INNOVATION: FROM DA VINCI TO MODERN CONCEPT OF INTELLECTUAL PROPERTY

Michael Tse
Chair Professor of Electronic Engineering
The Hong Kong Polytechnic University
You see things; and you say, 'Why?'
But I dream things that never were;
and I say, ‘Why not?’

- George Bernard Shaw (1856-1950)
JAMES BOND - GOLDFINGER 1964

• The James Bond car, an Aston Martin DB5, with Q’s special device that used “some tracking beacons” to find Auric Goldfinger’s base.

• Today we know this resembles the satellite navigation (or GPS) we use everyday with our smartphones.
A REAL “VIRTUAL” WORLD WHERE YOU CAN PRETEND A TOTALLY DIFFERENT PERSON

- In February 2004 Mark Zuckerberg launched "The facebook", now called Facebook.

- Social networking websites become popular and offer a variety of ways for connecting people together.

- Twitter, Instagram, LinkedIn, QQ, Weibo, …
First of all, some data...
THE TREND IN THE GROWTH OF KNOWLEDGE ECONOMY

- S&P500 asset distributions

<table>
<thead>
<tr>
<th>YEAR</th>
<th>Tangible Assets</th>
<th>Intangible Assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>95%</td>
<td>5%</td>
</tr>
<tr>
<td>1982</td>
<td>62%</td>
<td>38%</td>
</tr>
<tr>
<td>1992</td>
<td>38%</td>
<td>62%</td>
</tr>
<tr>
<td>1998</td>
<td>28%</td>
<td>72%</td>
</tr>
<tr>
<td>2002</td>
<td>13%</td>
<td>87%</td>
</tr>
<tr>
<td>2004</td>
<td>20%</td>
<td>80%</td>
</tr>
<tr>
<td>2008</td>
<td>25%</td>
<td>75%</td>
</tr>
<tr>
<td>2010</td>
<td>20%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Source: Linsay Moore, 2012 Intellectual Asset Management
IP-INTENSIVE INDUSTRIES IN US 2010

- $5.06 trillion in value added (34.6% of US GDP)
- 27.1 million jobs directly attributable (18.8% of all US jobs)
PATENT TRADE

- Rockstar group (Apple, Microsoft, Blackberry, Ericsson, Sony) acquired 6000+ patent portfolios of Nortel Networks for $4.5B.

- Google acquired Motorola Mobility 17000 patent portfolios for $12.5B

- Kodak sold its digital imaging technologies to a consortium of 12 licencees for $525M

- Microsoft sold 650 patents to Facebook for $550M

- HP acquired 15000 mobile patents from Palm for $1.5B
RESEARCH & DEVELOPMENT IN ASIAN COUNTRIES

- China is the 2nd largest investor of R&D, after US, and followed by Japan.

- Asian countries accounted for 24% of world's R&D efforts at the end of 20th Century, and in 2009 increased to 32%.

## Top Nations in Research and Development Spending

<table>
<thead>
<tr>
<th>Country</th>
<th>Spending (in billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td>$412.4</td>
</tr>
<tr>
<td>China</td>
<td>$177.3</td>
</tr>
<tr>
<td>Japan</td>
<td>$156.0</td>
</tr>
<tr>
<td>Germany</td>
<td>$89.5</td>
</tr>
<tr>
<td>South Korea</td>
<td>$53.5</td>
</tr>
<tr>
<td>France</td>
<td>$49.6</td>
</tr>
<tr>
<td>U.K.</td>
<td>$41.4</td>
</tr>
<tr>
<td>India</td>
<td>$38.4</td>
</tr>
<tr>
<td>Russia</td>
<td>$35.7</td>
</tr>
<tr>
<td>Brazil</td>
<td>$27.9</td>
</tr>
<tr>
<td>Canada</td>
<td>$27.6</td>
</tr>
<tr>
<td>Italy</td>
<td>$24.3</td>
</tr>
<tr>
<td>Australia</td>
<td>$20.8</td>
</tr>
<tr>
<td>Taiwan</td>
<td>$20.8</td>
</tr>
<tr>
<td>Spain</td>
<td>$20.0</td>
</tr>
</tbody>
</table>

