Technology Assessment and deciding on a strategy

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Who's Speaking

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Dr. Stevens is a biotech entrepreneur and technology commercialization expert. He co-founded Genmap, Inc. and Kytogenics, Inc., bringing academic innovations to market. He later led technology transfer at Dana-Farber Cancer Center and Boston University, where he helped launch 55 startups.

Affiliation

- Past President Association of University Technology Managers, USA(AUTM)
- Head of Tech Transfer for Boston University
- President Focus IP Group, LLC

Introduction to Invention Triage and Selection

Technology Commercialization

- Academic inventions are embryonic
  - The technology is unproven
  - The market demand is unknown
- Commercialization is all about risk reduction
  - The Technology Evaluation is the first round of risk reduction
  - There will be successive rounds of risk assessment / reduction
    - Generally tied to:
      - License transactions; or
      - Financing

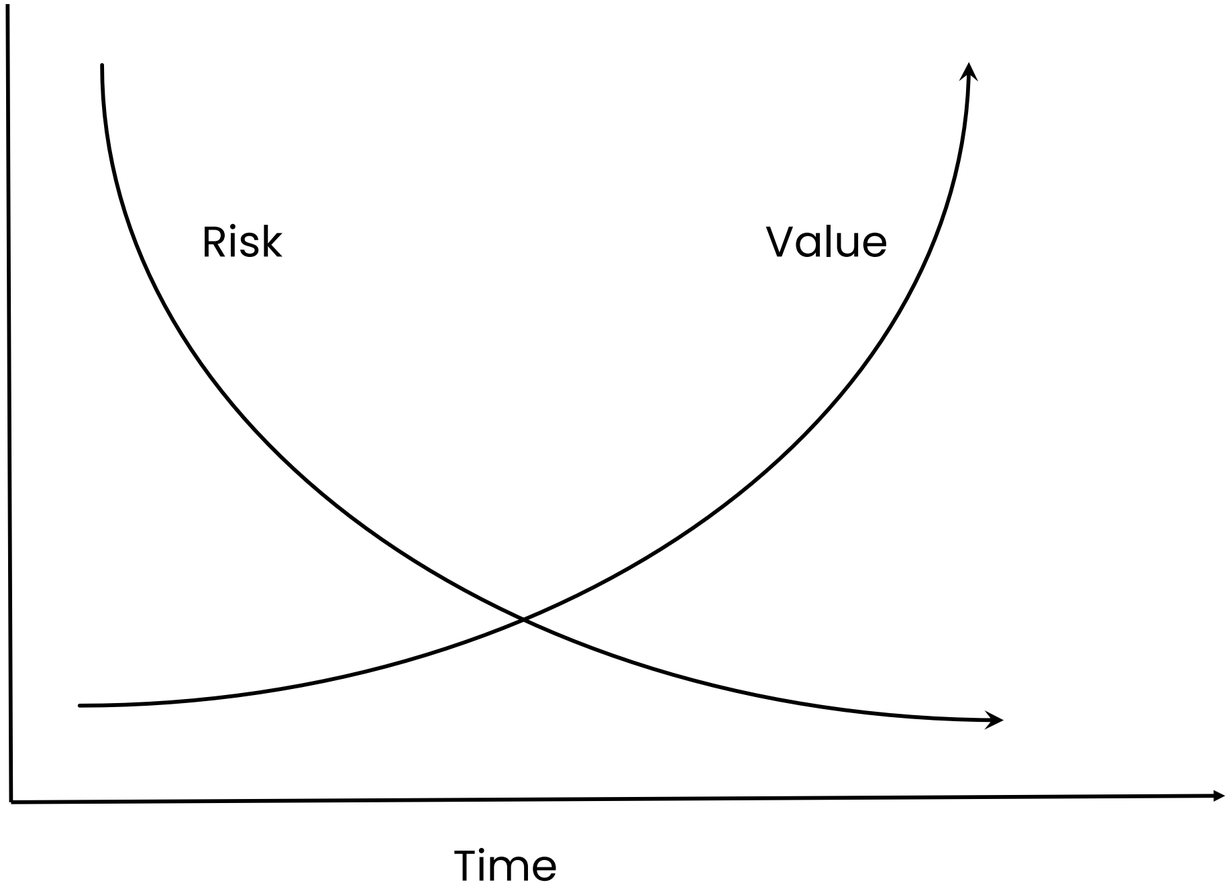
Technology Assessment

- The foundation of a tech transfer office
- All experienced practitioners have some form of Technology Assessment
  - Mine is the “First Look Technology Assessment”
    - My Osaka University G-TEC course was a week of doing a First Look Technology Assessment
    - My system derived from Brett Cornwall’s “Quick Look Technology Assessment”
      - IC^2 at the University of Texas Austin
  - Dick Cahoon’s is the Ten Point Technology Scoring Template (TPTST)

