Establishing Galapagos Ke-tai’s Dominant Industrial Design

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Abstract: The folding “clamshell” mobile phone was chosen as the dominant industrial design in the Japanese mobile phone industry due to the importance of mail functionality, and NEC actively pushed this style and acquired major market share. As a result, at the start of the 21st century, the dominant design “Galapagos ke-tai,” unique to Japan, was established. However, this dominant industrial design along with the functionality of these phones became a barrier to the Japanese mobile phone industry when they shifted to smartphones. In other words, a dominant industrial design determined the competitive positions of companies.

Keywords: industrial design, dominant design, innovation, mobile phone

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1. Introduction

Japanese mobile phones evolved in a unique fashion through a process called “Galapagosization.” As a result of this unique evolution, Japanese mobile phones are generally known as Galapagos ke-tai (ke-tai meaning “mobile phone” in Japanese). An examination of the appearance of these phones reveals that many of them are of the folding “clamshell” type. How did the clamshell design become so broadly accepted by the market, and how did this impact business management?

This paper reviews prior research and notes their limitation at first. Next, it analyzes the impact of choices of appearance on business management as a dominant design is formed, in this case, that of the Galapagos ke-tai. As a result, it points out the appearance of mail functionality through data communication services tied to the adoption of the folding clamshell type design. It also notes that while the folding type design was tied to changes in market leadership by NEC and Panasonic, this same type design led to delays in responding to later challenges from smartphones. Although there is an insufficient focus on dominant industrial design in existing research, this paper points out that a consideration of fit in function and appearance is important, and business management should focus on dominant industrial design.

2. Existing Research

Existing research notes that as industries grow and innovate, products that characterize subsequent products appear such as Ford’s Model T. These designs are known as dominant designs (Abernathy, 1978; Abernathy & Utterback, 1978; Utterback, 1994).¹

¹ See Akiike (2013) for a discussion of the creation of the A-U model.
Dominant designs are formed in relation to market needs, which determine final structures and product parameters (Clark, 1985). There have been many studies on this in the field of technology management. However, while much of the existing research has debated the technological and functional sides of dominant design (e.g., Tushman & Anderson, 1986), little analysis has been on the appearance side of dominant design, or dominant industrial design (Akiike & Yoshioka-Kobayashi, 2017). Then, does dominant industrial design have an impact on the competitive position of firms just as it does on technology (e.g., Tushman & Anderson, 1986)? Moreover, how is appearance related to function?

3. The Case of the Japanese Mobile Phone Industry

The subject of this paper is the Japanese mobile phone industry. Japanese mobile phones evolved uniquely and rapidly, going from basic phones with minimum talk functionality to the unique dominant design that came to be known as the Galapagos ke-tai.

3.1. What is Galapagos ke-tai?

Galapagosization has been noted as an issue in Japanese manufacturing industries. The origin of the term is the evolution of the living thing in the Galapagos Islands. It means 1) unique product evolutions resulting from adaptation to the needs of Japanese domestic market and 2) that products are not accepted in global markets, and finally, the risk that global products will defeat them when global products enter the Japanese market arises (Miyazaki, 2008).2

Galapagosization is said to have occurred in the Japanese mobile

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2 The fundamental process is similar to that of Christensen (1997).
phone industry (e.g., Miyazaki, 2008; Yoshikawa, 2010). Thus, Japanese mobile phones are known as Galapagos ke-tai (or, mobile phones created from Galapagosization). Although, the definition of Galapagos ke-tai is included in feature phones, Galapagos ke-tai has some functions unique to Japan, such as FeliCa for NFC payments or One seg for TV broadcast reception. In other words, Galapagos ke-tai is shared as a standard for function of Japanese mobile phones. Hence, these mobile phones can be viewed as a dominant design for Japanese mobile phones.

