

*Design thinking &
innovation
concepts:*

From Research to Innovation in Life Science



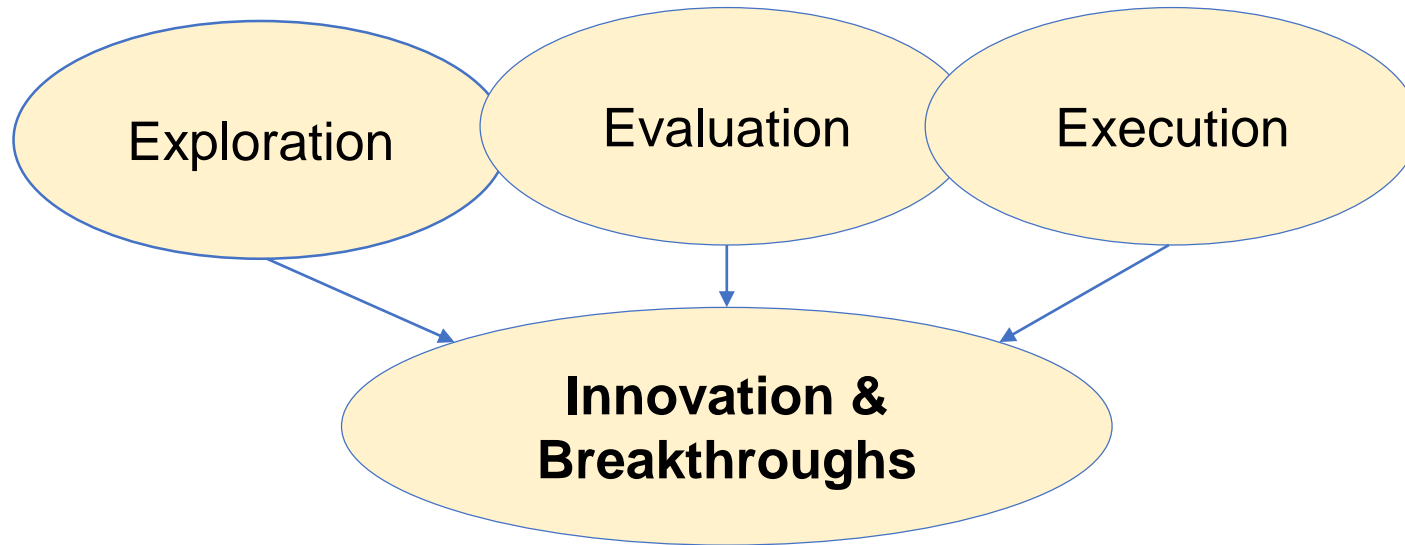
Dr. Onnida Thongpravati

Learning Objectives

Over the next hour, you should be able to:

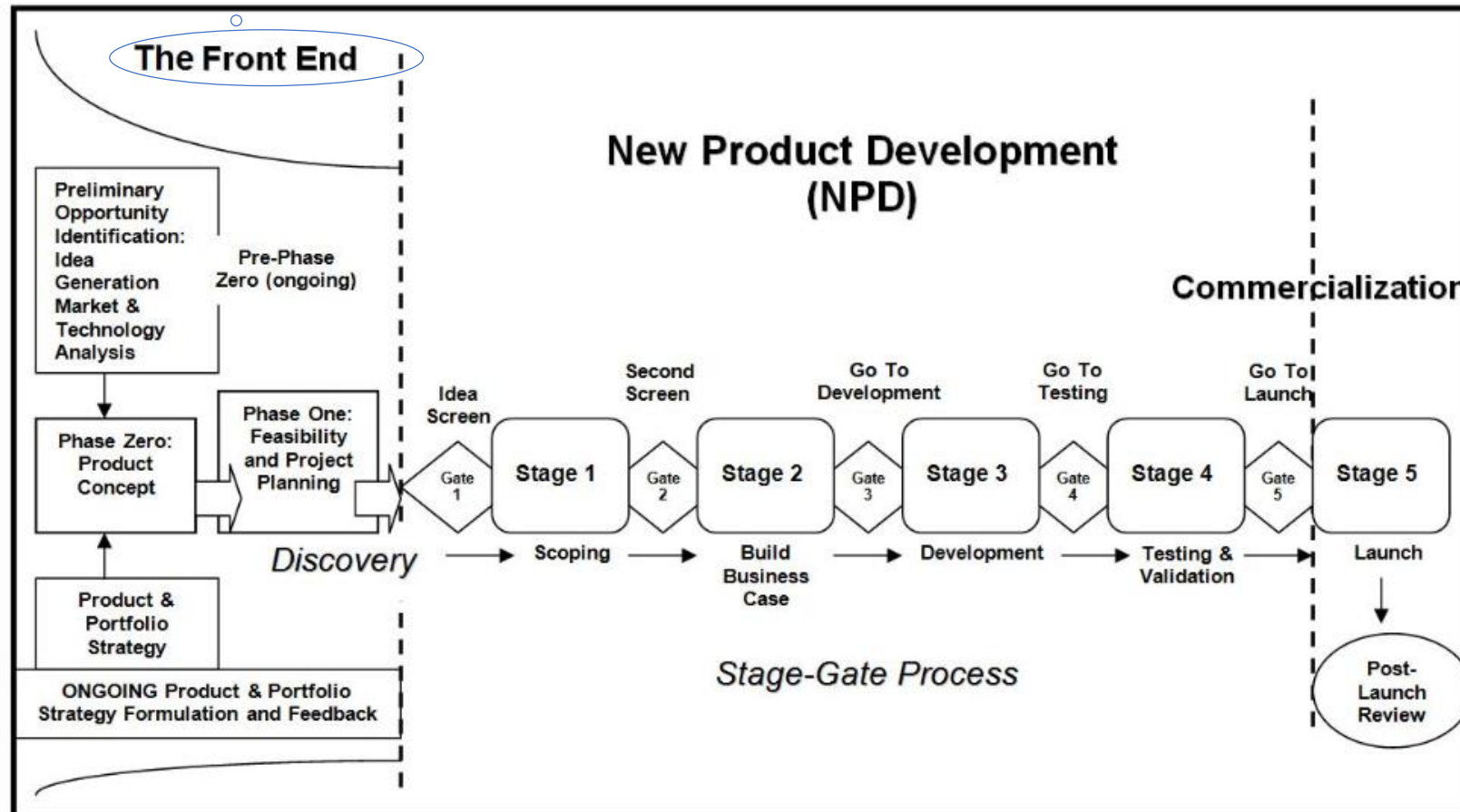
- Understand the importance of design thinking and [market-driving] breakthrough innovation
- Evaluate and define types of breakthrough innovation
- Highlight some critical success factors in innovation
- Comprehend the diffusion-adoption model of innovation

Later today ...



Design Thinking

The entire innovation process



Source: adapted from Cooper (2008); Khurana and Rosenthal (1998); Koen et al. (2002)



Learning is a collaborative process by which knowledge is co-constructed through social interaction using language and culturally organised activities that facilitate proper human intellectual and psychological development and higher-order thinking.

(Vygotsky 1962; Vygotsky 1978)



Collaboration

The breadth or diversity of knowledge and divergent thinking may give rise to creativity, allowing linkages between what is already known and novel associations

(Thongpravati 2014, p.103)

Diversity of knowledge is a source of new product creativity, particularly for market driving innovation

(Thongpravati 2014, p.319)

What is market-driving innovation?

‘Breakthrough’ or ‘market-driving’ innovation is a new line of *product (or service/process)*, which explores *new ideas or technologies* that significantly transform existing markets or create new ones:

- Using very new idea or very new technology that has never been used in the industry before, and/or;
- Has caused significant changes in the industry or category
- Was one of the first of its kind introduced into the market
- Is considered to be highly innovative by the market

Market-driving innovation?