Triage and Assessment

- All the systems attempt to answer two questions:
  1. How likely are we to get a patent on this technology?
  2. And if we do, will anybody care and want it?

Value vs. Risk



First Look Technology Assessment Template

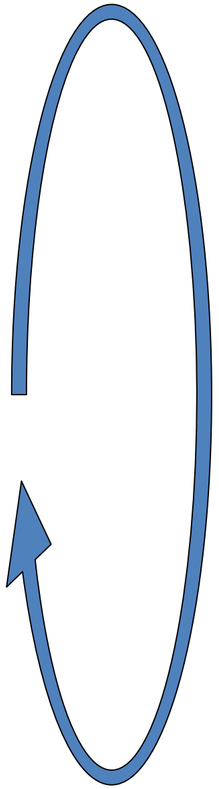
- A critical step in the technology transfer process
- Need to do it upfront
  - Otherwise, you make bad decisions
    - File on most disclosures
      - You have no good reason to explain to faculty why you're not going to go ahead
    - Kicks the can down the road
      - If the technology's no good, you're going to have to face up to it eventually
        - Faculty will be more disappointed if they've put a lot of work into the patenting effort

First Look Technology Assessment Template

- The Process
- Methodology
- Report Format
- Ranking methodology
- Outcomes
- Experiences

Assessment Outline

- Technology Description
- Value Proposition
- Product Vision
- Potential Markets
- Market Interest
- Competing Technologies and Competitors
- Barriers to Market Entry
- Development Status of Technology
- Intellectual Property Status
- Pathway to Market



In real life, this is a never ending process

- **We looked at the market issues in the Market Application Viability talk**

First Look Technology Assessment Template

- Important to let faculty review the document and recommendations
  - Before it's finalized and issued
    - "Have I missed something or misunderstood something?"
  - Perhaps you have and you need to do more work
  - But if they can't argue with your data or analysis
    - They now share ownership with you

First Look Technology Assessment Template

- Faculty will have thought through the science
  - What they propose will be scientifically / technically feasible
- But will it be practically feasible?
  - Is there a market?
  - Does the invention fill unmet market needs?
  - Are we going to get a patent or other protection?
  - What's the competition?
  - Will it work on a large scale?
    - Can it be made economically?
  - What are the regulatory barriers to market entry?
  - What's the commercial pathway to market?

Methodology

Step 1 – Obtain a complete description of the technology and how it translates into products and services

- Talk to inventor

Step 2 – Assess stage of development of technology and next steps

- Talk to inventor

Step 2 – Search for competing patents or prior art

- Talk to inventor

Step 3 – Identify potential markets and competing products

Step 4 – Secondary Research

- Identify end users, distributers and potential licensees

Step 5 – Primary Research

- Contact experts and companies

Step 6 – Write the report and fill holes if necessary

Step 7 – Prepare presentation

Discussions with the PI

- Your Objectives:
  - Establish a positive relationship with the inventor
    - Keep the door open for follow-up questions
  - Obtain the benefit of their thinking
    - They've been thinking about this for a long time
    - They know the market
  - Understand the science
    - What it can do
    - How it's superior
    - What are the competitive approaches
  - Their thoughts on the most attractive applications of the technology

Discussions with the PI

- Objectives (cont.)
  - Get their help on patent searching:
    - What are the key terms to search for?
    - What are other terms that capture those concepts?
  - What is the stage of development of the technology?
    - Their thoughts on where we go from here:
      - What are the key proof-of-principle experiments that need to be done?
      - How easy will it be to fund those experiments?

