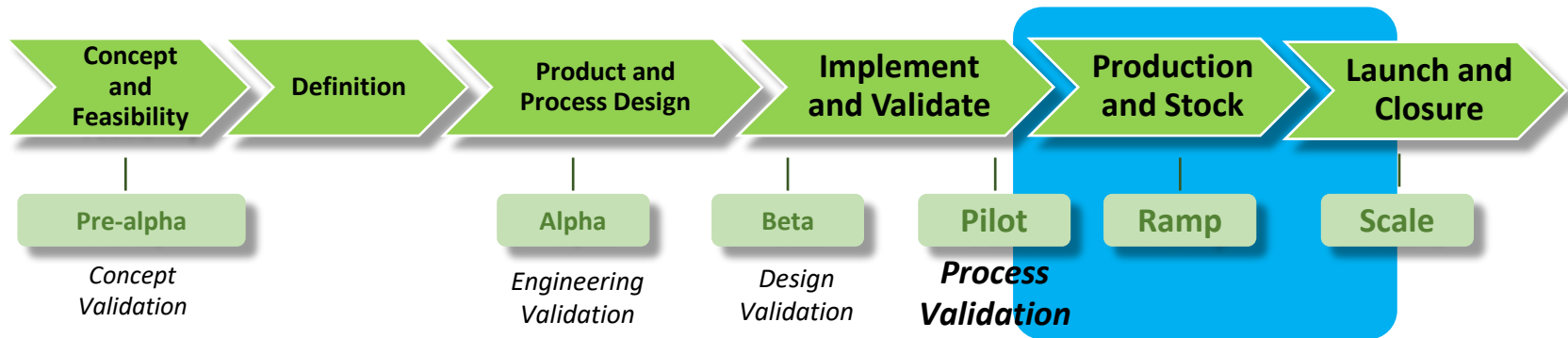
Module 6



- Module 6 discusses the regulatory, certification, and quality needs of your product
- This module helps you determine what certification your product needs, which regulatory regimes your product is subject to, and how to ensure consistent production quality for your manufacturing processes:
 - Module 6A:** discusses the differences between regulation and certification and the effects both have on your product launch

Regulation/Industry Standards

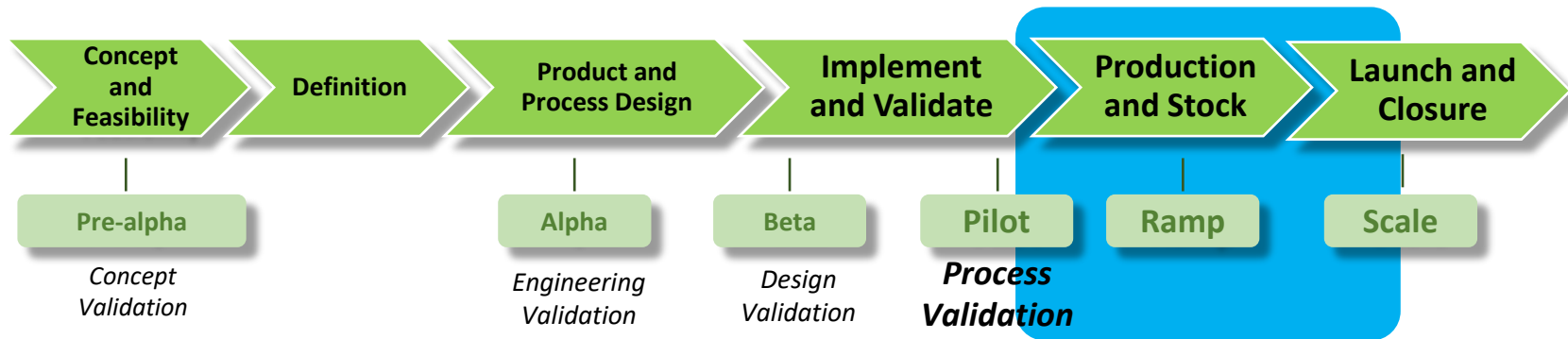
Module 6 (cont.)



- Module 6 discusses the regulatory, certification, and quality needs of your product: (cont.)
 - Module 6B:** covers certain industries that may have more regulatory requirements, and how to comply
 - Module 6C:** describes how to translate customer inputs into regulatory and certification needs and how to use benchmarking to determine regulation and certification

Regulation/Industry Standards

Module 6 (cont.)

