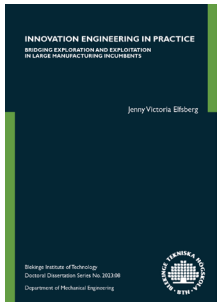
INNOVATION ENGINEERING IN PRACTICE

BRIDGING EXPLORATION AND EXPLOITATION IN LARGE MANUFACTURING INCUMBENTS

Jenny Victoria Elfsberg



Book review:

Innovation Engineering in Practice: Bridging Exploration and Exploitation in Large Manufacturing Incumbents.

In a world where change is constant, manufacturing companies face a thrilling challenge: how to stay relevant and thrive. Jenny Elfsberg's newest book, "Innovation Engineering in Practice", offers valuable insights and approaches to conquer this task, while being both thought-provoking and inspiring with relatable examples from her studies.

Discover the power of "Innovation Engineering," a groundbreaking approach that combines creativity and practicality. This book reveals how big manufacturing companies can not only improve their existing offerings but also revolutionize the way they create value – and if well played, gain a competitive advantage.

Imagine shaping the future with intention! The concept of "Intentional Product-Service-System Design" becomes your secret weapon — an organized way to build upon your current strengths and embark on a transformative journey.

But this book does not stop at theories. It provides step-by-step guidance on how to ignite innovation within your company. You'll learn how to bridge the gap between exploration and exploitation, making ideas a reality, ensuring your most promising innovations have fast and a lasting impact.

In my opinion, this is not only a book—it's your ticket to adapting and thriving in a fast-changing world. Embrace the challenges, inspire your team, and secure your company's future. Are you ready to unlock the door to the future?

Get your hands on this must-read guide today and join the ranks of forward-thinking manufacturing companies.

Presentation structure

1. Research background
2. Research questions
3. Research methodology
4. Theoretical concepts
5. Findings
6. Closing remark

Research background

PAGES IN THESIS: 21-29

Volvo Construction Equipment

A60H

55

HX02 (TA15)

15

Gravel Charlie

10

Large manufacturing incumbents

- Long history, many employees, stable and substantial revenue generation.
- Recognized as industry leader with longstanding presence and significant market share.
- Offers a wide range of products and services.
- Invest heavily in R&D to maintain competitive.
- Global footprint and supply chains spanning multiple countries.
- Focus on operational efficiency and maximized productivity.

Volvo CE's Changwon site in South Korea

Research motivation

- **Experience** from 22 years of industry practice in different roles, mainly R&D.
- **Research interest** stemming from long-standing and close collaboration with academic partner BTH.
- **A strong desire** to create a positive impact that will benefit future generations.
- **Passionate** about empowering engineers, and engineering teams to shape the future.

The scientist describes what is;

the engineer creates what never was

Theodore von Kármán
(1881-1963)

The scientists describe what is;

the engineers create what never was

… if we only set them free

… but do we? Starting point of my research journey at the company

- Corporate culture didn’t foster innovation.
- No process for innovation.
- Leadership had no interest in innovation.
- Leadership was lacking competence regarding innovation.
- Linear development process prioritizing risk-free increments.
- No resources allocated for innovation.
- Engineers weren’t encouraged to innovate.

Engineers with an innovative idea…

Photo by NASA
Slide by Reno Filla

ET of Volvo CE: “We choose to go to the moon …“

- 100% availability
- Zero emission solution
- ~10 times higher energy efficiency
- Zero accidents
- Semi to fully autonomous machines
- #1 in innovation

Photo by NASA
Slide by Reno Filla

VOLVO CONSTRUCTION EQUIPMENT XPLORATION FORUM 2016

Volvo Construction Equipment

The Triple Zero – Our aspiration, Our challenge

Zero unplanned stops

Zero emissions

Zero accidents

The technologies we demonstrated in action

Intelligent Machines

Electromobility

Site Solution

Research questions

Research questions

RQ1: How can large manufacturing incumbents strengthen their innovation capability?

RQ2: How can exploration be institutionalized, guided, and led in large manufacturing incumbents?