Discussions with the PI

- Be well prepared with specific questions, e.g.
  - What distinguishes it from prior art?
  - Needed development time/resources, etc.
  - What are the limitations? When doesn't it work?, etc.
- Start with a bullet point summary in your head, see if it changes
- Be ready to be surprised you've completely misunderstood!
- Don't take anything but the science at face value
- Be judicious with their time…

Report Content

1. Technology Description and Resulting Products
2. Potential Benefits
3. Potential Commercial Markets and Market Interest
4. Development Status of the Technology
5. Ease of scale-up
6. Technology Development Plan
7. Intellectual Property Status of the Technology
8. Competing Technologies and Competitors
9. Pathway to market
    1. Potential licensees
10. Barriers to Market Entry
11. Commercial Potential Rating
12. Recommendation

1. Description of Invention and Inventiveness

- Does the Invention Disclosure thoroughly and clearly describe the invention;
  - What it is and how it works?
- Are the inventive features clearly delineated and explained?
- Do the inventive features appear to be technically meaningful /significant?
  - Not simply a distinction without a difference
    - “Must Have” vs “Nice to Have”
- Are the superior performance features described clearly?
- Does it work?
  - As hoped?

Patent Due Diligence

- Two Levels of Analysis
  - Patentability
    - Us
    - Likelihood of getting our patent issued
      - Prior Art
      - Obviousness
  - Freedom to Operate
    - Them
    - Dominating patents
      - Will need a license to them to be able to practice our patent

FLTA

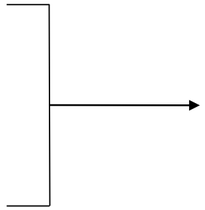
FLVA

Prior Art Searching

- One of the first steps in evaluating a technology
- Are we going to be able to get the right sort of patent to protect the products we envision?
- You should do a search yourself at the beginning
- If you decide to go ahead, the patent attorney will do another search
  - And the patent office you submit to will do another **really** thorough search

Criteria for Patentability

- Novelty
- Utility
- Non-obviousness



Prior art search

Mechanics of IP searching

- Search engines
- Search terms
- Search strategies

Types of Searches

- Patent Searches
  - USPTO
  - WIPO
  - EPO
- Non-Patent Searches
  - "Literature”

What Tools Are Used to Search Patents?

Finding Patents

- **USPTO –** www.uspto.gov/patft/index.html
- **WIPO –** www.wipo.int/pctdb/en/search-adv.jsp
- **European Patent Office –** worldwide.espacenet.com/
- **Google Patents –** www.google.com/patents?hl=en
- **Lens –** www.lens.org/
- **FreePatentsOnline – www.freepatentsonline.com**

Search Terms: Work with the Inventors!

- Use alternative terms
  - e.g. “steerable needle”=“manipulator”
  - “nanowires” = “thin channels”
- Names of competitor academic labs
  - PIs have best information (but still may not be enough)
- Names of competitor companies
  - PIs, patent assignees, licensors

2. Potential Value of Intellectual Property

- Is it patentable *vis-a-vis* the prior art
  - Is there an International Search Report
    - Are there “X” references?
- Is there an issued or pending patent on the invention?
- Do the claims effectively cover the invention?
- Will the claims be reasonably enforceable?
- In which countries do potential or existing patent claims exist
  - Are these relevant to the market for the invention?
    - Local – Utility model adequate
    - Global – Was PCT timely filed?

2. Potential Value of Intellectual Property

- Are other types of IP possible or existing?
  - Trademark
  - Copyright
  - Plant Breeders' Right
  - Trade Secret
  - Traditional Knowledge
- Is there potential or existing "bioproperty" that may have value in commercialization of the technology?
- What is the Property Control Position ("PCP")

