Technology Commercialization

Sanjay Dhole, Technology Programs Coordinator
Maricopa SBDC
Technology Commercialization

Agenda

✓ TRL Introduction
✓ Commercialization Model
✓ Stages of Technology Maturity
✓ “Valley of Death” Concept
While the "Technology Commercialization Model" does not provide the answers, it helps you to ask the right questions .... like "how do I get there from here?"
• **History**
  - Developed by NASA . . . Used by most USG entities and NGOs. Nomenclature reflects its origin.
  - Military Goal = Deployment
  - Private Sector Goal = Commercially Viable Products

• **Features**
  - Provides Common Language – Tradeoff Analysis
  - Facilitates Risk/Reward Monitoring
  - Aids Evaluation of Funding Readiness / Sources
  - Enhances Resource Allocation Decisions
  - Requires rigorous “Process” – knowledge, paperwork, reporting, reviews
Technology Readiness Level

TRL 1
TRL 2
TRL 3
TRL 4
TRL 5
TRL 6
TRL 7
TRL 8
TRL 9

System Test, Launch & Operations
System/Subsystem Development
Technology Demonstration
Technology Development
Research to Prove Feasibility
Basic Technology Research

Technology Commercialization, 2011
TRL Does Not Tell You ...

- Is there a “real” market?
- Who your customer is?
- Your customer’s requirements
- Where and how to manufacture
- Best Manufacturing Practices – 6 Sigma
- Competitive Positioning
- Staffing
- Best Distribution Channels
- Best Sales Organization
- Pricing
- Profitability
## Commercialization Model

<table>
<thead>
<tr>
<th></th>
<th>Technical</th>
<th>Market</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investigation</strong></td>
<td>Technology Concept Analysis</td>
<td>Market Needs Assessment</td>
<td>Venture Assessment</td>
</tr>
<tr>
<td><strong>Feasibility</strong></td>
<td>Technology Feasibility</td>
<td>Market Study</td>
<td>Economic Feasibility</td>
</tr>
<tr>
<td><strong>Planning</strong></td>
<td>Engineering Prototype</td>
<td>Strategic Marketing</td>
<td>Strategic Business Plan</td>
</tr>
<tr>
<td><strong>Introduction</strong></td>
<td>Pre-Production Prototype</td>
<td>Market Validation</td>
<td>Business Start-Up</td>
</tr>
<tr>
<td><strong>Full Scale Production</strong></td>
<td>Production</td>
<td>Sales &amp; Distribution</td>
<td>Business Growth</td>
</tr>
<tr>
<td><strong>Maturity</strong></td>
<td>Production Support</td>
<td>Market Diversification</td>
<td>Business Maturity</td>
</tr>
</tbody>
</table>
OBJECTIVE

Technology Concept Analysis
- to succinctly **define** the concept, to **assess** the implementation potential of the technical aspects of the concept, and **establish** the uniqueness of the technical concept.

Market Needs Assessment
- to **identify** a potential market for the concept, **estimate** the market size and **determine** a preliminary value of the product.

Venture Assessment
- to determine if the concept offers **sufficient profit potential** to pursue additional investment of time and money for additional research.

PRODUCT

Technology Concept Analysis
The product of this activity is a **verbal description**, schematic, formula, conceptual model or paper design, delineating the main features of the technical concept.

Market Needs Assessment
The product of this step is a **short summary of information**, from trade journals, data bases, and interviews, which follows the marketing section of a standard business plan format.

Venture Assessment
The product of this step is a brief description of the **business model**.
Technology Concept Analysis
• Do you know the current state-of-the-art competitive technologies?
• Have you selected the technologies for this application?
• Have you determined the advantages of this technology?
• Have you determined the risks for this technology?

Market Needs Assessment
• Do you know the product uniqueness?
• Do you know the product competition?
• Do you know the customer requirements?
• Have you identified the barriers to market entry?

Venture Assessment
• Do you have experience in launching a business enterprise?
• Are you the right person to commercialize the product?
• Is your enterprise the right one to commercialize the product?
• Have you estimated the resources (capital and service providers) required to launch your venture?
Feasibility (Development)

OBJECTIVE

Technology Feasibility
The objective of the technical feasibility step is to confirm that the product will perform and to verify that there are no production barriers.

Market Study
The objective is to identify who will buy the product, how many units will they buy, and how much they will pay.

Economic Feasibility
The objective of the economic feasibility step is to develop a financial model of the business venture.

PRODUCT

Technology Feasibility
The product of this activity is a working model.

Market Study
The product of this step is a market study that follows the marketing section of a standard business outline format.

Economic Feasibility
The product of this step is a complete integration of the technical product information and the market study into one or more break-even financial models.
Technology Feasibility

• Have you evaluated the feasibility of producing the product?
• Have you measured how the product will perform?
• Do you have a design for the product?
• Do you have a design for the production process?

