


Transitioning from idea/invention to marketing/licensing/startup

April 24, 2020
Reed McManigle
CMU CTTEC



Outline of presentation

- Evaluation of your invention
- Intellectual property as competitive advantage
- Protection of your invention
- Ownership of your invention
- Development of your invention
- Marketing of your invention
- Tapping into the local business community

Evaluation of your invention, part 1:

Market opportunity

- Great science/technical solution \neq great product
- What need or pain are you addressing?
- How many people or businesses have that need or pain?
- What are they willing to pay for a solution?
Can you make a profit at that price?
- What are the switching costs?

Evaluation of your invention, part 2:

Competitive advantage

- What are the current solutions to the problem?
- Why are they inadequate?
- What approaches are being developed by others?
- How is your solution better?
 - Quantify: faster, better, cheaper...
- How will you sustain your competitive advantage (e.g. patents, speed to market)

Evaluation of your invention, part 3:

Market dynamics

- Is the industry growing or shrinking? At what rate? Why—what are the trends?
- What are the margins in this industry?
- Is the market dominated by a few players or are there many? Who are the leaders? Who are the ‘up-and-comers’?
- Can small players be successful in this market? How is distribution controlled/ accessed? Regulatory barriers?
- What acquisitions have happened? At what stage of development? At what valuation?

Evaluation of your invention- Investor perspective

- Do you have a sustainable competitive advantage in providing a solution to a pressing need in an industry/niche with attractive margins, and high growth rates that is open to new entrants, and has viable, near-term exit strategy?
- Management skills to implement?
- Viable business model (how/when do you get paid?)

Sustainability of competitive advantage

- Speed to market
- Lock on distribution channels
- Leadership team
- Intellectual property
 - Know-how
 - Trade Secrets
 - Trademarks
 - Copyright
 - Patents

Types of IP (from Ulrich and Eppinger)