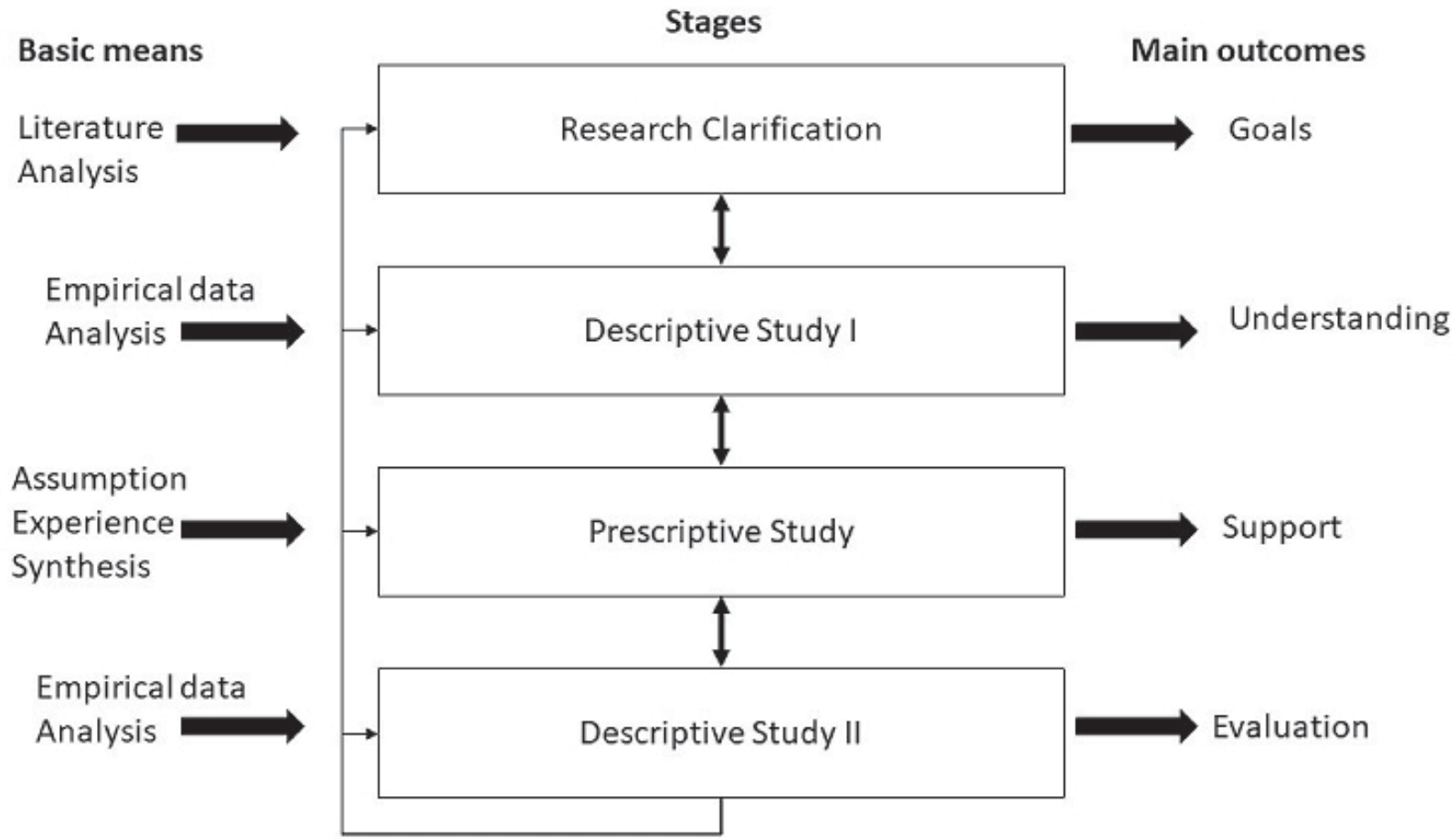
RQ3: How to bridge exploration and exploitation in large manufacturing incumbents?

RQ4: How might bridging between exploration and exploitation help a large manufacturing incumbent to shift its business orientation from products to product-service systems?

Research methodology

PAGES IN THESIS: 63-73

Design Research Methodology



Blessing & Chakrabarti (2009)

