First Consumer Fuel Cell Vehicle, the Monarch Fuel Cell Bicycle

Joerg Weigl,
UTM,

Helia Mohamadi Sepervand,
National University of Singapore,

Zizi Wang
NUS

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Outline

- Products
- Market analysis
- Development plan
- Performance of prototype

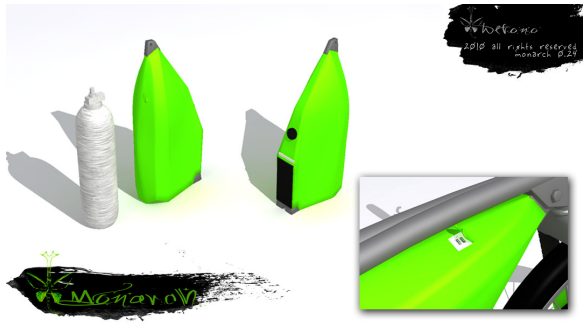
Products

- Monarch Hydrogen Powered bicycle
- Pios Hydrogen refueling station
- Pios Powerpack

Monarch

-World's longest range electric bicycle

- Range up to 200KM
- Fast refueling- 2minutes
- Top speed at 45km/h (options to limit to 25km/h)
- Top of the range components
- Real-time anti-theft tracking (optional)
- Retail price around 6,000-8,000 Euro



- 1.3kWh energy stored
- Power 15” Macbook Pro for 155hrs
- 3.6W LED light for 360hrs.
- USB connectors to power your gadgets
- Automotive standard nozzle (TN-1)

Pios Powerpack

- Allow users to enjoy excess power for other electronic appliances.

- Designed for light duty
- Proprietary refueling method
- Low cost
- No special approval required

Pios refueling station

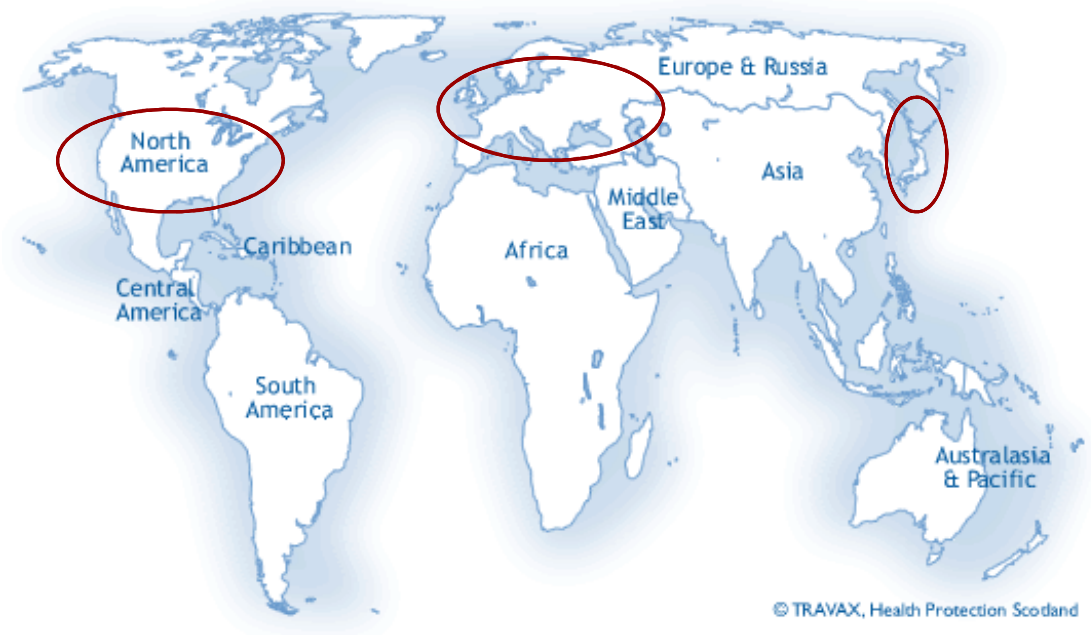
- Best solution in Hydrogen refueling for light duty vehicles