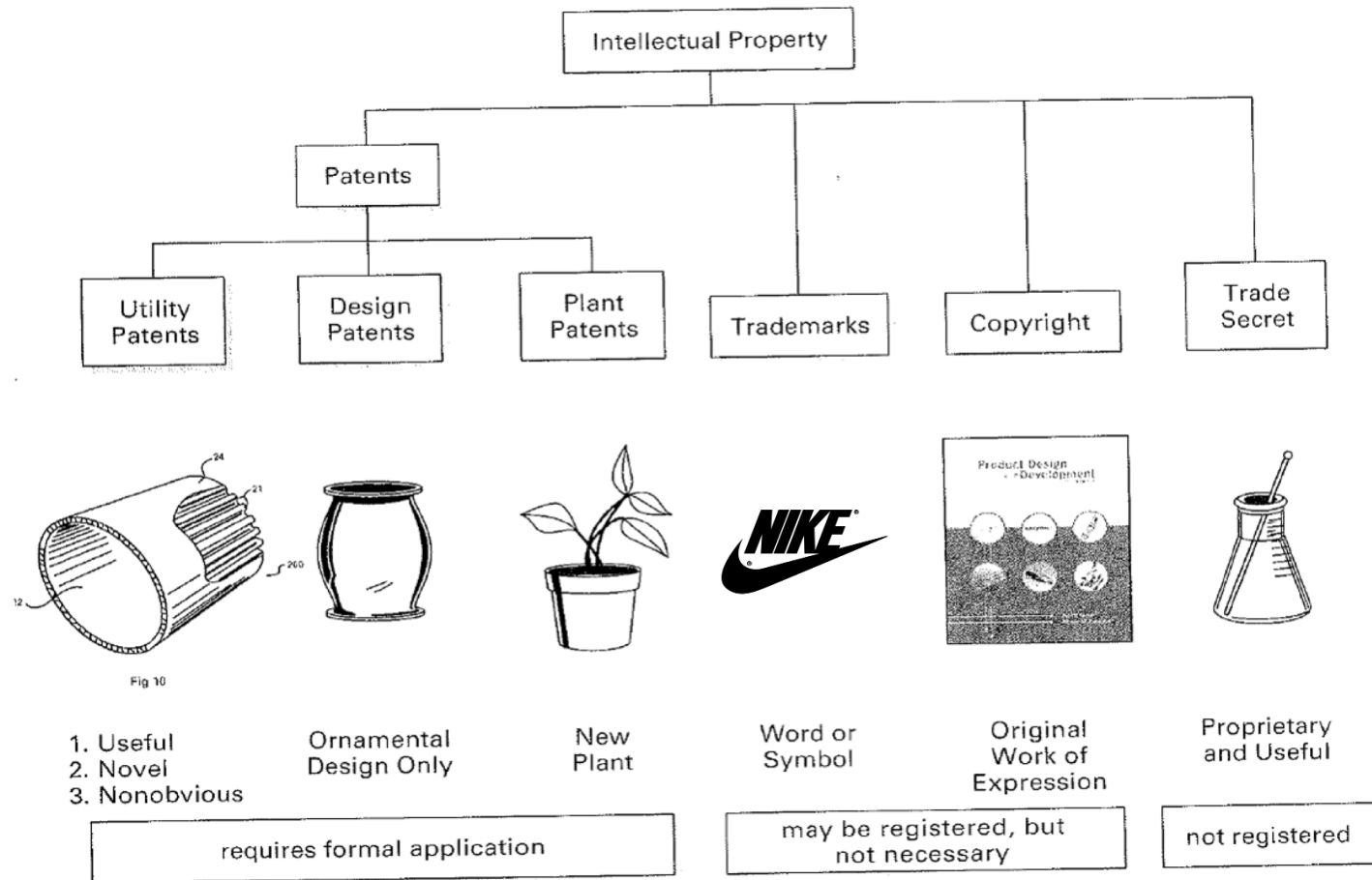


EXHIBIT 14-2 Taxonomy of types of intellectual property relevant to product design and development.

Types of IP

- **Patent:**

- A temporary monopoly granted by a government to an inventor to exclude others from using an invention.
- In the U.S., a patent expires 20 years from the filing date.
- Three types:
 - **Utility patents:** For a "useful, novel and non-obvious" invention.
 - **Design patents:** For ornamental design only.
 - **Plant patents:** Horticulture engineering.

- **Trademark/Service mark**

- Exclusive right granted by a government for owner to use a specific name/symbol in association with a class of products or services.

- **Copyright**

- Exclusive right granted by a government to copy and distribute an original work of expression (including software code, designs, etc.).

- **Trade secret**

- Information used in business that offers the holder a competitive advantage when kept secret. Not a right granted or enforced by government.

Patents as competitive advantage

- Patents provide a monopoly 'right to exclude' for 20 years, in return for 'teaching' how to practice (empowered in U.S. Constitution)
- Patents may be narrow or broad
 - Do the claims protect an advantage that matters in the marketplace?
 - How easy to do an 'invent-around'?
- Patent may not give you 'freedom to operate'
- Investors look for patent 'picket fences'

Why Patents?

- Rationale
 - Public disclosure
 - Encourage research & development
 - Encourage improvements
 - Encourage commercialization

Standards for Patentability

- **Useful:** Invention must be useful to someone in some context;
- **Novel:** Invention must not be prior art in public domain. This also means that the invention itself must not appear in the public domain before patenting;
- **Non-obvious:** If the invention would be clearly evident to those with "ordinary skill in the art" who faced the same problem as the inventor, then the invention is considered obvious and not patentable. Of course, this criteria can be a source of disagreement.

Patent search- novelty/non-obvious

- **USTPO.gov; google/patents, etc.**
- **Search by:**
 - **Keywords**
 - **Assignee** (owner—competitive landscape)
 - **Inventor** (e.g. after finding research article)
 - **Classification** (after finding similar inventions)
 - **References cited** (go back in time to start new search tree)
 - **Referenced by** (go forward in time to find later inventions)
 - **Patent number** (e.g. if referenced in product lit.)

Protecting your invention: Managing Research to Preserve Intellectual Property Rights

- Goal: avoid pitfalls in research management that can compromise intellectual property rights
 - Inadvertent actions can severely diminish the value of IP
 - Academic rewards and culture encourage actions which can compromise IP value!
 - Obstacles can be avoided with planning, diligence and thoughtful actions

Public disclosure and patents

- Inventions must be novel to be patentable
 - Typical understanding: “not previously invented”
 - Hidden pitfall: “not previously known to the public”
- What does ‘known to the public’ mean???
 - If you have disclosed enabling details of the invention, its no longer considered to be novel, and therefore it cannot be patented!!

Public disclosure (cont.)

- Exceptions:
 - Disclosure must be ‘enabling to one skilled in the art’
 - Can someone recreate the invention from the details that you have disclosed? Sometimes just the title is enough!
 - One year ‘grace period’ in United States
 - Can still file a patent up to one year after public disclosure
 - **NOTE: IN MOST OTHER COUNTRIES, THERE IS NO GRACE PERIOD AND PATENT RIGHTS ARE LOST IMMEDIATELY UPON PUBLIC DISCLOSURE!!!**

Public disclosures

<u>Obvious public disclosures</u>	<u>Less obvious public disclosures</u>
Publishing in a journal or book	Federal grant application after approval (FOIA)
Speaking at a conference	Student theses, dissertations in library
Offer product for sale	Web site
	Conversation with 'outsider'—e.g. company
	Conference posters, abstracts
	Emails

Research practices to manage disclosures

- Patent, THEN publish (more later on this)
 - File invention disclosure with adequate time for review and patent filing (e.g. submit before or at same time that manuscript is submitted)
 - Be conscious of impending publication dates (which may occur electronically before a conference or print edition is available)
- Don't reveal 'enabling' details
 - E.g. in abstracts and posters
- Do use confidentiality agreement in dealings with 'outsiders'
- Mark critical, enabling details in grant applications as 'Confidential'

Ownership of intellectual property, part 1: who are inventors?

