

Commercialization Milestones: Pathway to Success

Commercialization milestones mark the road to success for entrepreneurs. Innovators that use milestone-based processes have a competitive advantage over those that don't because the route, challenges, and specific actions needed to achieve the next step toward commercialization are made apparent to all parties.

Commercialization milestones are outlined below as summarized from U.S. Departments of Energy and Defense "Technology Readiness Level," "Stage Gate Management," and "Commercialization Readiness Program."

All such tools are designed to provide the means for diverse innovators and funders to consistently communicate what's currently known and unknown, and what will be learned from investing in the next level of a product's development. They assure that resources will be used to pass the current milestone before investing in the next.

Common milestones:

- 1. Preliminary Investigation – Concept explored:** Preliminary technical, market, and competitive assessment is commonly based on a thorough Internet-based literature and patent search. No laboratory or product development is funded at this stage. Time invested to investigate originality of the idea is the primary expense.
- 2. Initial Investigation – Concept defined:** Early stage research is funded to document technical feasibility and market requirements for successful commercialization. Facts that differentiate the innovation from competing products are documented. Individual inputs, components, and value chain partners needed to produce the product are identified.
- 3. Detailed Investigation – Proof of concept:** Individual components are acquired and tested. Resultant data are used to model potential range of performance of components when they are combined. Market, regulatory, and legal strengths and weaknesses are identified. The known versus the assumed inputs are made clear, and the need for protection of intellectual property is determined.
- 4. Initial Development and Verification – Proof of application:** Components are combined and tested to determine if and how the initial system functions as a whole. Critical success factors, including evidence of scalability, are specified. Results of testing provide inputs used to develop the most viable design for a prototype project. Appropriate protection of intellectual property is obtained.

Importance of milestone-based decision-making

Research & development is inherently risky. Only a small percentage of new ideas find commercial use. Many good ideas fail because of a lack of adherence to a methodical, decision-making process.

Methodical decision-making assures investors that resources will be used to address the most important "unknown" for the product's stage of development; reducing risk for the innovator and investor alike.

5. **Prototype Project – *Product validation***: Performance of integrated system components are tested in a simulated or operational environment. Results show that the technical, economic, environmental, and regulatory issues previously identified are, or can be, cost effectively resolved. Sample product is produced, evaluated and approved by intended customers. Letters of intent to purchase for a given performance and price are obtained. Engineering scale-up specifications needed to achieve demonstration project-scale operations are documented. Critical success factors needed to justify investment in a large-scale demonstration project are satisfied.
6. **Demonstration project – *Operational environment validation***: Demonstration project provides actual operating conditions, testing, and evaluation at scaled-up operations and product output. Intended customers contract for purchase of product for a specified performance and price. Information resulting from construction, operation, production, and use of the product in the intended market justifies investment in a full-scale, commercial production facility.
7. **Full-scale commercial production – *Final design***: Information obtained from demonstration project provides for final design, detailed engineering, production data, manufacturing processes, and performance and market demand metrics needed to obtain financing and construction of optimal-scale, commercial production facility.
8. **Market penetration and expansion – *Profitability***: Proven results create additional demand. Market penetration increases. Sales of the technology provide revenues and support justification for additional investment to develop additional further applications of the core innovation and expand market share.

Methodical milestone-based decision-making provides a path to transform a vision into a commercial success that others can see as well.

References:

U.S. Department of Energy *Stage-Gate Guide to Best Practices* provides consistent metrics to evaluate status and progress of product development and to guide disciplined decision-making throughout the course commercialization. http://www1.eere.energy.gov/manufacturing/financial/pdfs/itp_stage_gate_overview.pdf

U.S. Department of Energy *Technology Readiness Level Assessment Guide* DOE G 413.3-4A provides consistent metrics to mitigate risk of developing new technology or applying existing technology to different uses. <http://www2.lbl.gov/DIR/assets/docs/TRL%20guide.pdf>

U.S. Department of Defense *Manufacturing Readiness Level Best Practice Manual* uses uniform metrics to measure and communicate manufacturing risk and readiness. http://www.dodmrl.com/MRL_Deskbook_V2.pdf

Department of Defense Commercialization Readiness Program (CRP) is to accelerate the transition of SBIR and STTR funded technologies <http://www.acq.osd.mil/osbp/sbir/sb/crp.shtml>