Theoretical concepts

PAGES IN THESIS: 31-61

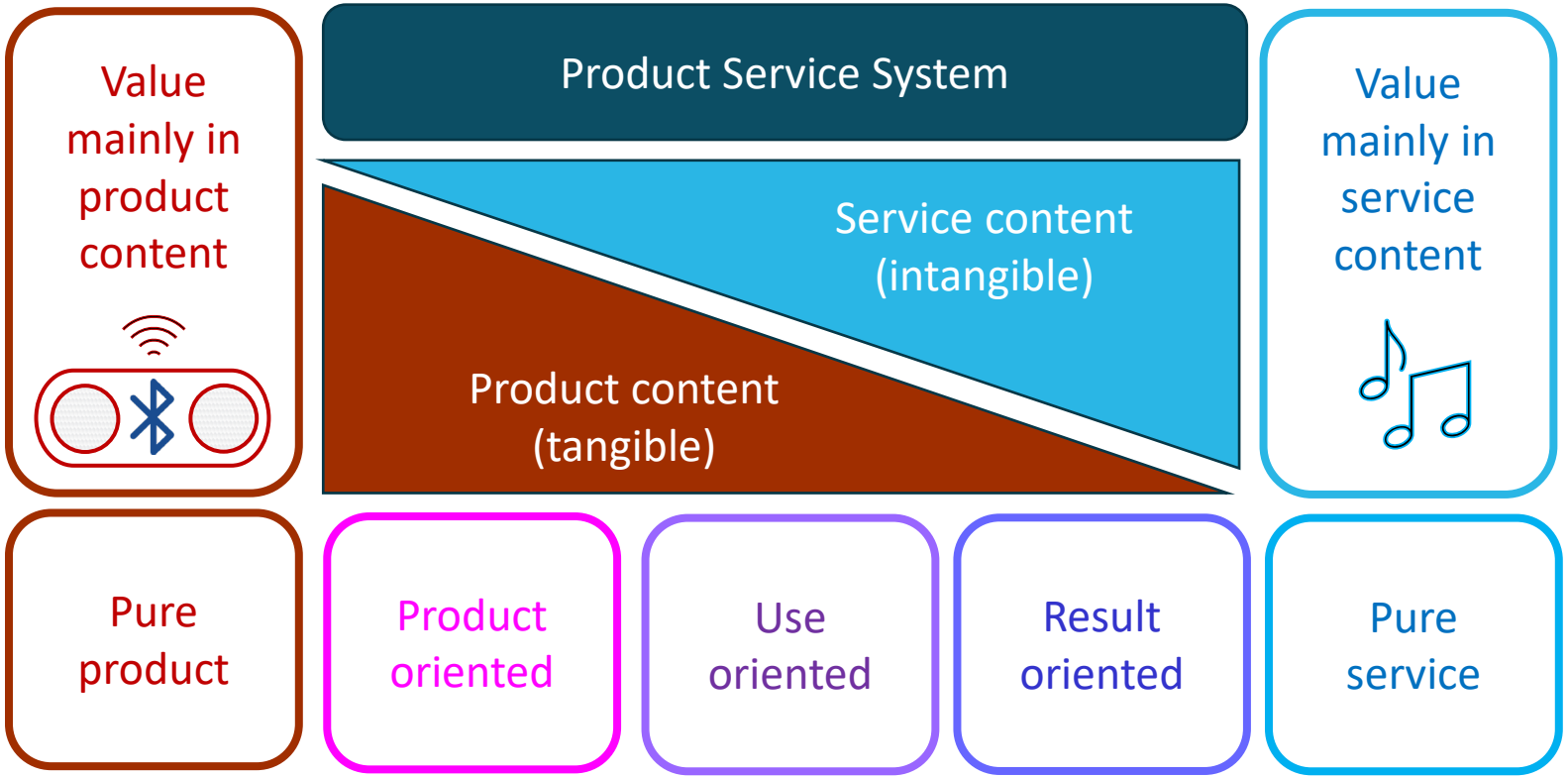
Organizational ambidexterity

BEING GOOD AT **BOTH** EXPLORATION **AND** EXPLOITATION

EXPLORATION OF THE NEW	EXPLOITATION OF THE EXISTING
• Innovation and growth	• Cost, profit, efficiency
• Entrepreneurship, search, discovery, risk taking	• Operational optimization, product improvement and refinement
• Loose in control and process, flexible, iterative, adaptive and agile	• Formal structure, well-defined process execution
• Potential for radical, breakthrough, revolutionary or disruptive innovation	• Incremental and continuous innovation, evolutionary development
• Ambiguity preserved	• Predefined expected outcome

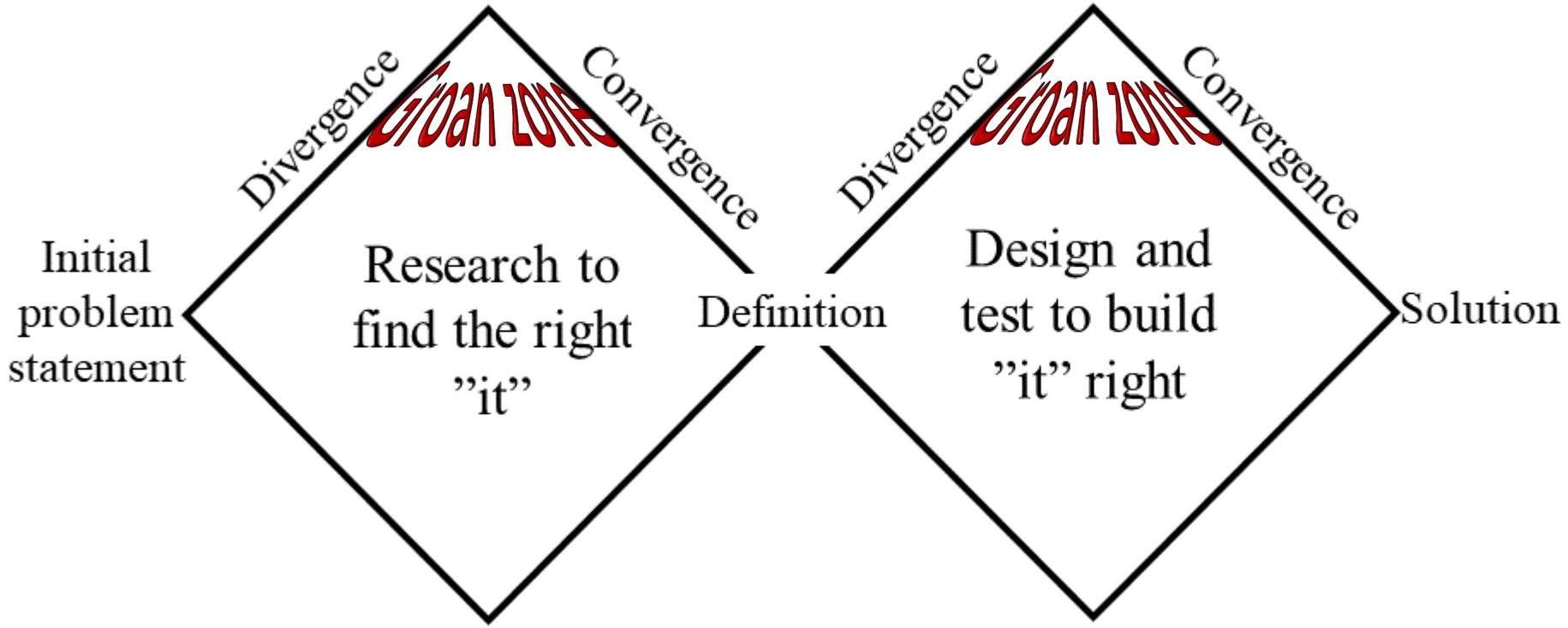
e.g. Duncan (1976), March (1991), Tushman & O'Reilly (1996)

