Creating Candidate Technologies for Disruptive Innovation

A case study approach

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Outlines

- Introduction
- Methodology
- Transistor as a disruptive technology
- Propositions
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Introduction

•“Simpler”, “initial inferior performance” and “cheaper” characteristics have given rise to the misperception that DT was not technologically challenging.

•Emerging focus on purposeful creation of technologies candidates for potential DI. (Kostoff et.al. 2004; Walsh, 2004; Yu and Hang, 2008)

•This revelatory case, combined with the extant literature, is devoted to correct the misperception and try to provide insights on how to make technologies candidates for DI in NPD process.

Methodology

- Qualitative single case study
  - –Lack of rich prior research
  - –Causation than correlation

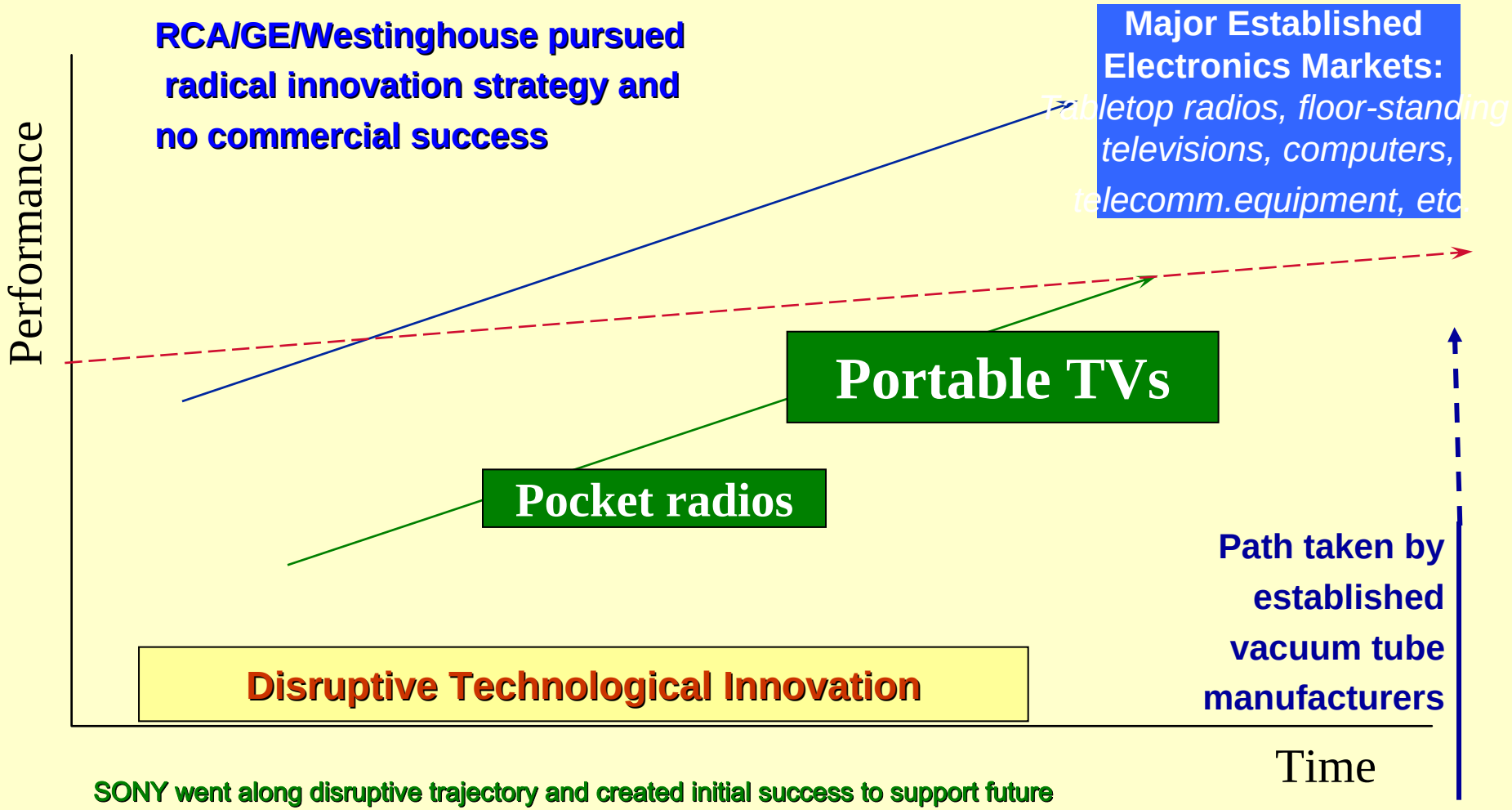
- Sony transistor radio as the focal case
  - –Full of objective documents
  - –Typical example of DI
  - –Technology-intensive DI
  - –Extremely challenging undertaking