3.2. The history of Galapagos ke-tai’s technological and functional improvement

Next, let us describe the process of Galapagosization for Japanese mobile phones and the history of how Galapagos ke-tai came to have these functions. Table 1 summarizes the development of Galapagos ke-tai’s functionality. Initial wireless technology (1G) for mobile phones was analog (Kanzaki & Nishii, 2008). There was a shift to 2G in 1993 (Morishima, 2006), which was digital and allowed for better audio quality and lower power consumption (Kanzaki & Nishii, 2008). In addition, 2G allowed for data communication such as mail and internet access. This resulted in more telecommunications services, such as i-mode (1999), ezweb (1999), and J-sky (2000) (Kanzaki & Nishii, 2008). i-mode had a particularly large impact on data telecommunications services in Japanese mobile phones. A closer look at this service shows that companies selling models that were compatible with it were, in order of market release, Fujitsu (Figure 1), NEC (Figure 2), Mitsubishi (Figure 3), and Panasonic (Figure 4) (Shirakura, 2003). These four companies were successful

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3 According to the definition of *Nihon Daihyakka Zennsyo* (http://japanknowledge.com/lib/display/?lid=5002015600190) and *Gendai Yougo no Kisochisiki* (http://japanknowledge.com/lib/display/?lid=1001050308425) (both in Japanese).
Table 1. The evolution of Galapagos ke-tai’s function

| Year | Function                  | First mover                  | Model             |
|------|---------------------------|------------------------------|-------------------|
| 1999 | Data communication (mail, internet) | Fujitsu                      | F501i HYPER       |
|      | Color display             | Fujitsu                      | F502i HYPER       |
| 2000 | Camera                    | Sharp                        | J-SH04            |
| 2001 |                           |                              |                   |
| 2002 | Music (Chaku uta)         | Casio, Hitachi               | A5302CA           |
|      |                           |                              | A5303H            |
| 2003 |                           |                              |                   |
| 2004 | FeliCa                    | Panasonic, Sony Ericsson, Sharp, Fujitsu |                   |
| 2005 | TV (One seg)              | Sanyo                        | W33SA             |

Source: Mobile Content Forum (2008).

in developing models in collaboration with NTT docomo, and this data telecommunications service was also hugely successful (Shirakura, 2003).

Japanese mobile phones continued to evolve. Color displays were first used by Fujitsu in the F502i HYPER. These displays allowed for internet viewing in color. To take advantage of the benefits of a color display, Sharp put a camera functionality in its J-SH04 model (Kikuchi, 2001). Later, Japanese mobile phones evolved in response to user needs, with such functions as music, FeliCa for NFC, and One seg for viewing television broadcasts. FeliCa was implemented in April 2004 by Panasonic, Sony Ericsson, Sharp, and Fujitsu, and
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Figure 1. F501i HYPER
Source: https://www.g-mark.org/media/award/1999/99A2233/99A2233_01_880x660.jpg?w=880&h=660&m=0

Figure 2. N501i HYPER
Source: https://www.g-mark.org/media/award/1999/99A2234/99A2234_01_880x660.jpg?w=880&h=660&m=0

Figure 3. P501iHYPER
Source: https://www.g-mark.org/media/award/1999/99A2235/99A2235_01_880x660.jpg?w=880&h=660&m=0

Figure 4. D501iHYPER
Source: https://www.g-mark.org/media/award/1999/99A2232/99A2232_01_880x660.jpg?w=880&h=660&m=0

Sharp was the first to market with a One seg model in 2005. Rapid technological functional improvements were made in the Japanese mobile phone industry to respond to the needs of Japanese users. In particular, FeliCa and One seg were achieved through the adoption of standards unique to Japan. Thus, by responding to the needs of Japanese users, a dominant design unique to Japan and known as Galapagos ke-tai was formed.

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4 Previous mobile phones did have analog TV functionality (Mobile Content Forum, 2008). Akiike (2014) discusses the relationship between TV functionality and appearance.
3.3. Which is Galapagos ke-tai’s design?

