Technology Forecast 2020 in Taiwan

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Why is tech foresight needed in Taiwan?

- Technology has long been considered one of the building blocks of international competitiveness of a nation.
- As technologies progress fast and get diversified, it is difficult for a government or corporations to decide the priority of technological development.
- Technology foresight has been thus used as an important decision-making activity of a country's science & technology policy.
- Technology foresight refers to a scientific process involving the use of focused discussion among experts in order to converge divergent opinions or expertise into a consensus to make the forecast result more socially consented upon.

The challenges of foresight activities

Although tech. foresight can help reach consensus from experts across fields and avoid dispersed R&D efforts, there are several shortcomings.

- only scientists participate (making the foresight merely a PR activity after few elites' efforts to justify their use of S&T budgets),
- the implementation process is long, tedious and exhausting",
- forecast activity consumes too many resources/ mobilization costs are excessive,
- forecast results do not take economic and social development needs into consideration,
- forecast activity cannot be linked directly with the priority of of R&D budget allocation,
- forecast activity lacks focus on assessing impact or influence on individual sectors".

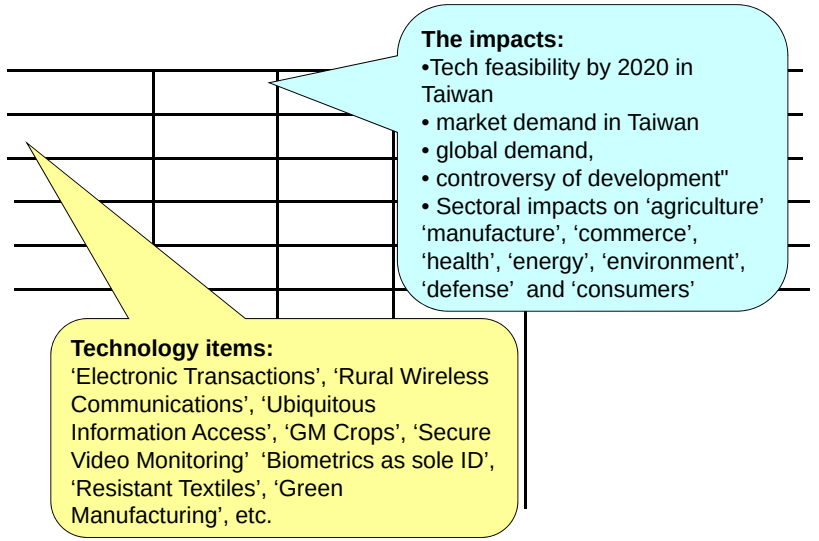
The goal of this study

- In response to the recent calls for more efforts on making the foresight activity not only a 'scientifically-certified' process but also a 'socially-robust' & 'politically-relevant' approach,
- This study aims to explore the most demanded & feasible technologies for Taiwan by 2020.

The process of research

- We began with the 56 technology items identified & defined by RAND in 2006.
  - Those items are from interdepartmental and technology-based fields such as biotechnology, ICT, nanotechnology, material science, energy, etc.
- then we designed a survey questionnaire on the parsimonious basis, and
- 20 experts were invited to fill in the questionnaire.
  - technology experts accounted for approximately 40%, economists for approximately 30%, and management experts for approximately 30%.

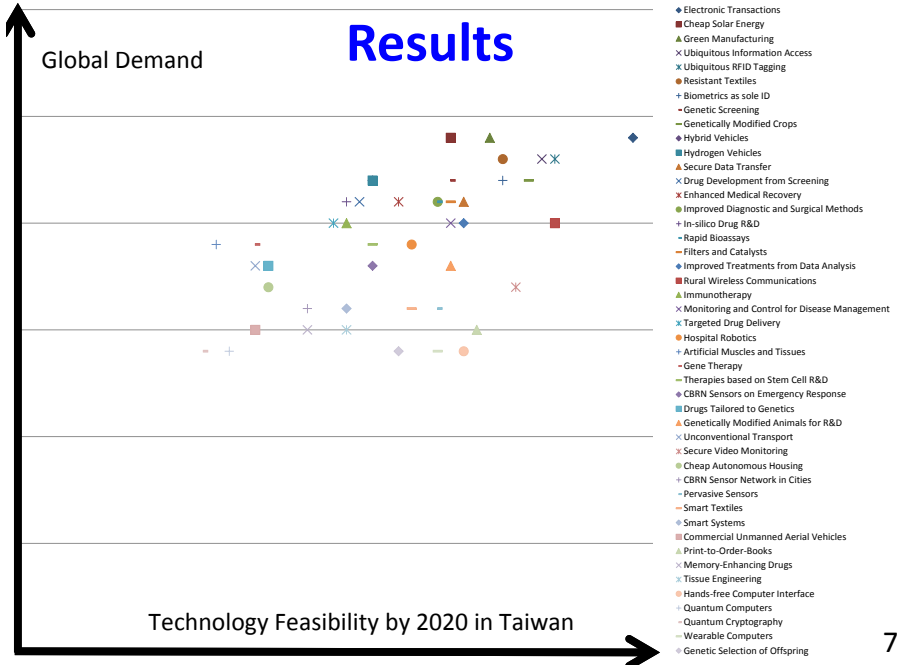
What is our questionnaire?