Innovation

Product	Technology	Benefits
Powerpack	FC Hybrid Motive	Smaller fuel cell and lower cost
	Powertrain design software	Optimized system with lower cost
	H_2 recirculation	Higher fuel efficiency, lower running cost
Refueling station	Proprietary refueling method	Simple system design, cheaper to build
	Off-grid design	Deduced civil work, cheaper to install

Geographical markets

- Europe
- North America
- Japan



Markets

- Stuttgart, Germany
  - Many technology enthusiasts
  - Hilly terrain
  - e-bike charging station and public Hydrogen refueling station
  - e-bike range decreases sharply in hilly terrain

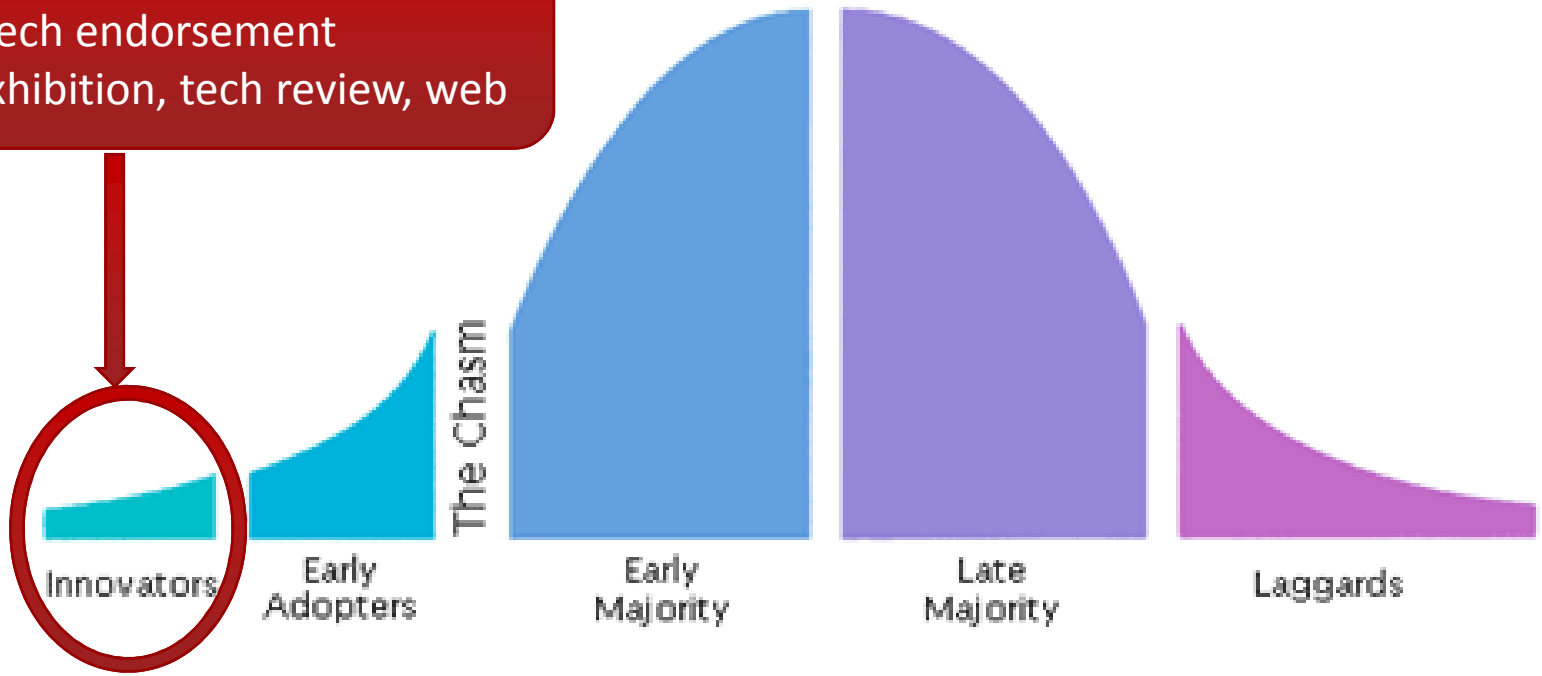
- Bodensee region (Lake of Constance)
  - Famous for eco tourism
  - Bicycling as weekend activities
  - 200Km around the lake