Japanese mobile phones followed a unique evolution on the functional side, as discussed in the previous section. However, one cannot ignore the appearance side of Galapagos ke-tai. The Japanese mobile phone industry saw major changes in mainstream designs for mobile phones between basic phones and Galapagos ke-tai. Specifically, mainstream designs for mobile phones moved from a straight type design in the basic phone era (Figures 1 and 4) to the folding type design through Galapagosization (Figure 2). In 2001, the folding type design became dominant over the straight type design, and around 2002 and 2003 most mobile phone adopted the folding type design (Figure 7). Although, new designs appeared later, such as the rotating (Figure 5) and slide type (Figure 6) designs, the mainstream folding type design of the Galapagos ke-tai became more widespread (Figure 7). This can be seen by the use of the folding type design in many smartphones that have the appearance of a Galapagos ke-tai and which were known as “garaho” (short for “Galapagos phone”; e.g., the au website).5

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Figure 5. P2102V

Source: https://www.g-mark.org/media/award/2002/02A03017/02A03017_01_880x660.jpg?w=880&h=660&m=0

Figure 6. D902iS

Source: https://www.g-mark.org/award/describe/32013?token=IJpl9MYpR5

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5 KDDI website “Garaho tte nani?” [What is garaho?]. https://www.au.com/mobile/product/featurephone/garaho/about/
With these facts, one can see the folding type design becoming the dominant industrial design for Galapagos ke-tai. How did this change occur?

3.4. NEC’s challenge for establishing Galapagos ke-tai’s dominant industrial design

This change in dominant industrial design was influenced by the efforts of NEC. They aggressively adopted the folding type design when data telecommunication services began to appear in 1999. When using mail, the number of characters that can be shown on a screen is critical, and a folding type design allows a larger screen (Shirakura, 2002). NEC saw mail functionality as becoming central to mobile phones in the future and therefore used the folding type design for its N50li HYPER (Figure 2), regardless of cost.

Figure 7. The bar chart of mobile phone design type

Note: Data for 2008 was created from the Mobile Content Forum (2008, 2009), and data for 2009 was created from the Mobile Content Forum (2009, 2010). Data through September 2010 was used to make this graph. Further, it should be noted that this graph contains some smartphone data.

Source: Retrieved from Mobile Content Forum (2008, 2009, 2010, 2011)
disadvantages. Their risk paid off with success, and NEC won over many users (Figure 8). As can be seen in Table 1, despite the fact that NEC did not pioneer any major functionality, they saw huge gains in market share. Their decision to use the folding type design likely had a major impact.

NEC was hugely successful through their aggressive development of the appearance of mobile phones in accordance with change in functionality. In Galapagos ke-tai, mail became increasingly important.

The camera functionality introduced into mobile phones in 2000 also had the intention of fusing mail (“Foto senryaku,” 2001). Because they started the sya me-ru (short for “mail with photos”) service by J-phone in June 2001. In addition, by using a camera on a mobile phone, a large display became increasingly important. In fact, the J-SH07 introduced by Sharp around that time used a folding type design (“Foto senryaku,” 2001). As a result of

Figure 8. The transition of market share

Note: These companies all had top market share at least once in the period noted in the graph.
Source: Nikkei Sangyou Shimbun (1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010)
these functional developments, other companies adopted the folding type design, and it came to be regarded as a dominant industrial design.

In addition to camera functionality, Sharp led out with FeliCa functionality ahead of NEC. And by going after both technological and functional aspects, it took over leadership in the market (Nikkei Sangyou Shimbun, 2002, 2003, 2004, 2005, 2006, 2007, 2008). This shows that the folding type design was adopted as a dominant industrial design as a result of responding to rapid functional development in accordance with uniquely Japanese needs.