Product Service Systems



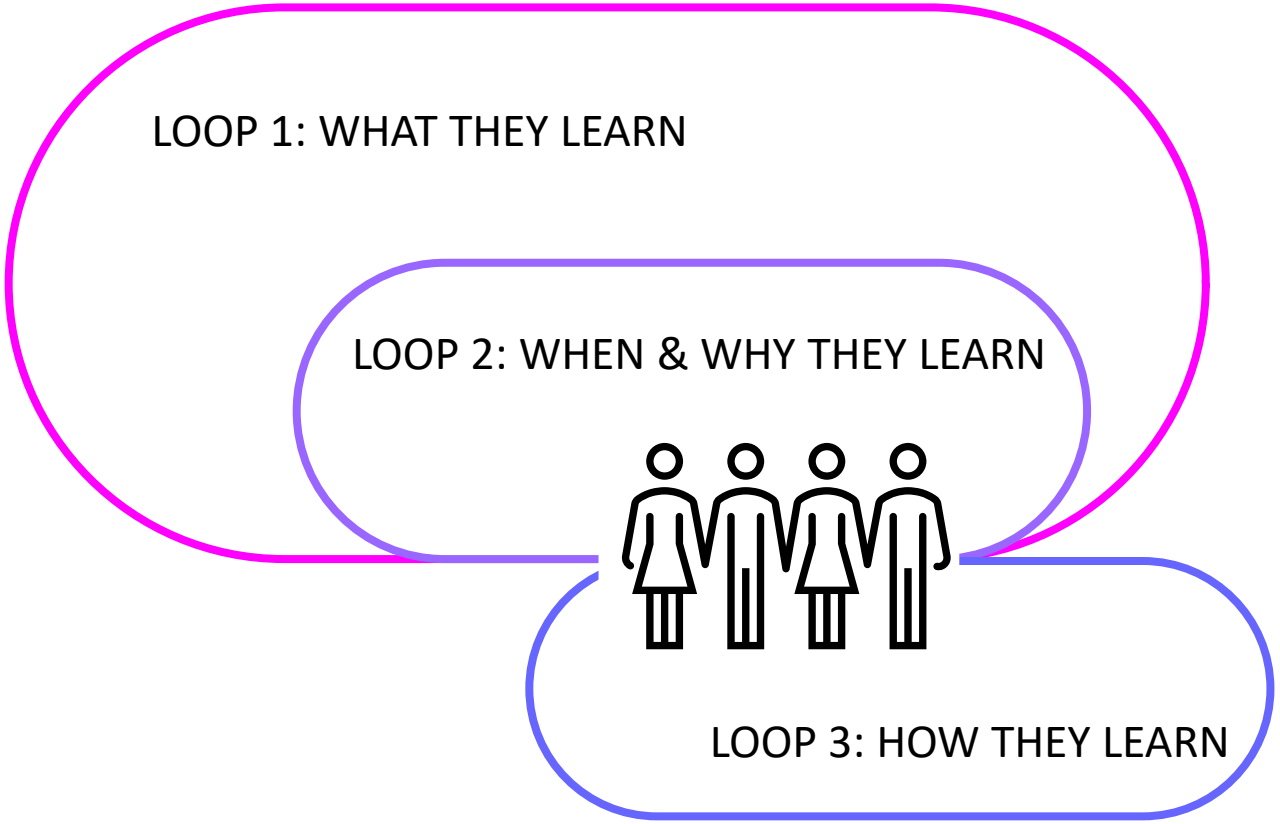
e.g. Tukker and Tischner (2006) , Baines et al. (2007), Johansson (2009), Gaiardelli et al. (2021)

Exploration – The Double Diamond



e.g. British Design Council (2004), Savoia (2019), Kaner (2014)

Exploration – triple loop learning



e.g. Eris (2003), Eris & Leifer (2003), Leifer & Steinert (2011)

Findings

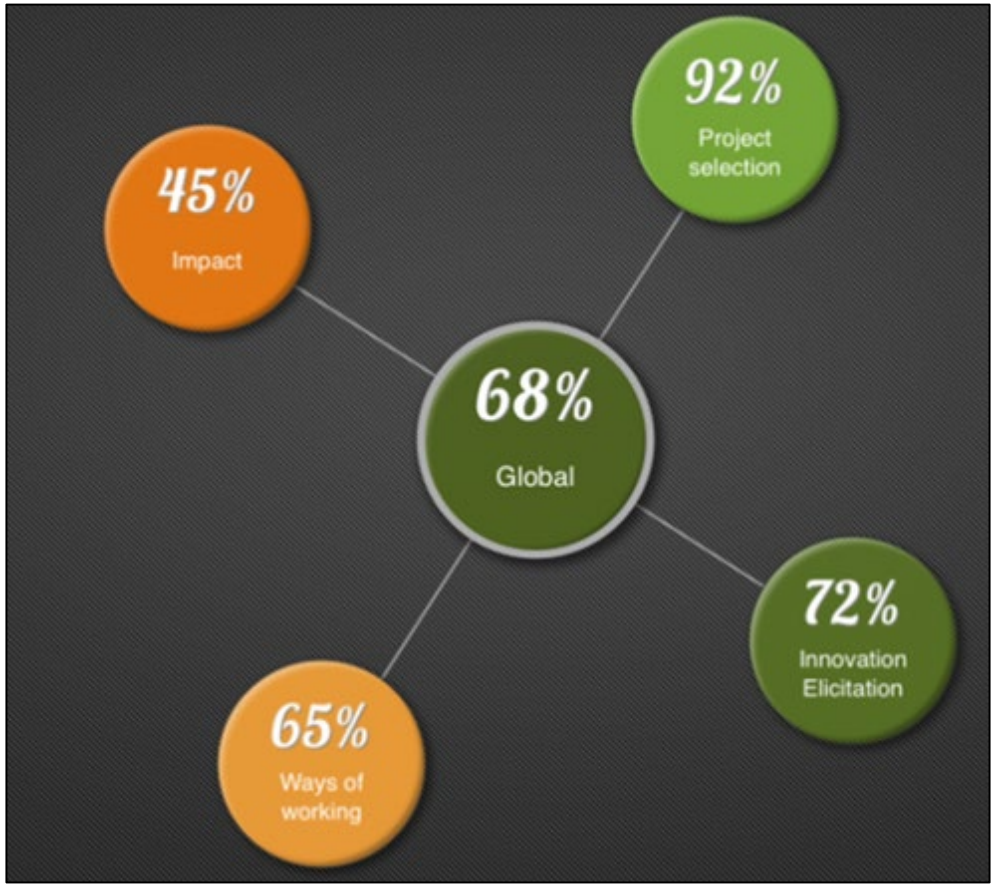
PAGES IN THESIS: 93-115

RQ1: How can large manufacturing incumbents strengthen their innovation capability?

