Successful Entrepreneurship for Microsystems

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The “Productization / Commercialization” Lifecycle
…Basic Research to High Volume Production

Basic Research

Applied Research

Project “down-selection”

1. Basic Principle
2. Concept

Lab Demo
Funding Market Customer Biz Plan ...

Model Prototype

“System”/Produce-able Prototype

Production

FFF
Angel
VC
IPO, M&A

Technology Release Levels, Ref. nasa.gov

1 2 4 5 7 9
The “Productization / Commercialization” Lifecycle
...Idea to High Volume Production

Technology Release Levels, Ref. nasa.gov

1 2 4 5 7 9
Definition Of Technology Readiness Levels

TRL 1 Basic principles observed and reported: Transition from scientific research to applied research. Essential characteristics and behaviors of systems and architectures. Descriptive tools are mathematical formulations or algorithms.

TRL 2 Technology concept and/or application formulated: Applied research. Theory and scientific principles are focused on specific application area to define the concept. Characteristics of the application are described. Analytical tools are developed for simulation or analysis of the application.

TRL 3 Analytical and experimental critical function and/or characteristic proof-of-concept: Proof of concept validation. Active Research and Development (R&D) is initiated with analytical and laboratory studies. Demonstration of technical feasibility using breadboard or brassboard implementations that are exercised with representative data.

TRL 4 Component/subsystem validation in laboratory environment: Standalone prototyping implementation and test. Integration of technology elements. Experiments with full-scale problems or data sets.

TRL 5 System/subsystem/component validation in relevant environment: Thorough testing of prototyping in representative environment. Basic technology elements integrated with reasonably realistic supporting elements. Prototyping implementations conform to target environment and interfaces.

TRL 6 System/subsystem model or prototyping demonstration in a relevant end-to-end environment (ground or space): Prototyping implementations on full-scale realistic problems. Partially integrated with existing systems. Limited documentation available. Engineering feasibility fully demonstrated in actual system application.

TRL 7 System prototyping demonstration in an operational environment (ground or space): System prototyping demonstration in operational environment. System is at or near scale of the operational system, with most functions available for demonstration and test. Well integrated with collateral and ancillary systems. Limited documentation available.

TRL 8 Actual system completed and "mission qualified" through test and demonstration in an operational environment (ground or space): End of system development. Fully integrated with operational hardware and software systems. Most user documentation, training documentation, and maintenance documentation completed. All functionality tested in simulated and operational scenarios. Verification and Validation (V&V) completed.

TRL 9 Actual system "mission proven" through successful mission operations (ground or space): Fully integrated with operational hardware/software systems. Actual system has been thoroughly demonstrated and tested in its operational environment. All documentation completed. Successful operational experience. Sustaining engineering support in place.
Key Requirements for Business Plan & Funding

- A Biz Plan Document (usually ~20 pages)
- An Overview Presentation (usually ~10 slides)
- An “Elevator Pitch”
Business Plan – a typical Outline

- Executive Summary
  - Objectives
  - Mission
  - Key to Success

- Company Summary
  - Startup Summary
  - Management Team
  - Technical Team
  - Company Locations and Facilities

- Market Analysis
  - Industry Overview
  - Market Size
  - Market Opportunities
  - Competitions

- Product Summary
  - Product Description
  - Sourcing and Technologies
  - Product Development Schedules
  - Competitive Analysis
  - Product Advantages
  - Product Roadmaps

- Marketing and Sales Strategy
  - Targeted Markets
  - Customers
  - Strategic Alliances
  - Advertising and Promotion
  - Selling Tactics

- Manufacturing and Operations Plan
  - Wafer Sourcing
  - Backend Manufacturing Plan

- Organization and Personnel Plan
  - Organization
  - Personnel Plan

- Financial Plan
Lifecycle of a Fabless IC development – the 4 phases

- Global Planning
- IC Design
- IC Prototyping
- IC Production

Series A

Series B

30 – 50% of TT$
Lifecycle of a Fabless IC development – activity highlights

- **Global Planning**
  - High Level Design
  - Floor Planning

- **IC Design**
  - Chip Design
    - RTL
    - NL
  - Physical Design
    - NL
    - GDSII
  - Analog IP Design

- **IC Prototyping**
  - FAT
  - Debug

- **IC Production**
  - IC Qualification
  - Prod. Ramp
  - Hi volume

- **Reference Design**
  - FPGA Implementation
  - Reference Boards
  - Customer Samples

- **Customer Evaluation**
  - “Proof of Concept”
  - Customer Evaluation

- **System” Architecture / Design / Simulation / Verification**

- Series A

- Series B

30 to 50% of TT$
The New Focus

SHOULD it be Built?

CAN it be Built?
Business Model Canvas

http://practicetrumpstheory.com/business-model/
HW 5 – Major Project Benchmarks and Milestones

Due on Wednesday, April 30th

What are the most important Benchmarks and Milestones for your Project?
Why do you consider these important

…a 1-page summary

For extra credit, line up your Project Milestones with the NASA TRL levels.