3.5. The dilemma of folding type

The Japanese mobile phone industry adopted the folding type design as a dominant industrial design for Galapagos ke-tai, as functionally evolved in a unique fashion to respond to the Japanese needs. Galapagos ke-tai, with their uniquely functions and appearance, were highly competitive in the Japanese market. However, adoption of the folding type design caused major issues that manufacturers were slow to respond to smartphones for the industry.

When the iPhone came to Japan in 2008 (Mobile Content Forum 2010), the Japanese mobile phone industry was slow to catch on to smartphones (“KDDI syachou ni,” 2010). This lag was impacted not only by functional aspects such as the use of FeliCa and One seg but also by appearance. Although, smartphones used a touchscreen for appearances, the Japanese mobile phone industry highly valued user interfaces such as keyboards used in traditional designs such as folding type designs (Okada & IT Media, 2008). They believed users would not use a mobile phone with a touchscreen. However, that ended up being a mistake (“KDDI syachou ni,” 2010). In the unique functional evolutions of functions in Japan, the dominant industrial design that had been developed proved to be a major impediment to a
shift to smartphones, even as the global products such as iPhone appears.

4. Discussion and Conclusion

This paper clarifies two points. First, changes in dominant industrial design can have a major impact on a company’s competitive position. NEC was slower than other companies when it came to technology and functions, but by using a folding type design that was appropriate for the new i-mode service, it was able to acquire major market share. However, adoption of the folding type design that was a result of responding to uniquely Japanese needs became a hindrance to shifting to smartphones that used touchscreens. Prior research notes the impact of technological and functional changes (e.g., Christensen, Suárez, & Utterback, 1998; Tushman & Anderson, 1986) on the competitive positions of firms. However, little attention has been paid to appearance. Thus, this paper makes a contribution by showing that changes in dominant industrial design can have a major impact on business management.

In addition, changes in dominant industrial design were shown to be related to changes in function seen as important by consumers. Clark (1985) noted that product structure is determined by the consumer perspective. In addition, Wii (2003) pointed out that product architecture that regulates how products can be combined depends on the function seen as important. In other words, it has been shown that there is a close relationship between a product structure and functions deemed important by consumers. However, there have not been any discussions extending to industrial design. Based on the results of this paper, the aforementioned discussions can be applied to industrial design. If the product functions demanded by consumers change, it is highly likely that the
ideal industrial design demanded by customers will also change. Existing research overlooks this point, and this paper makes a contribution for noting this point. As was pointed out by Sullivan (1956), there is a strong correlation between function and appearance.

When discussing the importance of industrial design, one may envision the “coolness” of a product. However, the relation of industrial design to function is important, and industrial design also impacts competitiveness. A practical contribution of this paper is the suggestion that firms must create their own design strategies bearing in mind this relation with functionality.

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References

Abernathy, W. J. (1978). The productivity dilemma. Baltimore, MD: Johns Hopkins University Press.
Abernathy, W. J., & Utterback, J. M. (1978). Patterns of industrial innovation. Technology Review, 80(7), 40–47.
Akiike, A. (2013). Where is Abernathy and Utterback model? Annals of Business Administrative Science, 12, 225–236. doi: 10.7880/abas.12.225
Akiike, A. (2014). Can firms simultaneously pursue technology innovation and design innovation? Annals of Business Administrative Science, 13, 169–181. doi: 10.7880/abas.13.169
Akiike, A. (2017, August). Why mobile phone’s form change? Paper presented at ABAS Conference 2017 Summer, University of Tokyo,
Establishing Galapagos ke-tai’s dominant industrial design

Akiike, A., & Yoshioka-Kobayashi, T. (2017). The power of existing design for establishing the dominant “industrial” design. *Annals of Business Administrative Science, 16*, 189–202. doi: 10.7880/abas.0170410

Christensen, C. M. (1997). *The innovator’s dilemma: When new technologies cause great firms to fail*. Boston, MA: Harvard Business School Press.

Christensen, C. M., Suárez, F. F., & Utterback, J. M. (1998). Strategies for survival in fast-changing industries. *Management Science, 44*(12 Part 2), S207–S220.