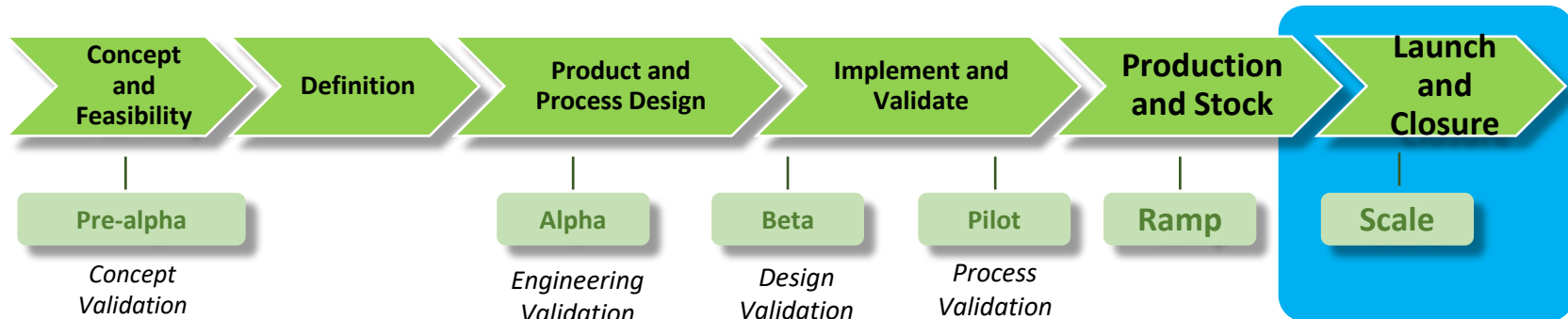


□ Module 6 discusses the regulatory, certification, and quality needs of your product: (cont.)

—**Module 6D:** describes how to determine what various manufacturing processes can do, and how to ensure that they're capable of consistently meeting customer needs

Sustaining Quality And Growth

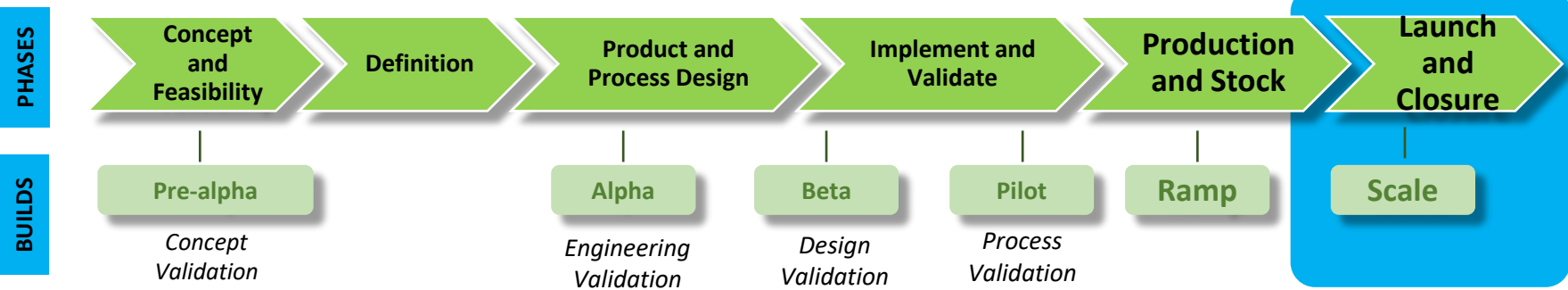
Module 7



- Module 7 covers how to sustain and grow your business
- This module describes how to consistently provide quality products to your customers, deal with any quality issues, and grow your business:
 - Module 7A:** discusses how to ensure that you (and your suppliers) are consistently producing products that meet your customers' needs

Quality And Warranty Plan

Module 7 (cont.)



□ Module 7 covers how to sustain and grow your business: (cont.)

—**Module 7B:** explains how to identify and resolve potential issues as your business grows and production increases

—**Module 7C:** discusses methods for capturing customer data and how to replace products that don't meet their expectations

—**Module 7D:** discusses how different cost categories grow with your business and how to fund that growth