Blamey
Sounders
Hears

Speech Perception Test (SPT) result

michael nich — 29/6/2018

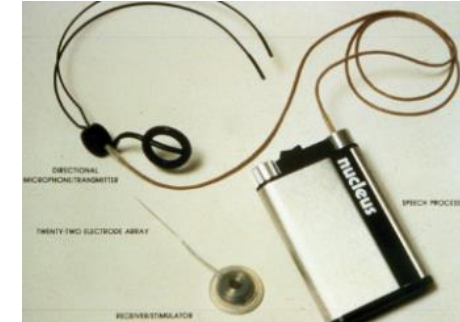
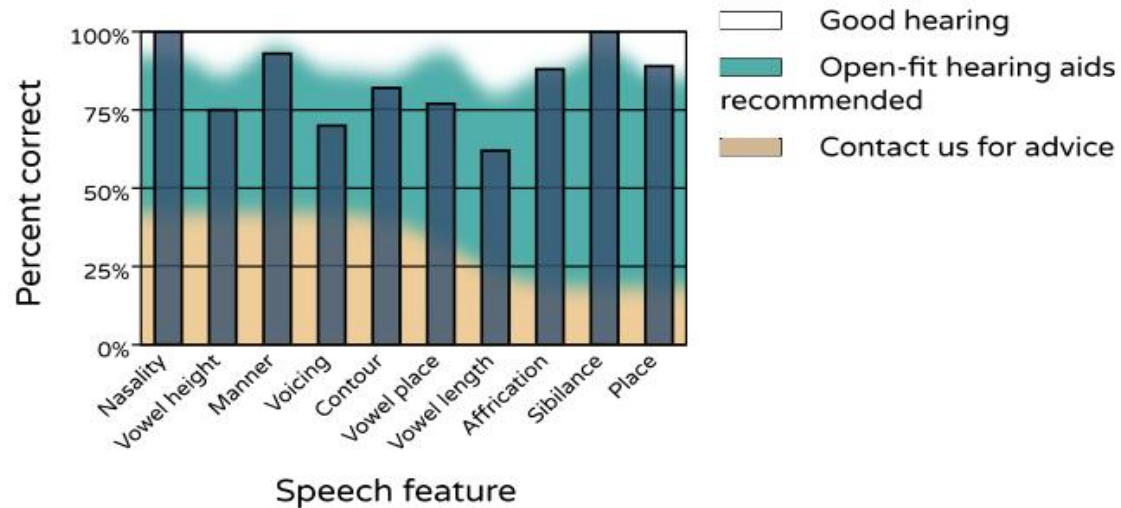
Vowels correct: 43/50

Consonants correct: 85/100

Words correct: 33/50

Words entirely missed: 0/50

Your results indicate you may have a hearing loss.



Market-driving innovation?

"X-Y position indicator for a display system"



<https://www.ideo.com/case-study/creating-the-first-usable-mouse>

OUTCOME

first usable computer mouse,

navigation device that is less

expensive and more reliable

the market.

with a "ribcage" to hold

THE

Create



than any other on

THE

The



pieces

*Design Thinking and Innovation Concepts:
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Types of Product Innovation

NEWNESS/ IMPACT TO MARKET/ INDUSTRY		NEWNESS OF IDEAS/ TECHNOLOGY	
		<i>Low</i>	<i>High</i>
	<i>Low</i>	(4) Incremental innovation (Market-driven innovation)	(2) Technological breakthrough/ Really new innovation (Market-driving innovation)
	<i>High</i>	(3) Market breakthrough/ Really new innovation (Market-driving innovation)	(1) Radical [breakthrough] innovation (Market-driving innovation)

Examples of product innovation?

NEWNESS/ IMPACT TO MARKET/ INDUSTRY		NEWNESS OF IDEAS/ TECHNOLOGY	
		Low	High
	Low	(4) Incremental innovation (Market-driven innovation)	(2) Technological breakthrough/ Really new innovation (Market-driving innovation)
	High	(3) Market breakthrough/ Really new innovation (Market-driving innovation)	(1) Radical [breakthrough] innovation (Market-driving innovation)

Quick Discussion of Product Innovations

Based on the ***examples of product innovations***

- What role does that innovation play in successful companies?
- What did that innovative company do differently?
- Critical success factors in innovation
 - What factors promoted their success?
 - Was success a function of the product, its design, marketing or the external environment?

Critical Success Factors

Factors/Dimensions		Market-Driven Innovation (incremental)	Market-Driving Innovation (breakthrough)
1	Organisational structure	Single structure (only one NPD program for all products) Cross-functional team between departments	Clearly identified structure (strategic business units, loosely coupled to mainstream organisation) Multifunctional skilled employees with entrepreneurial characteristics
2	Organisational culture/behaviour (market orientation)	Market driven (reactive market orientation) Top management involvement	Market driving (proactive market orientation)* Top management involvement (visionary leaders), external linkages with potential customers and constituents
3	NPD process	Stage-gate process, strong market orientation and rigorous go/kill decision points	Next generation stage-gate process ("full", "xpress" and "lite")