PAGES IN THESIS: 95-105, 117

Four key components

1. Establish an innovation capability framework
2. Measure progress – to promote, diagnose, experiment, and reflect
3. Build a network of innovation ambassadors
4. Infuse organizational ambidexterity

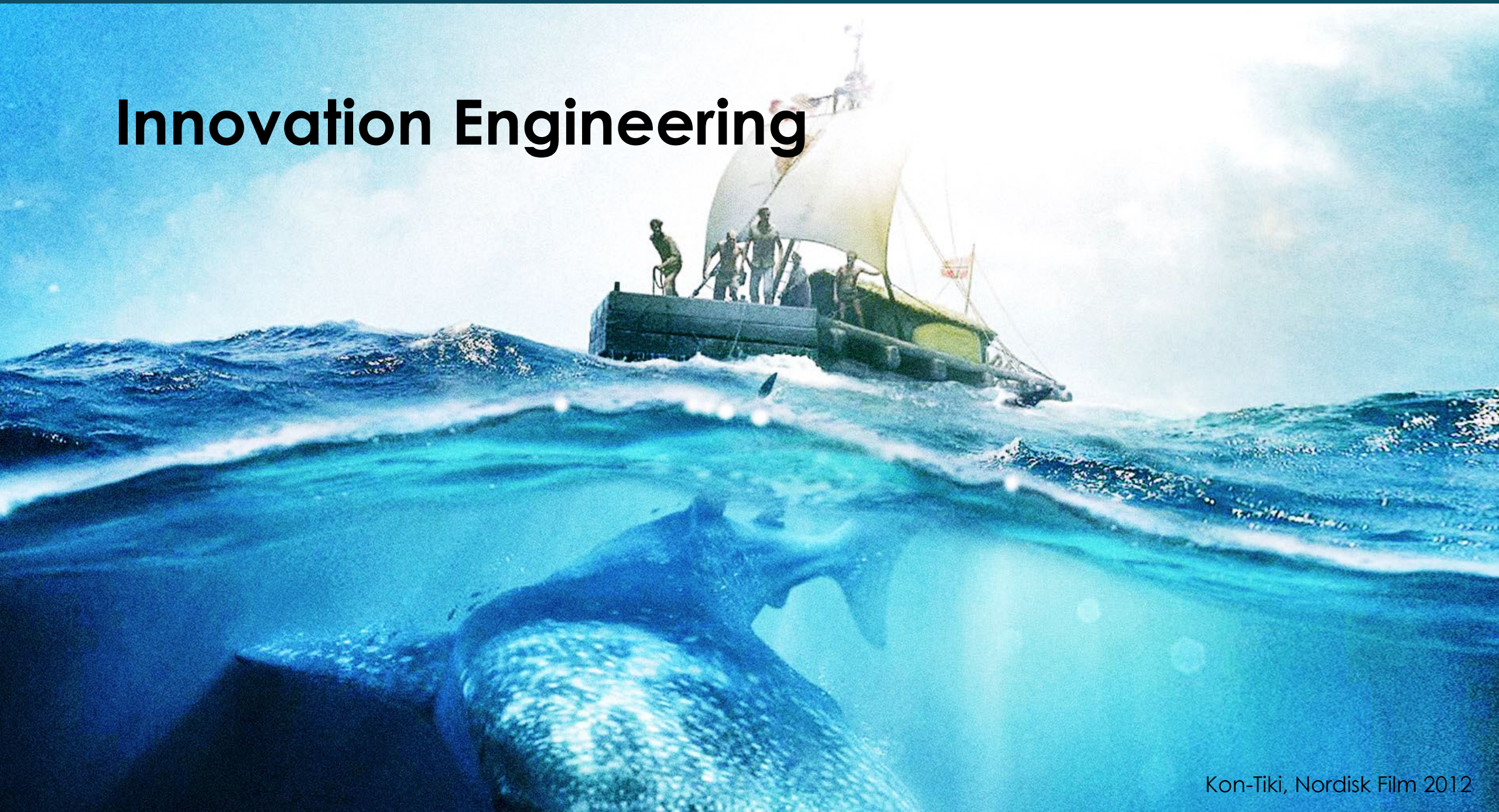


RQ2: How can exploration be institutionalized, guided, and led in large manufacturing incumbents?