IP APPLICATIONS WORLDWIDE

APPLICATION NUMBER

Source: Dr Francis Gurry, Director General of WIPO
PATENT APPLICATIONS WORLDWIDE

PERCENTAGE SHARED

Asia
Europe
North America

Source: Dr Francis Gurry, Director General of WIPO
In 2011, China became the largest patent office in the world.
TWO NOTABLE SHIFTS

Generation of Wealth: from tangible to intangible

- 18-20th Century: **Physical capital & industrialisation**, which spawned ideological debate and shaped the world’s political and social developments: marxism, socialism, communism

- 21st Century and beyond: **Intellectual capital and virtualisation**, which will also shape future political and social developments

Centre of IP generation: from west to east

- 20th Century: US and Europe, Japan
- 21st Century: China, South Korea, other Asian countries
SUSTAINABLE GROWTH

INNOVATION
WHAT IS INNOVATION?

CAN IT BE MADE OR LEARNT TO POSSESS?

CAN PROFESSORS TEACH INNOVATION?
LEONARDO DA VINCI
(1452-1519)
One of the greatest
painters of all time
and perhaps the
most diversely
talented person ever
to have lived
Da Vinci was also a great scientist, engineer, and inventor

An artistic scientist
A scientific artist
LEONARDO DA VINCI (1452-1519)
AN INVENTOR AHEAD OF HIS TIME

- Flying machine
- Helicopter
- Giant crossbow
- Transportation tank
- Hydraulic machine

http://www.da-vinci-inventions.com/
ZHANG HENG 張衡 (AD 78-139)

- Han Dynasty astronomer, mathematician, scientist, engineer, inventor, geographer, cartographer,
- also, artist, poet, statesman, and literary scholar.
So, what breeds innovation?
NORM ≠ INNOVATIVE
In terms of hairstyle, he is certainly more innovative.
Sticking to the norm is anti-innovation.

“\textit{If you ALWAYS DO} \\
\textit{what you} \\
\textit{ALWAYS DID,} \\
\textit{you will} \\
\textit{ALWAYS GET} \\
\textit{what you} \\
\textit{ALWAYS GOT.}”

Albert Einstein
INNOVATION = NON-MAINSTREAM

QUESTION

What are the likely factors that make a person more innovative?

• Education / training
• Work methodology
• Societal environment
• Policy / legal system
• what else?
OUR SCHOOL SYSTEM NATURALLY DISCOURAGES INNOVATION

Training = follow the norms

• Award those who converge to the norms more rapidly
• Punish those who deviate from the norms

Teachers complain to parents that their children are not focusing (on what?)!

Mostly said by Chinese parents to kids after school:

“Did you listen to teachers and behave well today?”

「今天有沒有好好聽老師的話？」
SOME BASIC REQUIREMENTS

**CURIOSITY** - Challenge the norm (accepted answers), challenge the authority — deviate from norm, look for connections of different things

**THINK LOGICALLY** - Ask the right questions, analyse scientifically, build from foundation, test your ideas.

**PRACTICE** - Keep practicing, but be ready to deviate from existing paths.
CONNECTIONS: MAKING THE BEST USE OF OUR OWN BRAINS

Making connections from observing nature and people, listening to views, challenging conventions, and converging all with scientific principles.

Our right brain does the imagination, and our left brain finds ways to realise it.

“Logic will get you from A to B, imagination will take you everywhere.” – Albert Einstein.
Making Connections: Key to Innovation

Take two different ideas and see how they can combine to become a better (?) idea.

Internet + music
A COMEDIAN INNOVATION
STEPHEN CHOW’S DA VINCI SOLAR TORCH
DOES THE CONNECTION MAKE SENSE?