Critical Success Factors

Factors/Dimensions		Market-Driven Innovation (incremental)	Market-Driving Innovation (breakthrough)
4.	Front End of Innovation Strategic focus (NPD strategy)	Reactive NPD strategy: Market sensing: what does the market want? - Focus on existing consumer needs - Address existing demand	Proactive NPD strategy*: Forward sensing: how can the marketplace evolve? - Focus on latent consumer needs - Build and create demand
5.	Research	Market research: - Customer insight (market pull)	Research and development (R&D): - Executive foresight* (technology push)
6	Commercialisation (launch tactics)	Mass market: Intensive distribution strategy: - Low expenditure - Product-market fit - Current channels	Niche market: Exclusive distribution strategy: - High expenditure - Customer education and service - New channels
7	Metrics and performance measurement	Traditional measures for product development performance	Activity- and performance-based measures

*Emerging success factors of market-driving innovation

Importance of Commercialisation

“You cannot save a bad product with a splendid launch strategy but you can surely kill a great product with a poor launch strategy” - Prof Erik Jan Hultink

- New product launches - key driver of business growth.
- Launching a new product has to be done right or the chances of success are severely diminished.
- Statistics for new product launches often suggest failure rates for new products at around 50% to 75%.

A failed invention/innovation?

Common causes of flops and Lesson Learnt

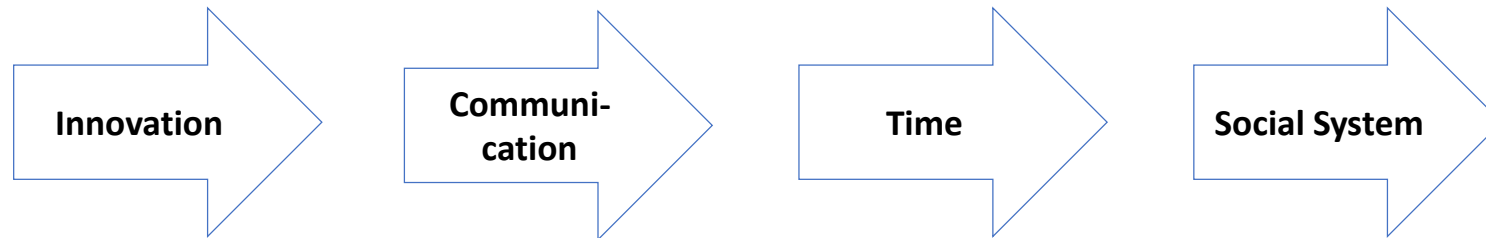
FLAW 1 Can't support fast growth.	THE LESSON Have a plan to ramp up quickly if the product takes off .
FLAW 2 The product falls short of claims and gets bashed.	THE LESSON Delay your launch until the product is really ready.
FLAW 3 The new item exists in "product limbo."	THE LESSON Test the product to make sure its differences will sway buyers.
FLAW 4 The product defines a new category and requires substantial consumer education—but doesn't get it.	THE LESSON If consumers can't quickly grasp how to use your product, it's toast.
FLAW 5 The product is revolutionary, but there's no market for it.	THE LESSON Don't gloss over the basic questions "Who will buy this and at what price?"
Source: Joan Schneider and Julie Hall, HBR, 2011	

Diffusion and Adoption of Innovation

- **Diffusion:** a *macro* process with the spread of new product from its source to the consuming public
- **Adoption:** a *micro* process that focuses on the stages through which a consumer decides to accept or reject a new product (through awareness, interest, evaluation, trial)

Diffusion of Innovation

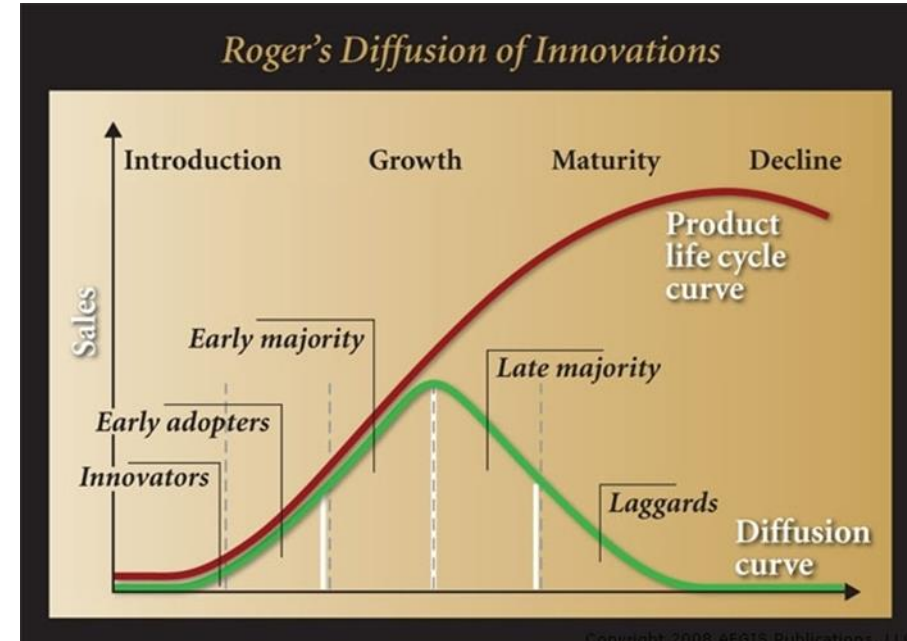
- Considering the way products are diffused into the population i.e. technology transfer