The inventors are those who come up with the ideas that end up as claims in the patent.

- Pitfall: not the same as authorship!
 - Managing the work of others, or doing work under the direction of others is not inventing!
- Faulty listing of inventors (over-inclusive or under-inclusive) can present an opportunity for competition to seek to invalidate your patent

Ownership of intellectual property, part 1: who are inventors (cont.)?

The U.S. had a 'first to invent' patent system

CHANGED: BECAME 'FIRST TO FILE'

March 16, 2013

Ownership of intellectual property, part 2: assignment of ownership

- In U.S., ownership of patent rests initially with inventor
- Automatic assignment of ownership is typical in employment and consulting relationships
- CMU has multiple ownership categories:
 - No sponsorship, no substantial use: inventor owns
 - Substantial use: inventor owns, with 15% revenue sharing
 - Sponsorship (e.g. federal grant, corporate sponsored research): university owns

Conflicting claims to IP

Multiple collaborators and multiple sources of funding can lead to multiple claims to the IP

- Intra-university collaboration
 - No conflicting ownership claims: Inventors assign to same institution; sign split agreement to allocate inventor share of proceeds
- Inter-university collaboration
 - Potential for conflicting ownership claims, but standard practice of ‘interinstitutional agreements’ to assign responsibility for IP management, and split of revenues

Conflicting claims to IP

- Company-sponsored research at university
Typically... (beware of variations!)
 - University invention is owned by University; company gets right to use internally and right to negotiate commercial license
 - Company invention during collaboration is owned by company; University gets right to use for education and research
 - Joint invention is owned by both—either can use for any purpose, including licensing to third parties (does company want to license University interest?)

Conflicting claims to IP

- Consortium-sponsored research at university (blend of federal and company funds) E.g. DSSC, QoLT ERC
 - University invention is owned by University; Member companies get shared license (non-exclusive, royalty-free?)
 - Company Visiting Researcher invention is owned by University, with shared company rights as above
 - Joint invention is owned by University, with shared company rights as above

Research practices to manage conflicting claims to IP

- Be disciplined about keeping projects that are funded by different sources separate
 - Separate scopes of work
 - Separate budgets (don't move funds from one project to another)
 - Separate lab notebooks

Protecting your invention—CMU process

- Invention disclosure
- Evaluation
 - Patent search
- Provisional patent application?
 - One year ‘place-holder’
 - Inexpensive to file; can do yourself but be careful
- Full patent application?
 - \$10-15K initially, ~\$20-30K over life
 - Similar amount per country

Protecting your invention: timing

- If patent application (even provisional) is filed prior to first public disclosure: options are preserved to file anywhere in world
- If public disclosure occurs prior to filing of patent application, opportunity to file patent is lost in most countries, but one year grace period in U.S.
- May file provisional prior to public disclosure, then abandon and file new prior to 1 yr after public disclosure—put off big \$ for 2 yrs but lose international options

Developing your technology

- CUSTOMER DISCOVERY, product idea testing
 - I-CORPS (CMU Site; regional/national Nodes)
 - Don't develop in a vacuum, FIND A REAL NEED
 - Get feedback, and referrals for more feedback
 - Refine ideas
 - Work networks of friends, faculty, alumni, CTTEC, economic development organizations, LinkedIn, business networking events, conferences, etc.
 - Line up beta test sites
 - Comparison testing

Developing your invention

CMU sources of funding—pre-company (**for univ-owned IP):

- CTTEC gap funds **
- CMU Swartz Center
 - Innovation Fellows Program **
 - Innovation Scholars
 - Spark Grants
 - I-Corps

Developing your invention

CMU/Partner sources of funding—pre-company
(**for univ-owned IP):

- UPMC: Center for Machine Learning and Health**
- Highmark/AHN: Disruptive Health Technologies Institute**
- PriceWaterhouseCoopers: Risk and Regulatory Services Innovation Center**

Developing your invention

Local sources of funding—pre-company (**for univ-owned IP):

- Innovation Works University Innovation Grants (UIG) aka TCC ** (sporadically available)
- Prizes
 - UPPrize (Social Ventures)
 - TransTech Energy Conference (energy/cleantech/manufacturing)
 - AlphaLab Gear Hardware Cup

Developing your invention

Non-local sources of funding

– Prizes

- Rice Business Plan competition (CMU often has category winners)
- SXSW (CMU often has category winners)
- Innovation Prize (life sciences, France)
- ROKO Labs (app competition)
- Many new competitions announced on regular basis

– Accelerators

- TechStars, 500 Startups, Y Combinator, Expa Labs, etc. etc.