Solar energy

+ 

Portable needs

∥

Thousands of products

but not all are smart and qualify as better idea.

https://www.youtube.com/watch?v=NmR3a6F7Ju4
A COMEDIAN INNOVATION
STEPHEN CHOW’S DA VINCI SOLAR TORCH
DOES THE CONNECTION MAKE SENSE?

https://www.youtube.com/watch?v=NmR3a6F7Ju4
MAKING THE RIGHT CONNECTIONS

- Computers and calligraphy
- Telephone, music and the Internet

We need to know more, see more, listen more, feel more, play more, ..., in order to make more connections.
CREATIVITY NEEDS PRACTICE
“GENIUS” MISUNDERSTOOD

“Genius is 1% inspiration and 99% perspiration.” — Thomas Edison.

- Shakespeare wrote 154 sonnets.
- Bach wrote a cantata every week of his adult life.
- Mozart produced more than 600 pieces of music.
- Einstein published 248 other papers in addition to his first and most famous.
- Darwin wrote 119 other publications beyond his theory of evolution.
- Edison filed 1093 patents for inventions
- Picasso delivered an incredible 20000 pieces of art.

CREATIVITY NEEDS PRACTICE
FURTHERMORE,
BEING VISIONARY

- Create something that people don’t even know they will need, but they do when they have it
- Not just to listen to what your customers say about how the existing products can do better
AND, ACCIDENTS!
“ACCIDENTS” CAPTURED BY INQUIRING MINDS

http://www.rdasia.com/10-inventions-discovered-by-accident?page=1
So, we see how making connections, insisting on practices, harvesting on "accidents", ... *might* lead to innovations.
AFTER ALL THESE, WE STILL NEED ...
WINNING IN THE MOVING MARKET: A GLARING IGNORANCE

- An innovative idea alone won’t make it successful.

- Knowing the market and engaging your customers are vital to success!

- Shift your model and design to suit changing customer behaviours

- CD sales shrink, but it does not mean the music industry would die
A RULE ON WINNING THE MOVING MARKET

- When you see threats in your market, there is always an opportunity.
- RISK is a signal of OPPORTUNITY!
- The question is how quick you can react!

When written in Chinese, the word "crisis" is composed of two characters. One represents danger and the other represents opportunity.

(John F. Kennedy)
So, we see how making connections, insisting on practices, harvesting on "accidents", reacting to crisis, ... might lead to innovations.
MAKING AN INNOVATION A SUCCESS

Creating a desirable idea require an open and multi-input environment; collaboration of people of various background

Technology makes it happen

The market determines its success!

What is desirable to people?
How does technology realise an idea?
Is the market ready?
A notable trend
British company Tesco Mobile asked UK customers to rank the most important inventions in history.

Towards virtualization
However,
DOES OUR EDUCATION SYSTEM ENCOURAGE CREATIVITY AND INNOVATION

- Our students are trained to be either a scientist, an engineer, a lawyer, a historian, an artist, or …

- Our schools split classes as early as in junior secondary schools

Does our education system actually suppress innovation.
BEING DEVOID OF CONNECTIONS
We use either our left brain or our right brain, right from the beginning of our education.
WHAT MAKES A SOCIETY MORE INNOVATIVE

• A liberal education system that encourages free learning, NON-MAINSTREAM thinking

• Let people imagine, think, talk and communicate freely

• Let people create without hurdle

“An essential ingredient for creativity is the free flow of information.”
– Prof. Pai Hsien-yong 白先勇教授 2013
MOTIVATE / REWARD PEOPLE TO INNOVATE

- Reward the innovators/inventors
- Commercial interest to invest

Turn innovative ideas into properties which can be traded.
THE CONCEPT OF INTELLECTUAL PROPERTY

THE KEYWORD IS “PROPERTY”

A property can be owned, transferred, sold and bought.
WHAT IS INTELLECTUAL PROPERTY?

A concept that is necessary for a developed society to fairly exploit the fruits of people’s creations and to maintain people’s incentive for continuation of useful creations to improve the livelihood of people.