- A universal process of social change
- How, over time, an idea or product gains momentum and spreads (or diffuses, hence the name) through a specific population or social system.

Product lifecycle and Adoption of Innovation

- the adopter groups that form part of the market e.g. early and late adopters
- the factors that ensure new products penetrate the market quickly
 - how best to promote our product and enable consumer to experience it quickly



Source: Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York: Free Press

Product lifecycle and Diffusion of Innovation

- Main characteristics of innovations
 1. **Relative Advantage** – Degree to which an innovation is seen as superior than the existing idea, program, or product
 2. **Compatibility** – Degree to which an innovation is consistent with the values, experiences, and needs of the potential adopters.
 3. **Complexity** – Degree to which an innovation is easy to understand and/or use.
 4. **Trial ability** – Degree to which the innovation can be tested or experimented with before a commitment to adopt is made.
 5. **Observability** – Degree to which an innovation provides tangible results.

ARC Training Centre in Biodevices Case



- “Facett” World-first self-fitting hearing aid with ...
 - The core: User’s setting to optimize their listening preference of the device via smartphone, tablet or home computer
 - Module: A rechargeable battery that activates the hearing aid

ARC Training Centre in Biodevices Case



"Facett is a true collaboration between science and design"

"It's part of a digital health system that empowers people to self-manage their hearing experience."

"This is a huge leap in progress for the four million Australians suffering hearing loss, many of whom aren't using hearing aids because of appearance, repeated and frustrating visits to suppliers for hearing aid tuning and the inconvenience and complexity of changing batteries"

ARC Training Centre in Biodevices Case

- PhD project – low-power, wireless control system that communicates between personal electronic devices such as smartphones and hearing aids
- *"I provided multiple designs for the modular connections, each of which provided different features aimed at improving the strength of the connection between modules without making the hearing aid too difficult to manipulate"*
- *"The design and prototyping process was carried out in rapid iterations using a combination of computer-aided design software and various types of 3D printing. The work I conducted on the modular connection is to be submitted a part of my PhD."*