- Limitation: It cannot clearly detach case specific elements from general elements. Further validation of the propositions with more cases is encouraged.

Transistor as a disruptive technology

- Performance trajectory
- The major elements in the disruptive innovation of transistor radio
- Comparison of value networks

Sony pursued the new-market disruptive path



SONY went along disruptive trajectory and created initial success to support future R&D.

The major elements in the disruptive innovation of transistor radio

COMPANIES	Disruptee: RCA/GE/Westinghouse	Disruptor: Sony
TECHNOLOGIES	Existing technology: Vacuum tube based radio	Emerging technology: Transistor based pocketable radio
ADVANTAGES IN TECHNICAL ATTRIBUTES (when transistor was introduced in 1950s)	Primary/key attributes that mainstream historically valued: Sound Quality; Fidelity	Secondary/new attributes that mainstream ignored: miniaturized; low-cost; less power hungry.
MARKET	Existing market: Customers of Tabletop radios, floor-standing televisions etc, adults	New market: Teenagers who like to listen to rock 'n' roll
TIME OF DISRUPTION	1965—1968	

Comparison of value networks

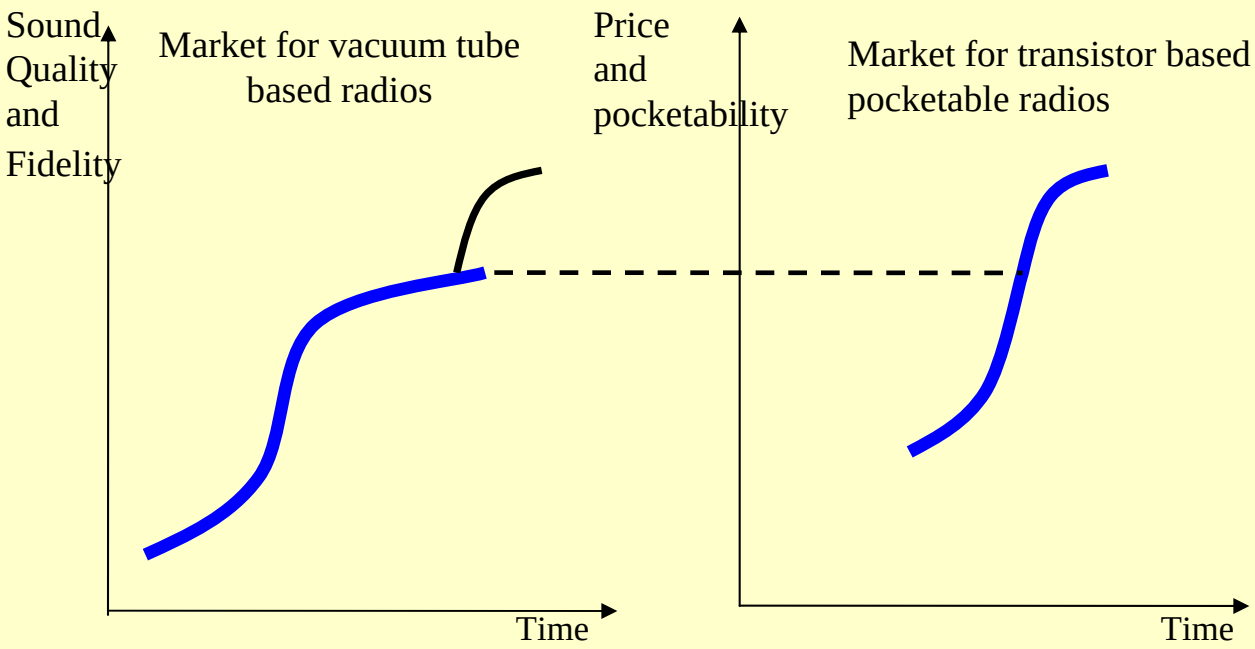


Fig. 2a Value network of Sound quality and Fidelity

Fig. 2b Value network of Price and Pocketability

Proposition 1

•The higher an SBU's emerging customer segment orientation, the more disruptive would be the innovations it developed (Govindarajan and Kopalle 2004).