Note: I wrote this definition from an academic viewpoint. But given the impact of IP on business, the purpose can be vastly distorted if IP is looked at from a commercial viewpoint.
SYSTEMATIC PATENT GRANTING

- Started in Venice
  - Legal protection against infringers began in 1450.
- Formalized in France
  - Formal description of patents in 1500
- Modern patent system
  - Emerged during industrial revolution to protect “monopolies”, and later revised to cover only inventions

Venetian Patent Statute, issued by the Senate of Venice in 1474

IP now plays an important role in shaping the development of business and society.

3 Intellectual Property Lawsuits Every Business Owner Should Understand

Intellectual property lawsuits are a reality of maintaining a productive IP portfolio. As one facet of your patent monetization efforts, you should be prepared to actively protect your patents – via legal proceedings, if necessary – to ensure other companies don’t use your patented invention to earn revenue.

Patent litigation requires an understanding of some of the landmark standards that have been seen in major, recent intellectual property lawsuits. The following three lawsuits have changed the game for patent infringement, licensing and injunctions.

1. Microsoft v. i4i: Supreme Court Rules Against Microsoft

If you are a smaller company experiencing patent infringement from enterprise organizations, you do not have to accept being pushed around the playing field.

Back in 2011, there was a high-profile intellectual property lawsuit in which the Supreme Court unanimously upheld a lower court ruling that software behemoth Microsoft infringed the patents of a small Canadian company, i4i. The ruling hinged on the strength of the presumption of “validity” for claims of a patent allowed by the USPTO.

Although Microsoft attempted to paint i4i as a “patent troll,” the small company withstood the legal fees and came out on top. An alleged infringer needs to show “clear and convincing” evidence in order to invalidate the claim in question at trial. Microsoft was forced to pay out $290 million for patent infringement.

If Microsoft had won the intellectual property lawsuit, however, it would have established a new precedent making it easier to invalidate a patent.

2. Ebay v. MercExchange: No Guarantee Of Injunction

http://www.techpats.com/3-intellectual-property-lawsuits-every-business-owner-should-understand/
IP is property that becomes capital and assets. Important economic role.
A FEW KEYWORDS IN CONCLUSION

- Culture of innovation
  - Inter-connections, open and free information
- Intellectual capital
  - Patents, trademarks, proper enforcement
- Virtualisation
  - Network, media, branding
OPEN QUESTIONS
DOES IP REALLY PROMOTE CREATIVITY OR KILL IT?

Classic IP theory states that the increased pricing resulting from the artificial scarcity is necessary in order to promote innovation and creativity, because the free market, with its inherent right to copy, would not allow for sufficient reward to obtain the required level of innovation and creativity.

http://jorendewachter.com/2012/02/will-big-data-kill-intellectual-property-rights/#sthash.e0uuCuZS.dpuf

- Do inventors’ interests really get protected?
- Who are the actual beneficiaries?
- Does the public really benefit from this system?
“Ultimately, “Free Culture” is about neither law nor technology, the author's areas of expertise. It is about power. Specifically, it concerns the way in which financial and political power are used by corporations to preserve the status quo and to further their own commercial interests. This may be to the detriment of something more socially valuable: a loss of creativity that can never be measured.”

The Economist, April 2004
MORE OPEN QUESTIONS:
IS IP AVAILABLE TO EVERYONE?
WOULD IP DISTORT WEALTH DISTRIBUTION?

- Is it fair?
- The game is expensive, and is certainly biased to the more established companies and the richer members of our society.
- Costs of lawsuits are not always affordable to the average persons or small companies. Revenge is costly.
- Local small shops have no place in the city! Expensive rents only affordable by big brand names.
“Creativity is just connecting things. When you ask creative people how they did something, they feel a little guilty because they didn’t really do it, they just saw something. It seemed obvious to them after a while.”

- Steve Jobs (1955-2011)
Thank You!

http://cktse.eie.polyu.edu.hk