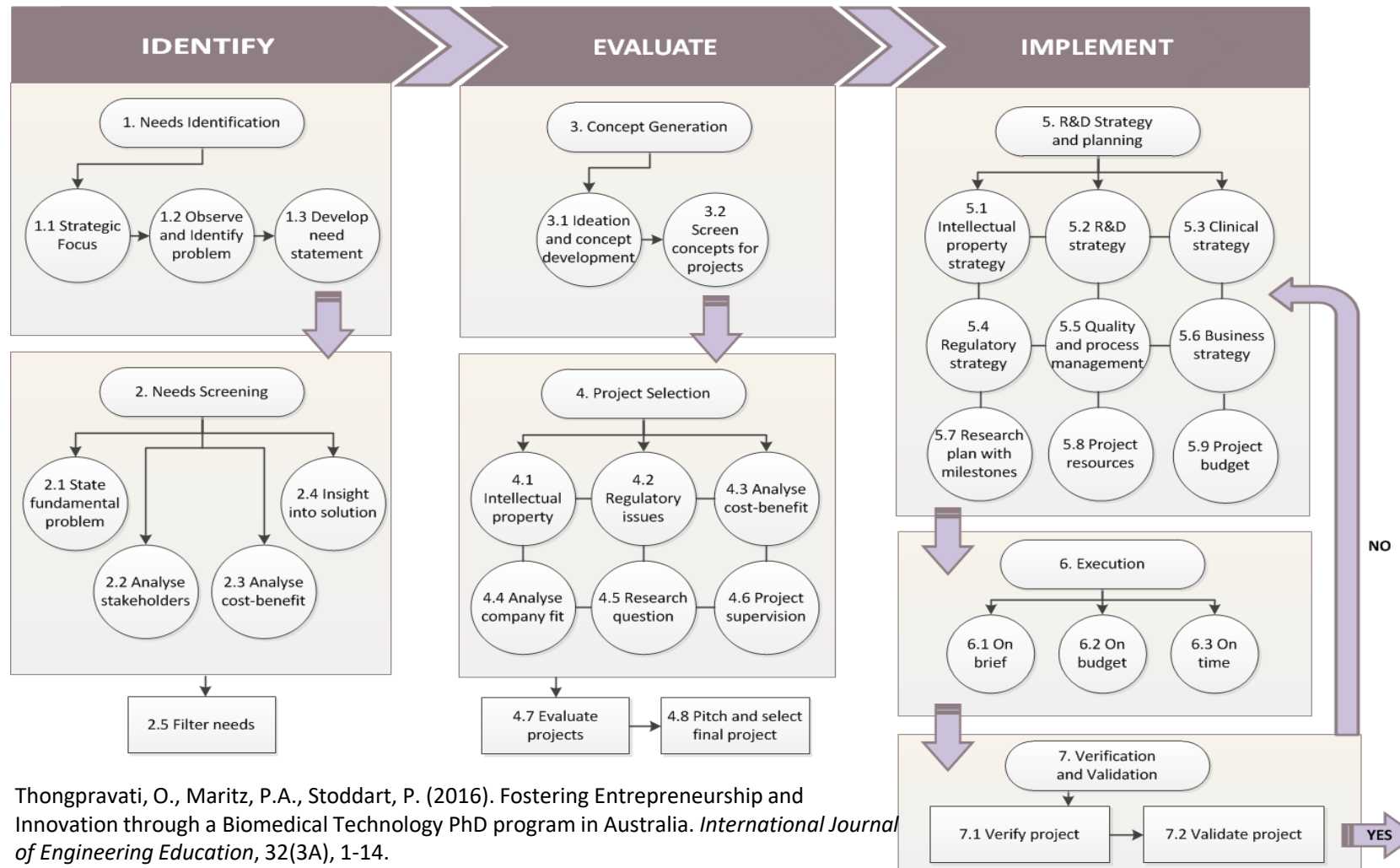
ARC Training Centre in Biodevices Case

- In March 2015, a new Doctor of Philosophy (PhD) in Technology Innovation, the “Swinburne BioReactor”, has commenced.
- In dynamic and rapidly growing medical technology (medtech) industry, fostering commercialisation of biomedical research and innovation through *entrepreneurship education and training (EET)* programs is critical
(Maritz, de Waal and Shieh 2014; Yoon and Lee 2013)
- Biomedical EET is relatively a young field of interdisciplinary
 - Limited number of existing programs, e.g. Stanford BioDesign, MIT Portugal, Ireland BioInnovate
 - Lack of training at a PhD level research
- Challenges and opportunities for university-industry collaboration
 - [Australia] TOP five countries; contributing 3 percent of the World’s medical research publications
 - Medtech industry with revenue of AUD\$10billion per annum
 - High-performing companies with success stories (AAMRI 2014; Australian Innovation Systems Report 2014)

ARC Training Centre in Biodevices Case

- Aim: To develop the next generation of entrepreneurs, industry-ready applied researchers and leaders in the field of biomedical engineering, specifically biomedical devices and diagnostics
- An innovation hub with *multi-stakeholders*
 - Program designers, industry liaison and advisory board
 - Supervisory team including industry partners
 - 10 PhD students and 3 postdoctoral researchers
- Industry-led and cross-disciplinary research and training
 - Focuses on real-world healthcare challenges; making a difference in people's lives!
 - "Entrepreneurship Education" and "Design Thinking" themes.

ARC Training Centre in Biodevices Case



Thongpravati, O., Maritz, P.A., Stoddart, P. (2016). Fostering Entrepreneurship and Innovation through a Biomedical Technology PhD program in Australia. *International Journal of Engineering Education*, 32(3A), 1-14.

*Design Thinking and Innovation Concepts:
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Guest
Speaker:
Chula TH
21.1.19