•The mainstream customer orientation and the emerging customer orientation are not two options on the opposite ends of a continuum but they are independent of each other, suggesting that firms can develop both orientations simultaneously (Narver *et al.* 2004; Slater and Mohr 2006; Baker and Sinkula 2008).

•Sony was engaged to satisfy their existing customers of tape recorders while targeting at emerging opportunities in teenagers' pocket. The business of transistor radio was not growing at the expense of recorder business.

Proposition 1: Diversified customer orientation is viable and positively related to creating technologies for disruptive innovation.

Proposition 2

[1] There was not even transistor technology in the US

MITI: a small company can not do such complex thing;

Akio Morita (Founder): completely new to our experience; Developing the transistor would be a job that challenge the skills of all of them(40 engineers).

[2] Material Science challenge

Indium->gallium->antimony->Phosphorus->Phosphorus doping method->diode tunneling effect,
Nobel Prize of 1973

[3] Miniaturization challenge

Redesign every component, e.x. PCB

Manage to persuade component manufacturers to go with them, e.x. microspeakers.

[4] Cost reduction challenge

Transistors alone cost 18000Yen ; Target cost 13000Yen

Proposition 2: A consistent and compelling vision to inspire emotional commitment provides major foundation for creating technologies for disruptive innovation.

Proposition 3

•One recent study on how the international context was actually present in the process of DT development and indicated that both the degree and international scope matter (Sandberg and Hansen, 2004).

•Compared with US equivalents, the Japanese transistor radios were very competitive in terms of price, which enabled its success in the niche market of American teenagers.

Proposition 3: International market perspective at the beginning increases the likelihood of firm's success in niche market, thus contributing to creating technologies for disruptive innovations.

Proposition 4

Contributions by core team members of transistor project

NAME	POSITION	CONTRIBUTION	IMPLICATIONS
Leo Esaki	Physicist	Discover and describe diode tunneling effect, Nobel Prize winner	Technical talent, has the risk-taking courage to challenge authority and think out of box
Akio Morita	Co-Founder	Finance the project, marketing champion	Companies are in urgent needs of marketing champions such as Morita who has the tacit wisdom on how to create disruptive technologies in advance.
Masaru Ibuka	President	Obtain the license, set up the mission	Set counter-intuitive R&D goal to aim for low cost while maintaining adequate performance at the very early stage of a science/engineering breakthrough, and lead the team with shared vision
Kazuo Iwama	Project leader	Responsible for R&D of this project, send prodigious reports and principles of transistor technology back to Sony	Inter-disciplinary talent, experienced manager who knew the scientific mind.
Junichi Yasuda	Electric engineer	Design twelve different varieties of local oscillator coils. Design PCB all by them.	Technical talent, very creative and innovative.

A doctoral study on I-mode disruptive innovation in NTT DoCoMo has found similar characteristics of team members in the creation of DT (Murase, 2003)

Proposition 4: A development team with characteristics such as shared vision, risk-taking courage, diversified capabilities, creativity, and determination increase the likelihood of creating technologies for disruptive innovation.

Conclusion and Future Research

•Emphasize creating candidate technology for potential DI is a worthwhile research direction, not only to fill the gap in theory, but also to satisfy the industrial needs to create new growth and to sustain competitive advantages.

•The creation of certain disruptive technologies could be extremely challenging, especially if it is based on a new scientific discovery.

• Four preliminary propositions on how to create technologies for potential DI in NPD process have been brought forward for further validation.

•Future research could make comparative studies among multiple cases, to test the propositions and find general and necessary elements to the creation of technology for potential DI.