Emerging competition

Product	Company	Commercial product?	Remark
	Pearl Hydrogen	Yes	Problem of expensive fuel cell fit in cheap bicycle
	Iwatani	No	Nice design but Very limited range (40km)
	Horizon Fuel Cell	Yes (USD 4,600)	Problem of expensive fuel cell fit in cheap bicycle

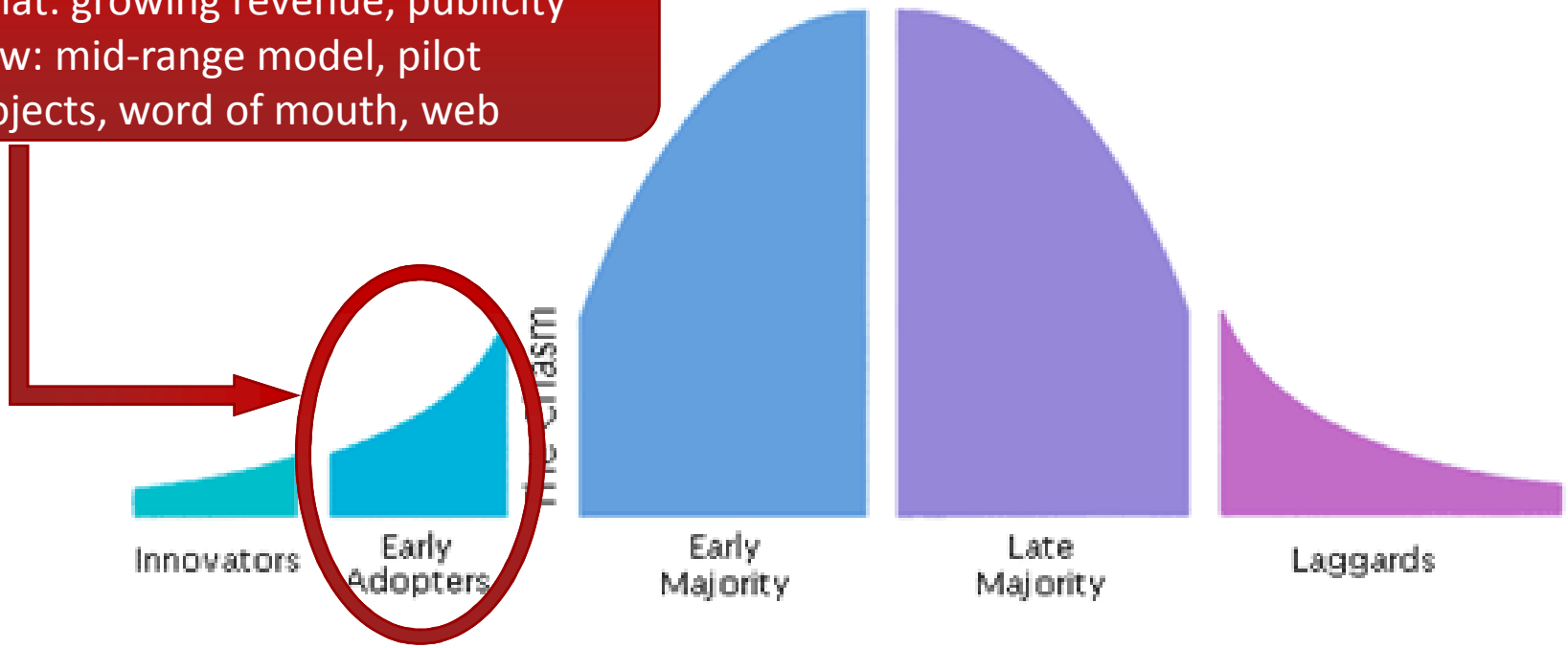
Technology enthusiasts

Who: Geeks
What: tech endorsement
How: exhibition, tech review, web



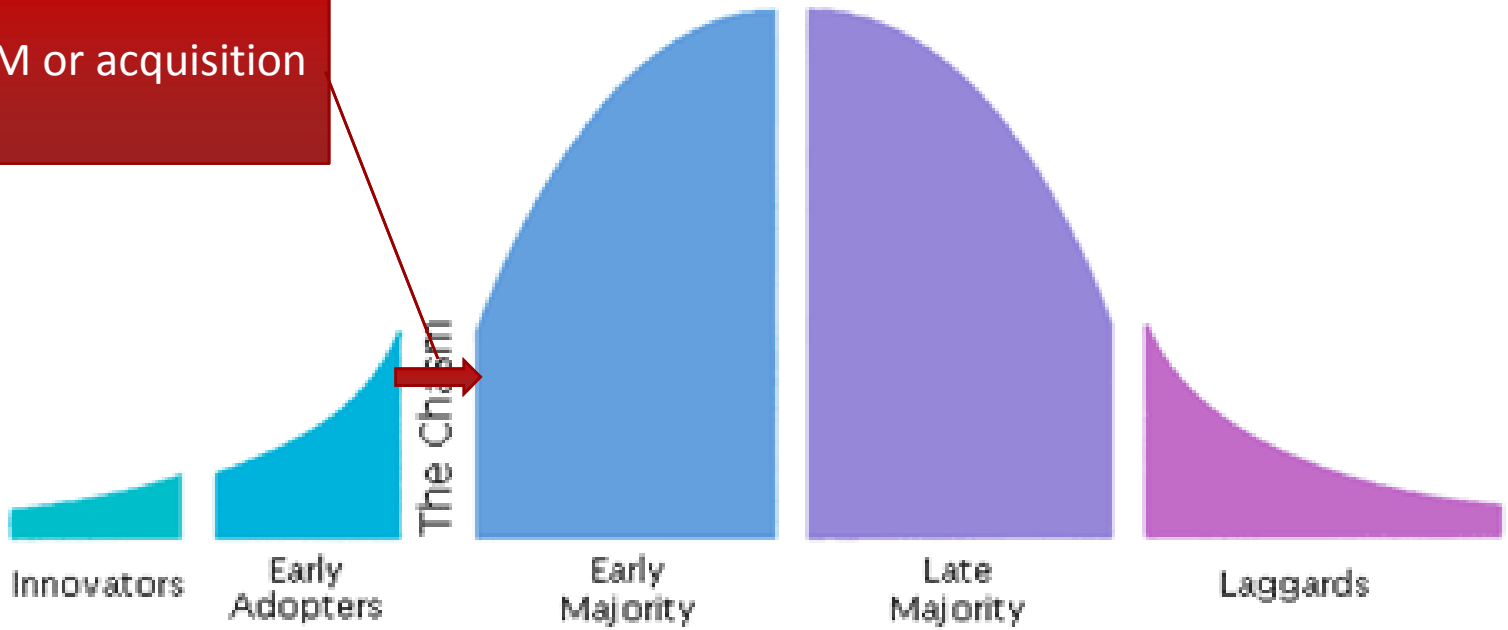
Visionaries

Who: Corporates, bike lovers
What: growing revenue, publicity
How: mid-range model, pilot projects, word of mouth, web