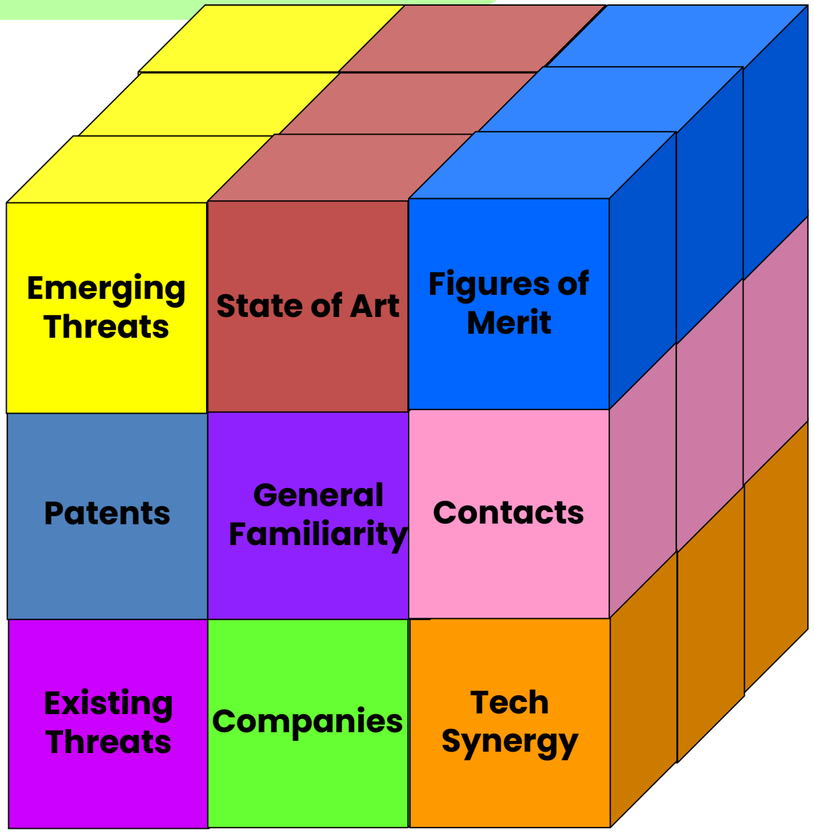
3. Market Relevance

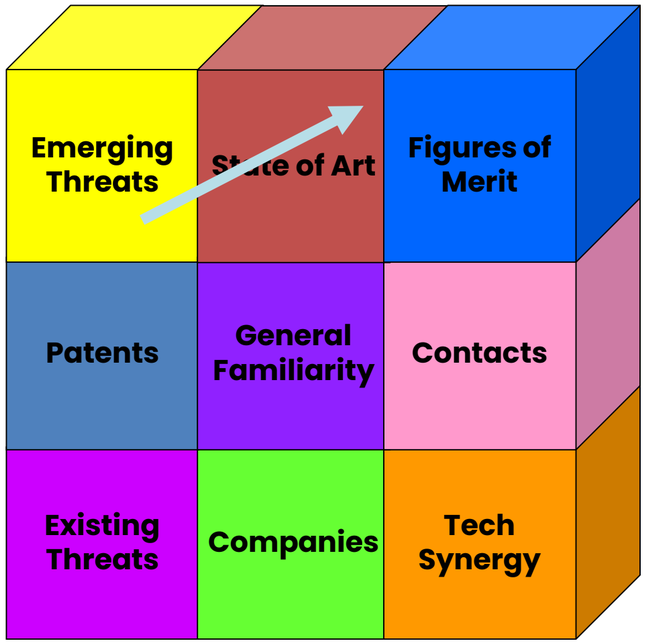
- A two-step process:
  - Secondary research ➔ Primary research

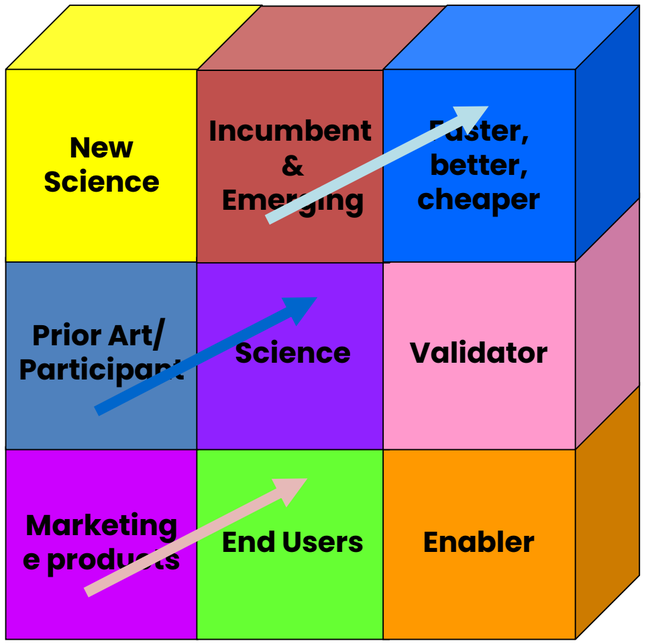
    - Secondary research = OPR (Other peoples' research)
    - Primary research = MR (My research)