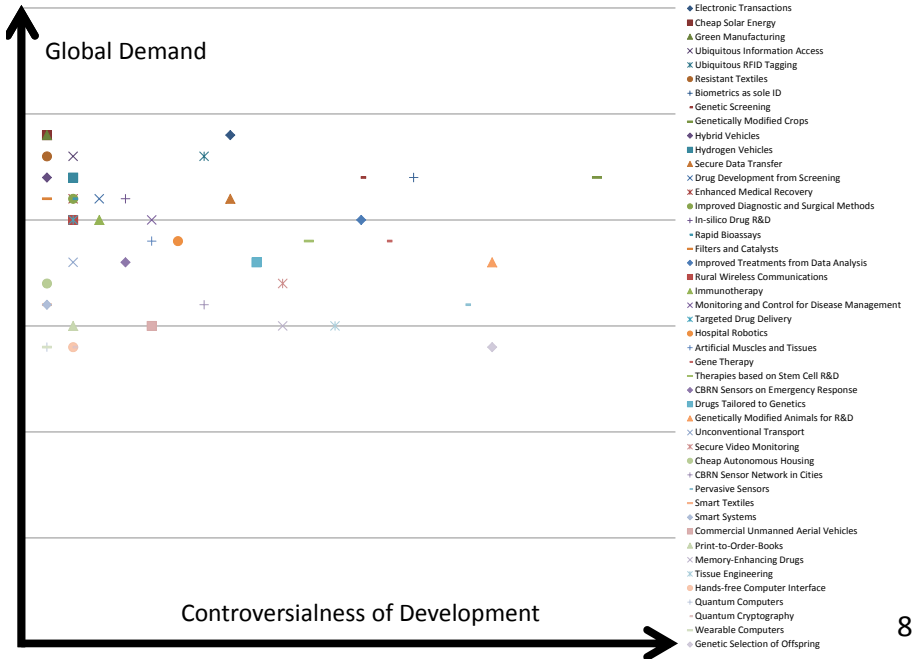


The impacts:
•Tech feasibility by 2020 in Taiwan
• market demand in Taiwan
• global demand,
• controversy of development"
• Sectoral impacts on 'agriculture' 'manufacture', 'commerce', 'health', 'energy', 'environment', 'defense' and 'consumers'

Technology items:
'Electronic Transactions', 'Rural Wireless Communications', 'Ubiquitous Information Access', 'GM Crops', 'Secure Video Monitoring' 'Biometrics as sole ID', 'Resistant Textiles', 'Green Manufacturing', etc.

Results





The sectoral impacts (1/6)

	Agriculture	Manufacturing	Commerce	Health	Energy	Environment	Defense	Consumer
Electronic Transactions	**	****	*****	**	*	*	**	*****
Cheap Solar Energy	**	****	***	**	*****	****	**	****
Green Manufacturing	***	*****	**	***	****	*****	*	***
Ubiquitous Information Access	**	****	*****	****	**	**	****	*****
Ubiquitous RFID Tagging	***	*****	*****	**	**	**	***	*****
Resistant Textiles	**	****	**	****	*	**	**	****
Biometrics as sole ID	**	***	****	****	*	*	****	****
Genetic Screening	*	**	**	*****	*	*	*	***

Note: Delphi Survey of ***Technology Forecast 2020 in Taiwan*** (TIER).
Source: RAND (2006), ***The global technology revolution 2020, In-depth analyses*.**

The sectoral impacts (2/6)