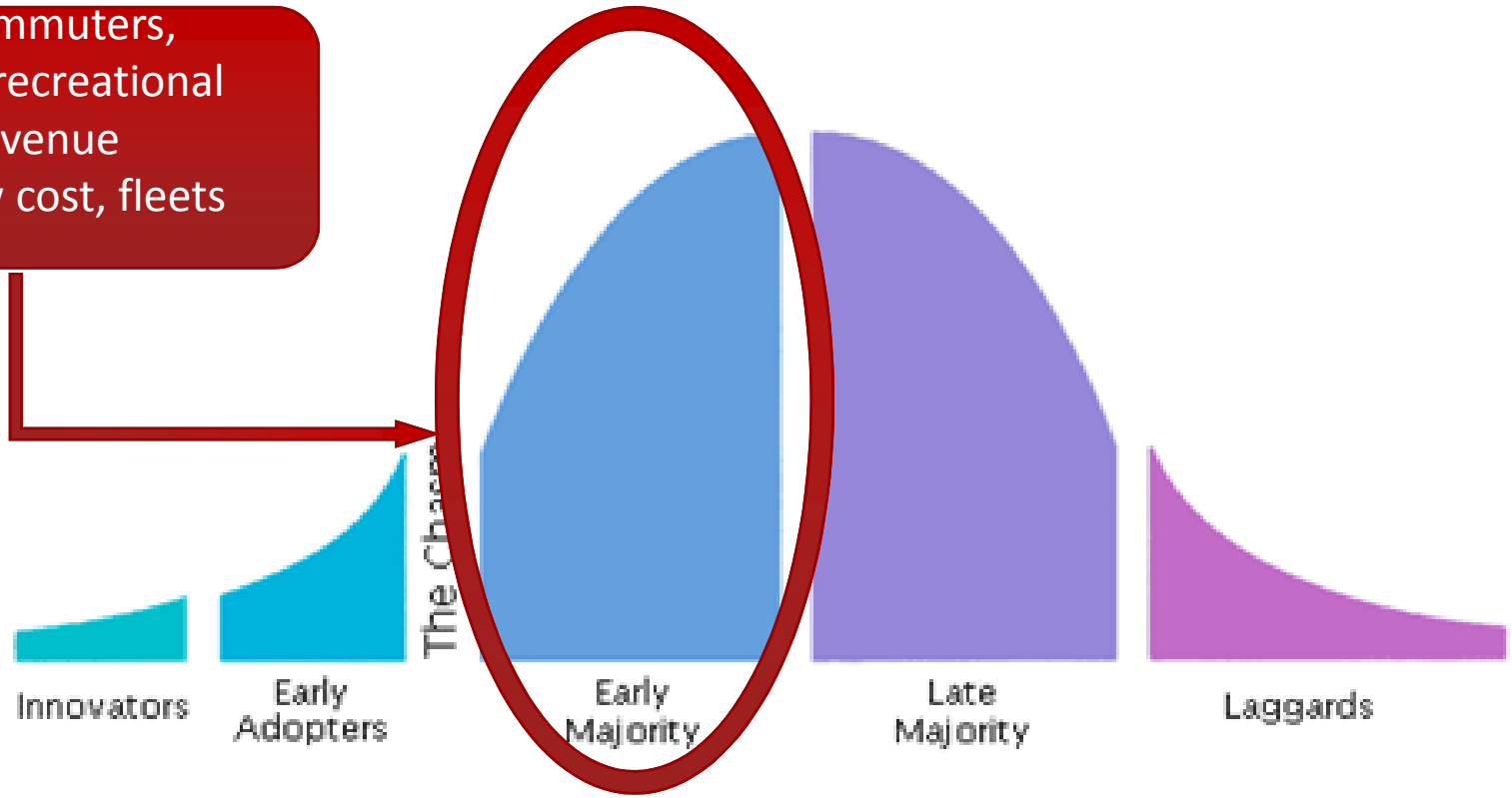
Pragmatists

How: OEM or acquisition

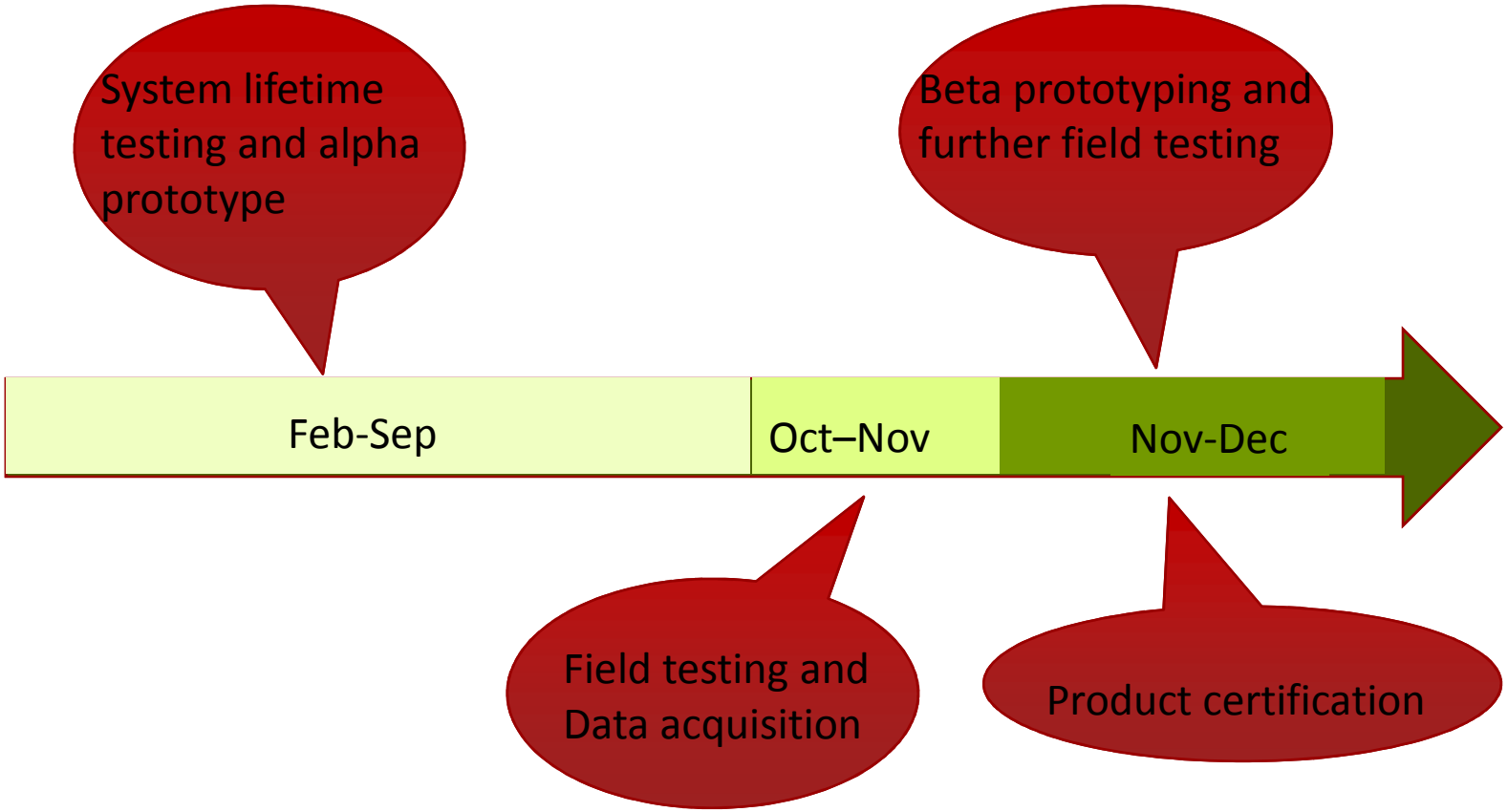


Pragmatists

Who: Commuters, tourists, recreational
What: Revenue
How: low cost, fleets



Development plan for 2012



Collaboration support

- Engineering Design and Innovation Center (EDIC) in the Faculty of Engineering will be supporting the project with its facilities in prototype development.
- InfoWave Pte. Ltd. supports the prototyping project to provide vehicle tracking device while Singtel sponsors SIM card for tracking
- Singapore Fuel Cell Community supports powerpack lifetime testing experiments with its facilities

Thank you!