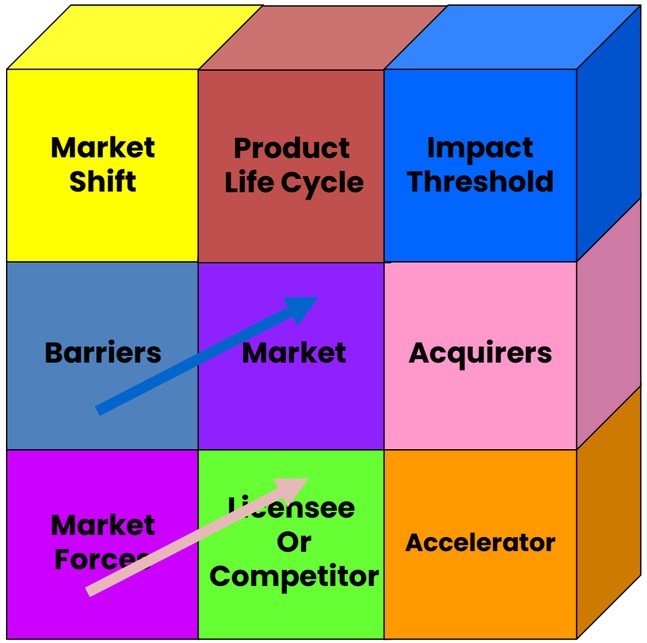
Stay Skeptical

- Assume everything already exists
- First search for things that destroy your opportunity, then search for things that support it.
  - A quick kill of a project early in the process is preferable to wasting time on a dead end.
  - People (mistakenly) tend to focus their attention on supporting evidence
  - Investors look for ways to say NO









Secondary Research Resources

- Google
- Business School Library
- Subscription Services
  - Frost & Sullivan

Healthcare

- Much easier than physical sciences/IT/Software
  - Need is more obvious
  - Addressable market size is easier to estimate
  - Range of possible products is usually constrained

Healthcare

But… horizons vary

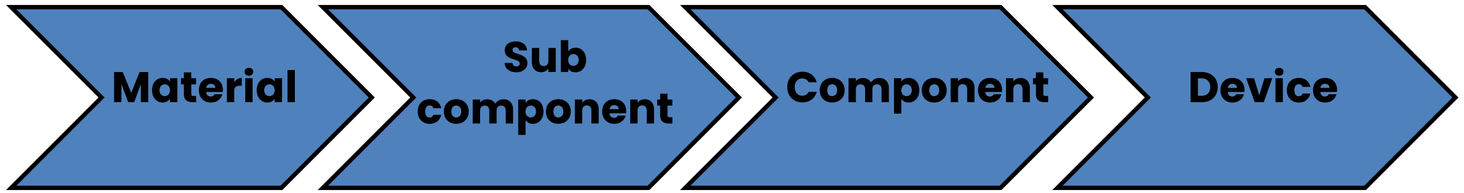
- Drugs
  - Stage of development is earlier
  - Leads to far reaching assumptions about performance
- Devices
  - Returns are usually much lower than drugs
  - Therefore risk must be much lower
  - Translation: 510K, replace an existing therapy, has an established reimbursement code
- Diagnostics
  - Market is highly competitive (many solutions, many entry points…)
  - Incumbents require compelling data
  - Expectations on performance are much higher (clinical samples)

Physical Sciences & IT

- Many possible products
- Many possible markets
- Varying levels of competition
- Value chains not clearly defined
- Market data harder to identify