	Agriculture	Manufacturing	Commerce	Health	Energy	Environment	Defense	Consumer
Genetically Modified Crops	*****	**	**	****	***	**	*	****
Hybrid Vehicles	**	****	**	*	*****	*****	**	****
Hydrogen Vehicles	*	****	**	**	*****	*****	**	****
Secure Data Transfer	**	***	****	**	*	**	****	****
Drug Development from Screening	**	**	**	*****	*	*	*	**
Enhanced Medical Recovery	*	**	**	*****	*	*	*	****
Improved Diagnostic and Surgical Methods	*	**	*	*****	*	*	*	***
In-silico Drug R&D	*	**	**	*****	*	*	*	***

Note: Delphi Survey of ***Technology Forecast 2020 in Taiwan*** (TIER).
Source: RAND (2006), ***The global technology revolution 2020, In-depth analyses*.**

The sectoral impacts (3/6)

	Agriculture	Manufacturing	Commerce	Health	Energy	Environment	Defense	Consumer
Rapid Bioassays	***	**	**	****	*	**	*	***
Filters and Catalysts	**	****	**	****	**	****	**	****
Improved Treatments from Data Analysis	*	**	**	*****	*	*	**	****
Rural Wireless Communications	***	*****	*****	****	***	***	****	*****
Immunotherapy	*	*	**	*****	*	*	*	**
Monitoring and Control for Disease Management	*	**	**	*****	*	*	*	****
Targeted Drug Delivery	*	**	**	*****	*	*	*	***
Hospital Robotics	*	***	**	*****	*	*	**	****

Note: Delphi Survey of ***Technology Forecast 2020 in Taiwan*** (TIER).
Source: RAND (2006), ***The global technology revolution 2020, In-depth analyses*.**

The sectoral impacts (4/6)

	Agriculture	Manufacturing	Commerce	Health	Energy	Environment	Defense	Consumer
Artificial Muscles and Tissues	*	**	**	****	*	*	**	***
Gene Therapy	*	*	**	*****	*	*	*	***
Therapies based on Stem Cell R&D	*	**	**	*****	*	*	*	***
CBRN Sensors on Emergency Response	*	***	**	****	**	***	****	***
Drugs Tailored to Genetics	*	**	**	*****	*	*	*	***
Genetically Modified Animals for R&D	**	**	**	****	*	*	*	**
Unconventional Transport	*	****	****	**	*****	****	*	****
Secure Video Monitoring	*	****	****	**	*	**	****	****

Note: Delphi Survey of ***Technology Forecast 2020 in Taiwan*** (TIER).
Source: RAND (2006), ***The global technology revolution 2020, In-depth analyses*.**

The sectoral impacts (5/6)

	Agriculture	Manufacturing	Commerce	Health	Energy	Environment	Defense	Consumer
Cheap Autonomous Housing	*	***	***	*	****	****	*	****
CBRN Sensor Network in Cities	**	***	**	****	**	***	****	***
Pervasive Sensors	**	****	****	**	**	**	****	***
Smart Textiles	*	****	**	**	*	**	**	****
Smart Systems	**	****	***	**	**	***	**	****
Commercial Unmanned Aerial Vehicles	***	***	***	**	**	***	****	**
Print-to-Order-Books	*	**	****	*	*	**	*	****
Memory-Enhancing Drugs	*	**	**	*****	*	*	*	****

Note: Delphi Survey of ***Technology Forecast 2020 in Taiwan*** (TIER).
Source: RAND (2006), ***The global technology revolution 2020, In-depth analyses.***

The sectoral impacts (6/6)

	Agriculture	Manufacturing	Commerce	Health	Energy	Environment	Defense	Consumer
Tissue Engineering	*	**	**	*****	*	*	*	***
Hands-free Computer Interface	**	****	****	***	*	**	***	****
Quantum Computers	*	****	****	**	**	**	****	**
Quantum Cryptography	*	***	****	**	**	*	****	***
Wearable Computers	*	****	****	***	*	*	****	****
Genetic Selection of Offspring	*	*	**	*****	*	*	*	**

Note: Delphi Survey of ***Technology Forecast 2020 in Taiwan*** (TIER).
Source: RAND (2006), ***The global technology revolution 2020, In-depth analyses.***

Conclusions

- Despite the self-report bias, this study is an early attempt in Taiwan to identify the important technologies feasible technologically and demanded socio-economically by 2020
- Recommendation for the foresight activities in the future:
  - Including more stakeholders in the ST policy making & implementation.
  - Identifying more indigenous demanded technologies rather than following those defined by technologically leading countries.