Developing your invention

- Local sources of funding—into company:
 - Innovation Works
 - Technology Commercialization Initiative (IW)
 - Alpha Lab, Alpha Lab Gear
 - Pittsburgh Life Sciences Greenhouse
 - Idea Foundry
 - Angel investors (e.g. BlueTree Allied Angels)
 - Venture capitalists
 - CMU Open Field Entrepreneurs Fund (for alums)
 - Ascender
 - Urban Redevelopment Authority (City of Pittsburgh)

Developing your invention

- Non-local sources of funding:
 - SBIR/STTR
 - Federal agency set-asides for small business
 - Phase I: ~\$100K, 6-12 months
 - Phase II: \$500-750K, 2 years
 - Solicitations from each agency come out 1-3 times/yr
 - Accelerators
 - Crowdfunding (gifts, e.g. Kickstarter)
 - Crowdfunding (investments)
 - Corporate partners
 - For any source of funding, important to have potential customer involved to confirm need and direction

Marketing of your invention

- Identify firms in the industry with:
 - Competitive products
 - Synergistic products
- Connect with technologists
 - Conferences
 - Research paper contact info
- Connect with business development, in-licensing groups

Marketing of your invention

- Invention marketing firms
 - Beware of scammers!
 - Some invention development/marketing firms:
 - <http://www.inventionland.com/>
 - <http://www.impama.com>
 - www.inpex.com

CMU/inventor revenue sharing policies

- If university technology is licensed to 3rd parties, inventors receive 50% of net proceeds
- If university technology is licensed to startup formed by the inventors:
 - 5% equity/1% royalty for non-exclusive license
 - 6% equity/2% royalty for exclusive license
 - Add-ons if:
 - Not all inventors are participating in company
 - Incubation on campus
 - Deferral of patent expense reimbursement

Outline of key licensing terms

- Field of use (product/geographic)
- Exclusive/non-exclusive
- Right to sublicense?
- Equity? Royalties--% of sales? Upfront? Annual?
- Performance milestones
- 'As-is'—no warranty, no liability, indemnification by licensee

Highlights of stats

- ~ 286 invention disclosures FY 2018
 - More than doubled from FY 2010
- ~ \$6-8M in revenues/yr
 - Acquisitions of startups can provide big spikes (\$19M in FY 2012; \$16M in FY2016; \$19.7M in FY2019)
- ~ 10-12 startups a year that are based on licensed inventions
 - CMU is a leader in the creation of startup companies, per research dollar.
 - ~20-30 more startups that aren't based on licensed IP
 - Project Olympus, Tepper, Institute for Social Innovation, Integrated Innovation Institute, Entertainment Technology Center, Open Field Entrepreneurs Fund
 - 52 total startups in FY 2019
 - CMU startups have raised over \$1.5B since 2011

Getting tapped in to entrepreneurial activities in Pittsburgh

- Finding out about jobs in young tech companies
 - Pittsburgh Technology Council
 - Career section of web site
 - job/internship fairs; e.g. HireUP
 - Follow the money—who received investment?
 - Pittsburgh Business Times
 - ‘sister’ publications in 47 cities
 - Searchable archives
 - Network

Getting tapped in to entrepreneurial activities in Pittsburgh

- Economic development groups working with tech startups (\$, mentoring, etc.)
 - Swartz Center for Entrepreneurship (Project Olympus/Don Jones Center): focus on CMU;
 - Innovation Works (all techs; AlphaLab program for IT/Web 2.0 and AlphaLab Gear device startups)
 - Technology Commercialization Initiative (IT, robotics)
 - Pittsburgh Life Sciences Greenhouse (medical/health care techs)
 - Idea Foundry (startup coaching, \$; various focus areas: social ventures, entertainment, water)
 - Accelerators: Ascender, StartUptown, C-Leveled, etc.

Getting tapped in to entrepreneurial activities in Pittsburgh

Networking events and organizations

- Swartz Center for Entrepreneurship
 - Many events for student/faculty startups; weekly email/calendar of events
- CMU Graduate Entrepreneurship Club
- Pittsburgh Technology Council
 - Many events, many topics; student membership
- Pittsburgh Entrepreneurs Forum
 - Business strategies publicly discussed;
 - robotics event April

Getting tapped in to entrepreneurial activities in Pittsburgh

- TiE Pittsburgh: events, workshops, mentoring, etc. for entrepreneurs
- Ascender: workshops, co-working space, accelerator
- See: Swartz Center newsletter/website for event listings



QUESTIONS?