Supply / Value Chain Analysis

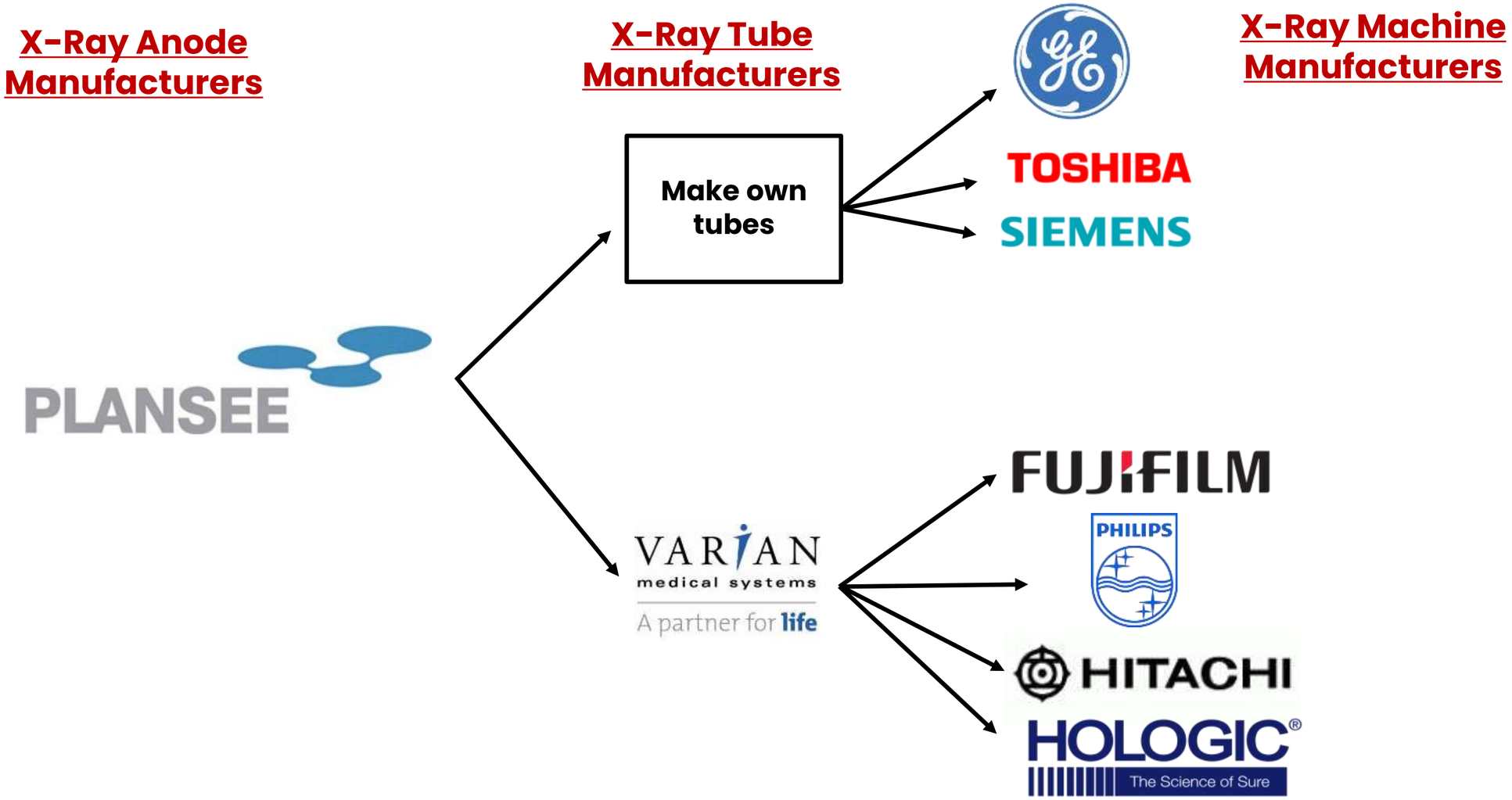
- Where in the supply chain does your technology fit?
- How far forward in the supply chain does the technology's value add let you integrate?
- The further forward you go, the more value you capture
  - e.g., a new material



- Most supply chains have been so disaggregated that you can usually find a contract manufacturer

Example: A Material for an Improved X-Ray Anode

- The supply chain options:
  - Make the material and sell to anode manufacturers
  - Make anodes and sell to X-ray tube manufacturers
  - Make X-ray tubes and sell to X-ray system manufacturers
  - Make and sell X-ray systems to healthcare providers
- The supply chain realities:
  - Only a few manufacturers of X-ray systems
  - Only one manufacturer and seller of X-ray tubes
  - Only one manufacturer of anodes



Example: A Material for an Improved X-Ray Anode

- The only strategic options:
  - Make anodes and sell to the four tube manufacturers; or
  - Make the material and sell to the one anode manufacturer
- Licensing strategy
  - Determine whether the tube manufacturers are happy with Plansee
    - Monopolists can build up ill-will
  - If they are happy:
    - Only option is to sell to Plansee
  - If they're not happy:
    - **MAY** be an opportunity for a start-up anode manufacturer

5. Value Proposition / Potential for Reasonable Business Model

- Can at least one “value proposition” be described and substantiated for the invention, in at least one market application?