PAGES IN THESIS: 106-110, 117-118

Innovation engineering

Innovation Engineering

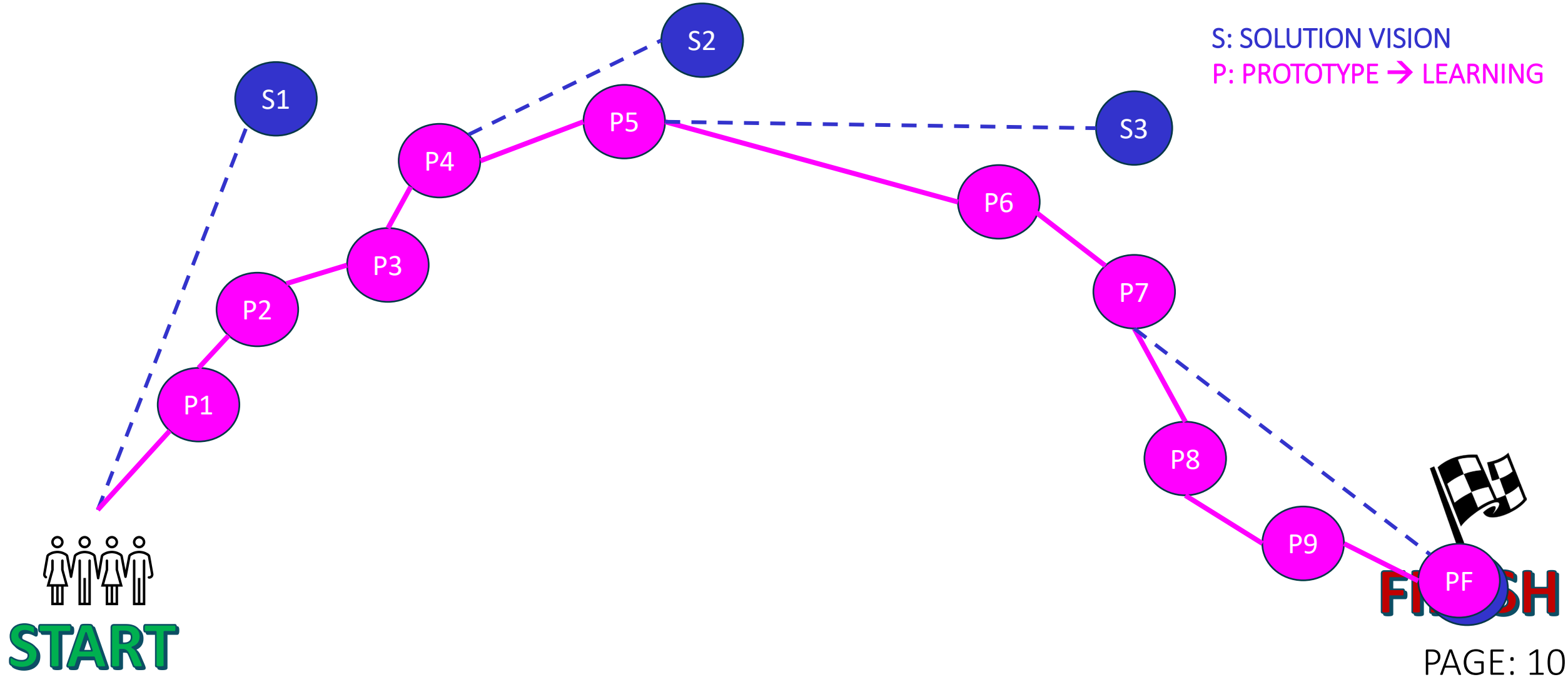


Kon-Tiki, Nordisk Film 2012

Guiding with a team journey map

START	DIVERGENT PROBLEM SPACE	CONVERGENCE TO THE PROBLEM TO ADDRESS	DIVERGENT SOLUTION SPACE	CONVERGENCE TO THE SOLUTION TO TEST	DESIGN/ BUILD/ TEST SOLUTION
					
Nudge for:	**Nudge for:**	**Nudge for:**	**Nudge for:**	**Nudge for:**	**Nudge for:**
Get to know each other – for real	Get out there	Embrace the groan zone	Relentless prototyping	Embrace the groan zone	Focus on selected solution
Select tools and rules for effective team collaboration	Preserve ambiguity	Keep connectedness	Preserve ambiguity	Keep connectedness	Get external support

Guiding with a hunter-gatherer map



SOLUTION VISIONS

PROTOTYPING EXPLORATION

CURB-SIDE RECYCLING ASSISTANCE

PACKAGING MATERIAL WASTE STREAMS

OCEAN PLASTIC

PLASTIC RECYCLING

POLYVINYL ALCOHOL ENVELOPES

MOTORIZED TRASH TROLLEY

POLYVINYL ALCOHOL PACKING BOXES

COVID-19

"EUREKA!!"
PIVOT

A.I. SORT ASSIST

3D-print PLASTIC RECYCLE

Testing:
- Humidity,
- Mechanical,
- Sterilization,
- Remanufacturing

Manufacturing trials

SYSTEM MODEL:

FINAL PROBLEM (SOLVED):
SINGLE-USE PPE SHORTAGES

PRODUCT: REGLOVE

Minimum viable product

PROMPT:
EXPLORE "THE FUTURE OF WASTE INDUSTRY",
- ZERO ACCIDENTS,
- ZERO EMISSIONS,
- ZERO UNPLANNED STOPS

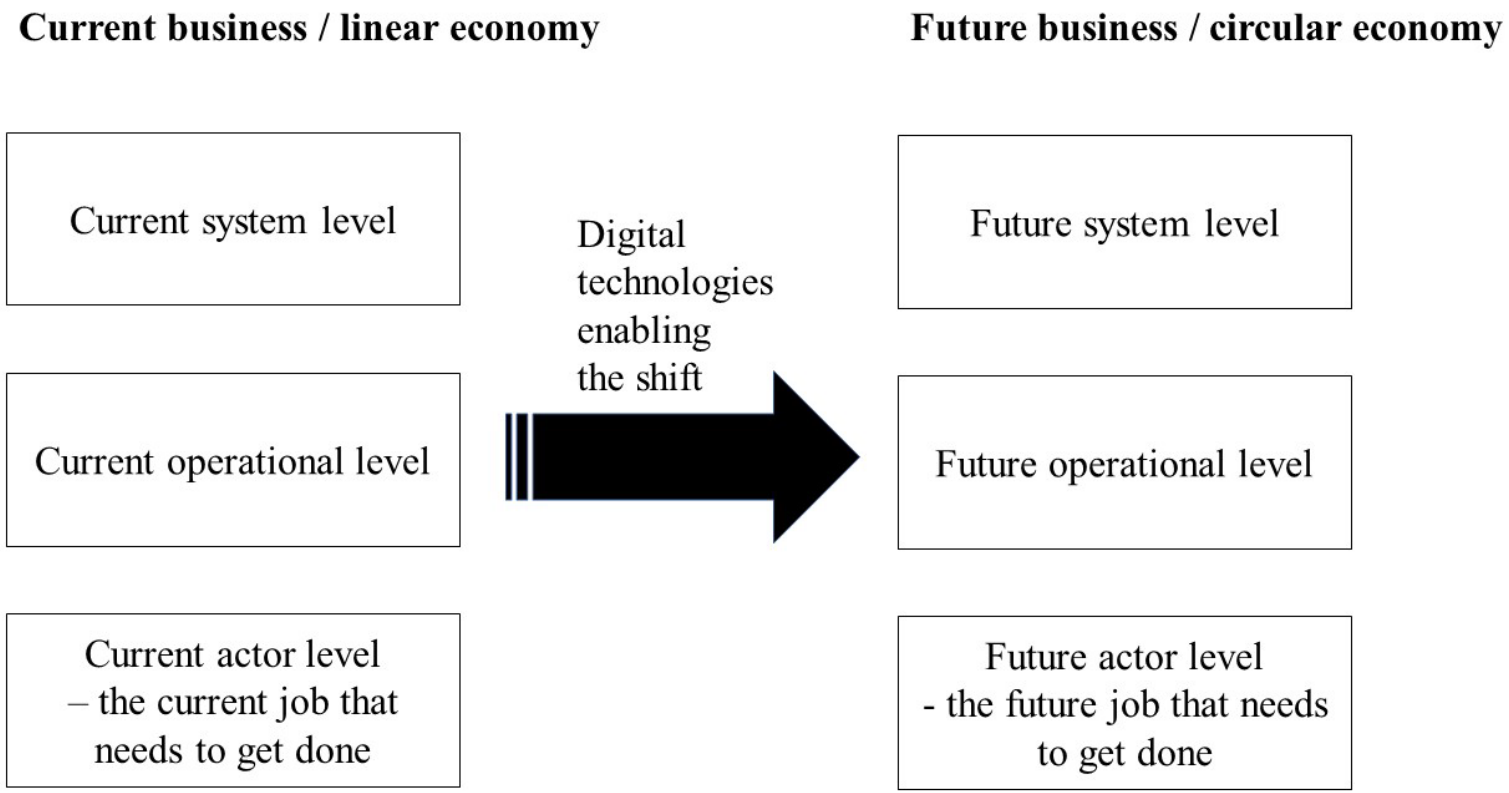
The Inner Life of the Team

Social connectedness in the global team is essential

Preserving ambiguity is hard, but takes the team further

A community of stars

Intentional PSS design



RQ3: How to bridge exploration and exploitation in large manufacturing incumbents?