Market Study

• Have you quantified the market size?
• Have you identified the market segments?
• Have you identified the size, growth rate and competition of the market segment?

Economic Feasibility

• Does the venture demonstrate a positive economic feasibility?
• Have you developed a break-even financial analysis for the venture?
• Does the venture offer financial returns that justify investment?
• Have you compared the merits of licensing to venturing?
OBJECTIVE

Engineering Prototype
The objective of the engineering prototype is to make improvements in materials, designs, and processes in the product and to verify the product will perform as specified

Strategic Marketing
The objective of the strategic marketing step is to narrow the marketing decisions to those that offer the highest opportunity to maximize profitability

Strategic Business Plan
The objective of the strategic planning step is to identify and prioritize the business options, which optimize the opportunity for success

PRODUCT

Engineering Prototype
The product of this activity is an engineering prototype or a pilot process

Strategic Marketing
The product of this step is a concise marketing component of the business plan that reflects the optimum strategic business options for the enterprise

Strategic Business Plan
The product of this step is a concise business plan that reflects the optimum strategic business options for the enterprise
Planning (Assessment)

Engineering Prototype
• Do you have an engineering prototype of the product?
• Have you identified what critical materials you will need?
• Have you conducted final tests on the prototype?
• Do you have a pilot production process?

Strategic Marketing
• Have you selected target markets?
• Have you selected product features?
• Have you selected a price?
• Have you selected distribution channels?

Strategic Business Plan
• Have you developed a strategic business plan?
• Have you finalized the business organizational structure?
• Have you selected a board of directors (or advisory team)?
• Have you developed a formal financial plan that includes the strategy and timing of present and future funding rounds?
OBJECTIVE

Pre-Production Prototype
The objective of the pre-production prototype is to develop the manufacturing processes and techniques required to produce the product.

Market Validation
The objective of the market validation step is to test the receptivity of the market to the product and to compare expectations of the business plan with the realities of the marketplace.

Business Start-Up
The objective of the business start-up step is to introduce the enterprise to the market within the parameters identified in the business plan.

PRODUCT

Pre-Production Prototype
The product of this activity is a pre-production prototype or process.

Market Validation
The product of this step is a quantitative analysis of limited sales performance and a qualitative analysis of customer response.

Business Start-Up
The product of this step is an enterprise capable of producing a product that meets technical and customer specifications, satisfies customer expectations, and demonstrates a potential profit.
Introduction (Assessment)

Pre-Production Prototype

• Do you have a production prototype of the product?
• Have you conducted pilot production?
• Have you selected the manufacturing process, equipment?
• Do you have a commercial-level design?

Market Validation

• Have you conducted limited product sales?
• Have you designed and implemented a customer survey?
• Have you analyzed customer feedback (price, design, function, packaging, delivery)?
• Have you analyzed your competitor's response?

Business Startup

• Have you hired and trained core personnel?
• Have you arranged for the next stage of financing?
• Do you convene regular board of director meetings?
<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>PRODUCT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Production</strong></td>
<td><strong>Production</strong></td>
</tr>
<tr>
<td>The objective of the production step is to put a new product into commercial production and optimize the manufacturing process.</td>
<td>The product of this activity is a <strong>market-ready</strong> product.</td>
</tr>
<tr>
<td><strong>Sales &amp; Distribution</strong></td>
<td><strong>Sales &amp; Distribution</strong></td>
</tr>
<tr>
<td>The objective of the sales and distribution step is to gain market share and increase profitability.</td>
<td>The product of this step is a <strong>final confirmation</strong> or modification of one or more elements in the marketing approach.</td>
</tr>
<tr>
<td><strong>Business Growth</strong></td>
<td><strong>Business Growth</strong></td>
</tr>
<tr>
<td>The objective of the business growth phase is to operate a business enterprise which produces a profitable product for which there is increasing market demand.</td>
<td>The product of this phase is a business enterprise that is perceived by the market as a <strong>preferred source</strong> for the product and/or service.</td>
</tr>
</tbody>
</table>
Production

- Do you support commercial production?
- Do you have after market support for the product?
- Have you improved the production process?

Sales & Distribution

- Have you established product distribution and sales?
- Have you identified areas for market expansion?
- Have you refined product features?

Business Growth

- Have you arranged for full scale production financing?
- Do you have a process to monitor business trends and practice?
- Can you identify opportunities and threats to enterprise profits?
Valley of Death

- The most difficult time for a business is surviving the Valley of Death.
- The Valley of Death is the funding gap between promising research and the transition to the marketplace.
- Typical stages of funding and potential funding sources a business can consider to successfully navigate its way through the commercialization process.
Thank You!

Sanjay Dhole,
Technology Programs Coordinator
Maricopa SBDC

Sanjay.dhole@domail.maricopa.edu
480-784-0591