  Value Proposition = Quantitative Benefit – Quantifiable Cost

- Is the value proposition feasible?
- Can you identify at least one reasonable business model for the selected value proposition?
- Is this business model suitable for:
  - A disruptive / paradigm shift, or
  - A revolutionary, or
  - An incremental (large or small)

  innovation?

6. Potential for Significant Economic Value

- Does the combination of:
  - Value proposition,
  - Market size
  - Business model, and
  - Market characteristics

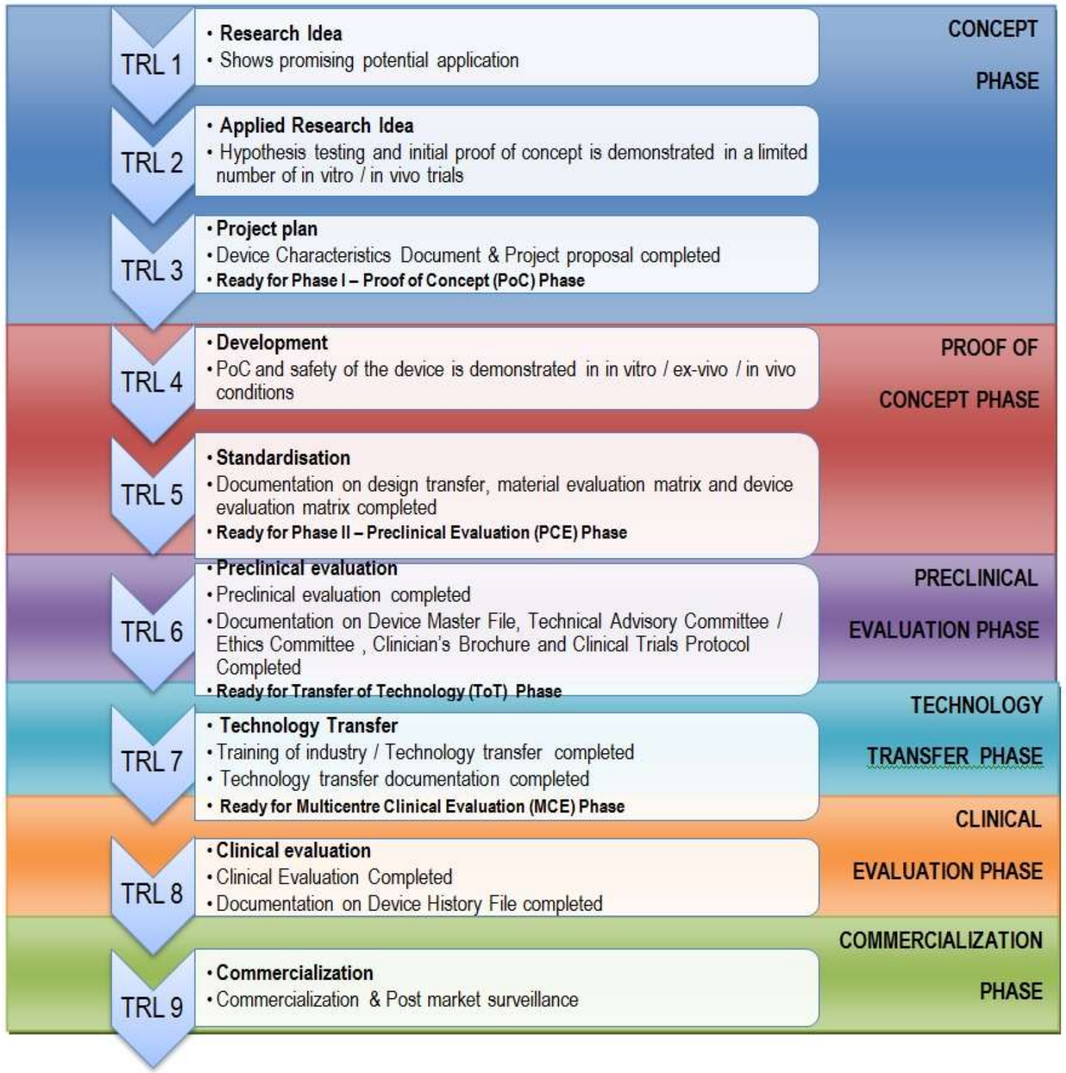
  establish the basis for significant economic value?
- Will the realization of that value require:
  - Very large
  - Large
  - Moderate, or
  - Small investment?
- Will the potential return justify the investment required?