PAGES IN THESIS: 110-115, 118-119

The need for the buffer

https://media2.giphy.com/media/3o6ZtnxGZyxDDQtGvu/source.gif

Pixar’s movie The Incredibles, Elastigirl

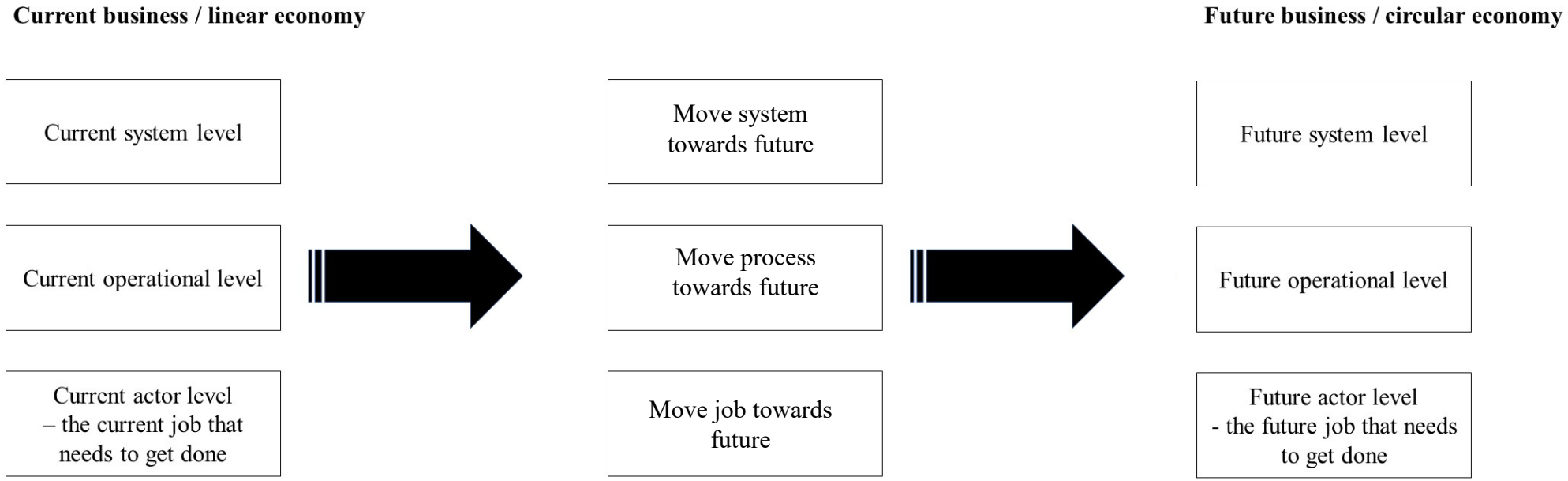
Bridging exploration and exploitation

1. BOTH-AND LEADERSHIP FROM THE TOP

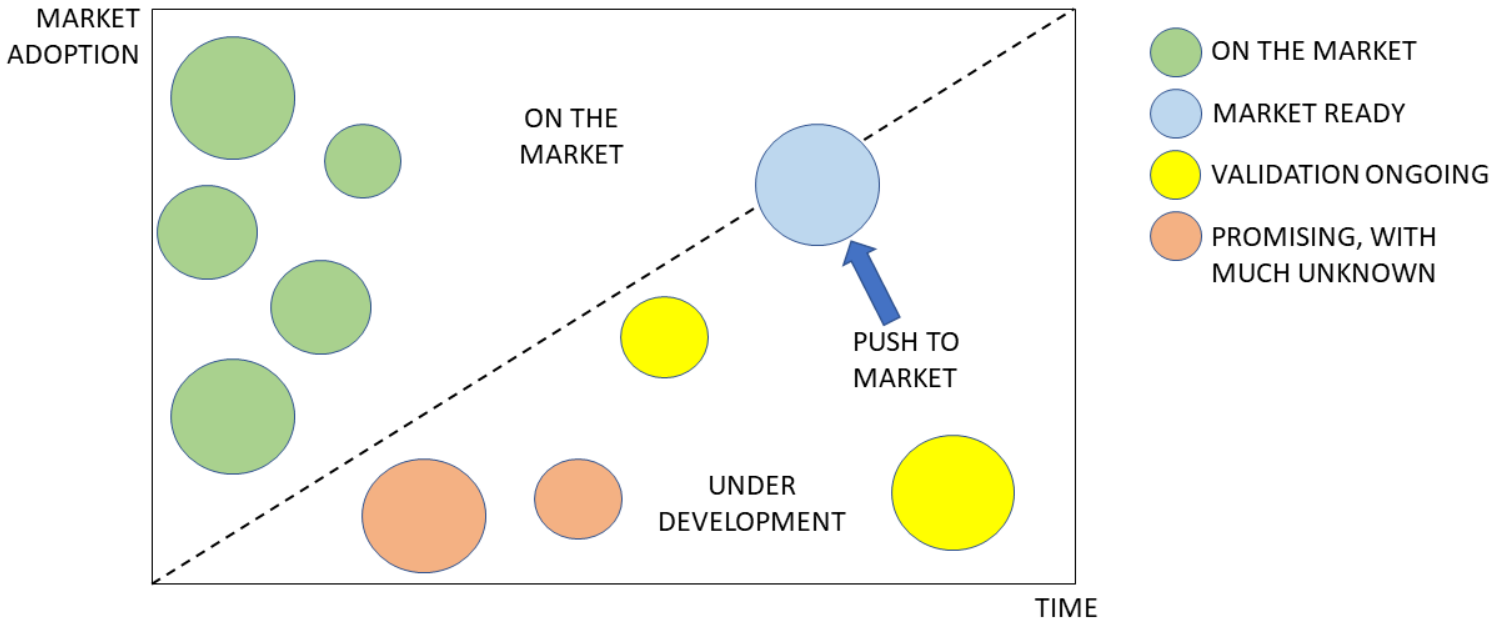
2. BOTH-AND LEADERSHIP FROM THE EXPLOITATION SIDE

3. TRANSPARENCY, INCLUDING AND INVITING BEHAVIOR FROM THE EXPLORATION SIDE

Bridging approach 1



Bridging approach 2

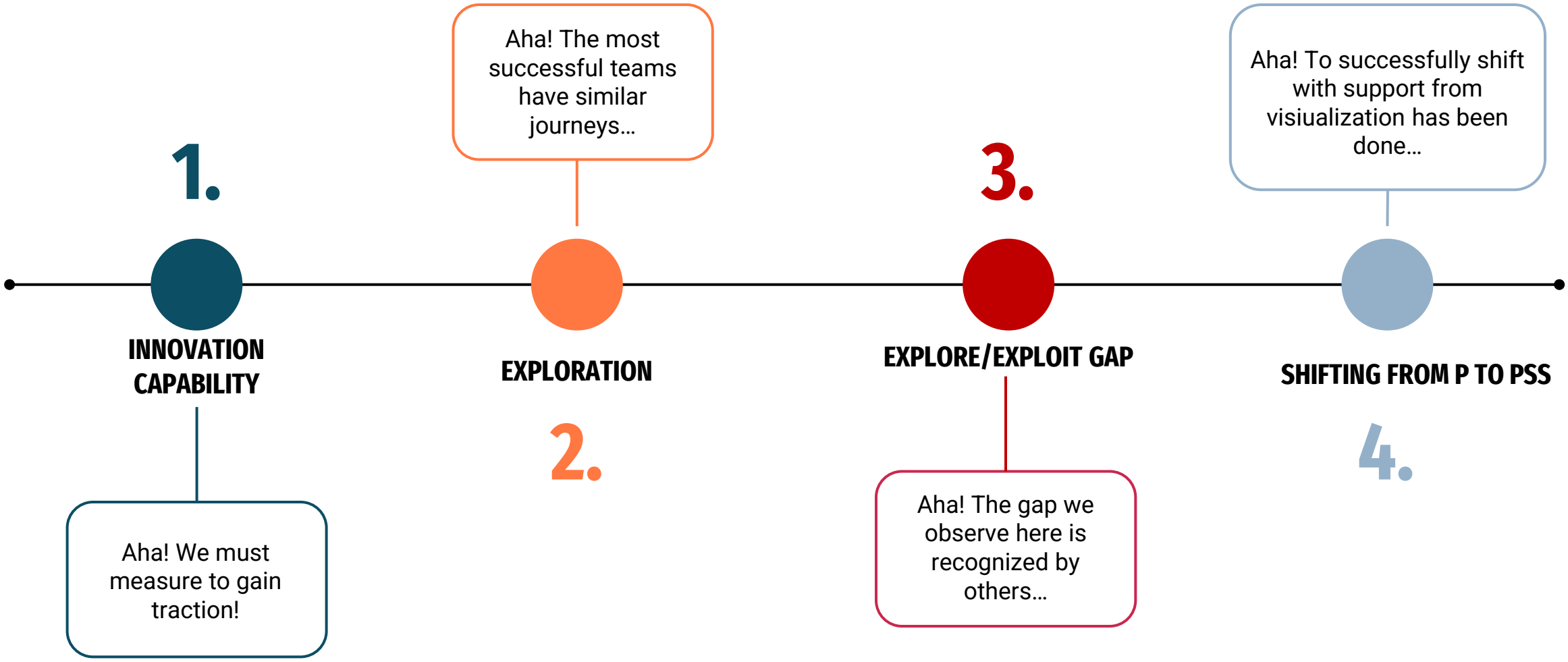


This approach is based on HP's "Wonderbread model" as understood from conversations with Sheryl Root, but simplified

RQ4: How might bridging help a shift from products to product-service systems?

- Infuse organizational ambidexterity
- Make innovation engineering process and practice part of core
- Apply innovation engineering tools (i.e., intentional PSS design, team journey and hunter-gatherer map)
- Apply the bridging approaches
- Take a digiphysical approach, where both product and contextual (synthetic or real) data are utilized from early design through the solution's entire lifecycle

Four Aha-moments on my journey



Closing remark: What's up with the burger?

Mars Albertsson, 2023

PAGE: 123-125

"Here's to the crazy ones. The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is ignore them. Because they change things. They invent. They imagine. They heal. They explore. They create. They inspire. They push the human race forward.

Maybe they have to be crazy. How else can you stare at an empty canvas and see a work of art? Or sit in silence and hear a song that's never been written? Or gaze at a red planet and see a laboratory on wheels?

We make tools for these kinds of people. While some see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world, are the ones who do."

Apple Inc.