Clark, K. B. (1985). The interaction of design hierarchies and market concepts in technological evolution. *Research Policy, 14*(5), 235–251.

Foto senryaku: Purikura sedaini syashin tuki me-ru wo teian [Photo strategy: The proposal of e-mail with photo to photo booth generation]. (2001). *Nikkei Mechanical*, (No. 564), 44–47 (in Japanese).

Kanzaki, Y., & Nishii, Y. (2008). *Taikeitekini manabu keitaidenwana no shikumi* [Systematic learning about structure of mobile phone] (2nd ed.). Tokyo, Japan: Nikkei BP Soft Press (in Japanese).

KDDI syachou ni Tanaka senmu ga syoukaku [Tanaka senior managing director becomes KDDI’s president]. (2010). *ITmedia*. Retrieved from http://www.itmedia.co.jp/news/articles/1009/10/news069.html (in Japanese).

Kikuchi, T. (2001). *Kameratsuki keitaidenwaki no kaihatsu: Dai 2 kai* [The development of mobile phone with camera function: Episode 2]. *Nikkei Electronics*, (No. 802), 197–201 (in Japanese).

Miyazaki, T. (2008). *Garapagosu ka suru nihon no seizougyou* [Galapagosization of Japanese manufacturing]. Tokyo, Japan: Toyokeizai Shinpousya (in Japanese).

Mobile Content Forum (Ed.). (2008–2010). *Ke-tai hakusyo 2009–2011* [Ke-tai white paper 2009–2011]. Tokyo, Japan: Impress (in Japanese).

Mobile Content Forum (Ed.). (2011). *Sumaho hakusyo 2012* [Smartphone white paper 2012]. Tokyo, Japan: Impress Japan (in Japanese).

Morishima, M. (2006). Idoutsushintanmatsu keitaidenwagi-jutuhatten no keitoukacyousa [Systematic survey of technological developments in mobile communication terminals/portable telephones]. *Survey*
Reports on the Systemization of Technologies, 6, 239–301. (in Japanese).

Nikkei Sangyou Shimbun (1997–2005). Shijyou senyuritsu ’98–2006 [Nikkei Market Share ’98–2006]. Tokyo, Japan: Nihon Keizai Shimbun (in Japanese).

Nikkei Sangyou Shimbun (2006–2010). Nikkei shijyou senyuritsu 2007–2011 [Nikkei Market Share 2007–2011]. Tokyo, Japan: Nihon Keizai Shimbun (in Japanese).

Okada, Y., & ITmedia (2008). iPhone fushin ha souteinai to KDDI Onodera syacyou [The slump of iPhone is expected]. ITmedia. Retrieved from http://www.itmedia.co.jp/news/articles/0809/17/news089.html (in Japanese).

Shirakura, M. (2002). Ai mo-do to yobareru mae: Dai 8 kai [Before the service was called i mode: Episode 8]. Nikkei Electronics, (No. 836), 211–215 (in Japanese).

Shirakura, M. (2003). Ai mo-do to yobareru mae: Dai 12 kai [Before the service was called i mode: Episode 12]. Nikkei Electronics, (No. 841), 163–167 (in Japanese).

Sullivan, L. (1956). The autobiography of an idea. New York, NY: Dover.

Tushman, M. L., & Anderson, P. (1986). Technological discontinuities and organizational environments. Administrative Science Quarterly, 31(3), 439–465.

Utterback, J. M. (1994). Mastering the dynamics of innovation. Boston, MA: Harvard Business School Press.

Wii, J. H. (2003). Inobe-syon no soshikisenryaku [Organization strategy of innovation]. Tokyo, Japan: Shinzansha (in Japanese).

Yoshikawa, N. (2010). Garapagosu ka suru nihon [Galapagosization of Japan]. Tokyo, Japan: Kodansha (in Japanese).