7. Stage of Development Technology Readiness Level

- What is the current stage of technical development of the invention:
  - Idea
  - Test-tube proof
  - Bench-test validation
  - Extensive testing
  - Pilot scale
  - Beta-test
  - In application, etc?
- Where is the invention on the Technology Readiness Level scale?
- What level of risk (that the technology will not work as expected / hoped) is the technology currently at?

Technology Readiness Level

- Developed by NASA to manage their major development projects
- Adopted by U.S. military
- Widely accepted



Most academic inventions

Manufacturing Readiness Level (MRL)		
Phase	MRL	State of Development
Phase 3: Production Implementation	9	Full production process qualified for full range of parts and full metrics achieved
	8	Full production process qualified for full range of parts
	7	Capability and rate confirmed
Phase 2: Pre production	6	Process optimised for production rate on production equipment
	5	Basic capability demonstrated
Phase 1: Technology assessment and proving	4	Production validated in lab environment
	3	Experimental proof of concept completed
	2	Application and validity of concept validated or demonstrated
	1	Concept proposed with scientific validation

8. Getting from Here to There

Risk Reduction

- What are the next few steps needed to reduce the risk to where the technology is investable?
- Will those risk reduction steps be relatively easy or difficult?
  - In terms of time and money
- Will you be able to secure that proof-of-principle funding?
- Will the cost required to de-risk the technology be justified by the potential return on needed investment?

Scale-Up Feasibility

- Can the technology be cost-effectively scaled-up to a level of profitable manufacture or service delivery?

8. Getting from Here to There

Barriers to Entry

- What road blocks are there between this technology and market entry?
  - Long and hard regulatory path?
  - Market reluctance to adopt?
  - Reimbursement?
  - Entrenched players:
    - Need an overwhelming sales force?
    - Who would lose and how would they react?
  - *How many right things have to happen for your product to be bought?*

9. Support, Funding and Resources

- Are there resources readily available to further develop the invention:
  - Money
  - Staff
  - Facilities
- Is development funding readily available?
- Are there additional resources available to help develop the technology from its current stage to commercialization?
- Are there other pre-commercialization partners who can help with risk reduction?
  - Another academic partner who uses this technology?
  - A government lab or NGO?
    - Who'd self fund their activities because our technology addresses their mission

10. Existing or Potential for Private-sector Partnerships

- Is this technology going to be developed with an existing company or does it need a start-up?
- If an existing company, who are some potential partners?
  - Do relationships with any of these potential partners exist?
  - Are these partnerships closely linked to commercialization activity?
- If a start-up company, is there investment interest?

Scoring

- Score each category1-5
  - 1= Very Unfavorable
  - 2= Unfavorable
  - 3= Neutral
  - 4= Favorable
  - 5= Very Favorable
- Maximum possible 10 * 5 = 50

Technology Rating

Factor	Weight	Score (1-5)	Weighted Score
Market Potential	15%		
Market Maturity	15%		
Current Status of Technology	15%		
Proof of Concept/Prototyping	15%		
Ease of Scale-up	10%		
Competitors	15%		
Patents	15%		
Total			

Technology Rating

Factor	Weight	Score (1-5)	Weighted Score
Market Potential	15%	3	0.45
Market Maturity	15%	4	0.6
Current Status of Technology	15%	2	0.3
Proof of Concept/Prototyping	15%	4	0.6
Ease of Scale-up	10%	2	0.2
Competitors	15%	3	0.45
Patents	15%	4	0.6
Total	100%		3.2

Technology Rating

- Critically important to explain why each score is being awarded
  - This is where you show the inventor where the weaknesses are
    - Get his buy-in on why not to proceed
    - Show him where things could be improved
      - E.g., More reduction to practice / proof of concept
- Scores tend to come out in range ~2.0-3.0
  - Academic technologies are embryonic!
- Value of scoring to the TTO is to compare one technology with another
  - Prioritization of resources
  - History as a guide to the future

Outcomes

- Go >3.5
- Kill <2
- Conditional Go 2.5-3.5
  - Go if.....
- Conditional Kill 2-2.5
  - Kill unless.....

Questions:

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UNITED NATIONS
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