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High-tech innovation through partnerships – systemic perspective

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ABSTRACT

The paper interprets innovation through technology alliances in the high-tech industry using frameworks from systems science and organizational theory. The case study of Japanese mobile phone operator NTT DoCoMo offers the opportunity to discuss the benefits of plural governance form, involving constant competition among inner and outer circles of partners, which stimulates innovativeness of a technological ecosystem.

Keywords: innovation, systems science, organizational theory, inter-organizational alliances, governance form, high-tech industry, case study, qualitative research

1. INTRODUCTION

1. 1. Systemic interdependencies in the high-tech industry

Significant high technology innovations are often created within networks of alliances, not simply individual firms. The present paper attempts to explore this phenomenon by applying the body of knowledge of systems science and organizational theory to a case study of NTT DoCoMo, leading mobile telecommunications company. The paper's particular focus is the governance form – institutionalized ways of

working with partners – and its role in new product and service development, positioned as a new type of business logic, overcoming the deficiencies of existing perspectives on strategic alliances.

Technological and strategic linkages among companies in the high-tech industry can be interpreted as systemic interdependencies, represented by the model of high-tech value chain [1] – a network of relations, focused on specific technology-driven value propositions, and structured by the characteristics of the underlying technologies. The model corresponds to similar concepts of: value network [2, 3], constellation [4], ecosystem [5] and platform [6]. Modularization of technological products [7] contributed to the formation of alliances between companies, which complement their respective offerings [8] and jointly create solutions for end customers. Specific segments of the high-tech value chain (or technology layers) such as: hardware, software, components (including integrated circuits), services and content, may nowadays be provided by diverse companies, so that breakthrough innovations are generated by networks of organizations, not just individual companies [9], and the industry can be decomposed into broad coalitions of firms, which use dedicated technical standards, thus resembling biological ecosystems.

1. 2. NTT DoCoMo

NTT DoCoMo is the leading Japanese mobile telecom operator, in 1992 spun off from the former state-owned monopoly NTT. In February 1999, DoCoMo introduced a highly successful mobile data communications service *i-mode*, making Internet content available to mobile phone users. Dedicated handsets offered access to entertainment sites (including cartoons, ring tones, games), as well as useful services (like stock charts, mobile banking or yellow pages). Due to initially high fees for home Internet connections in Japan, *i-mode* was for many people the primary method of accessing the web (phones were also able to access unofficial sites, not affiliated to DoCoMo). Official content providers were receiving subscription fees, billed from users by the telecom operator.

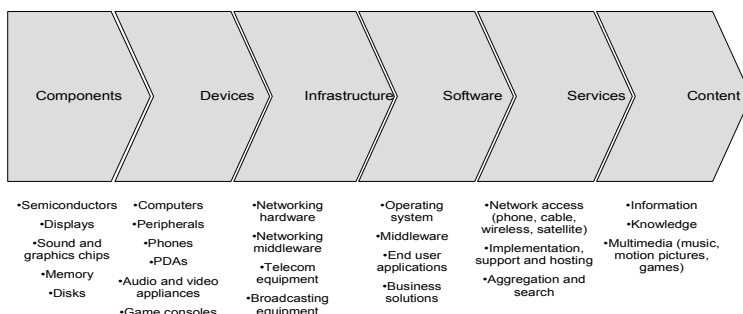


Figure 1. High-tech value chain; source: [1]

Thanks to *i-mode*, DoCoMo became the leading industry player, setting standards for other companies, rolling out the platform internationally and pioneering the next generation telecommunication technologies [10]. This part of DoCoMo's story is widely known and has been described by popular press as well as academic articles. However, Western telecom companies unsuccessfully tried to imitate DoCoMo's service offering and revenue model – their failure is usually attributed to the specificity of Japanese culture and local demand for mobile communications. The present paper challenges the views, offering alternative explanations within the systems theory: foreign players were focused on individual elements of DoCoMo's business model, overlooking the systemic relations with partner companies and ignoring the importance of the institutional context. As the following discussion will demonstrate, *i-mode* was one of many innovative solutions of DoCoMo, and for all of them, the company adopted similar partnership patterns, deeply rooted in the Japanese tradition and NTT's organizational culture. Understanding of these systemic relations should help identify the sources of DoCoMo's competitive advantage, and offer a wider perspective on the possible uses of alliances to generate high-tech innovations.

1. 2. Theoretical perspectives on partnerships

Literature on interorganizational alliances adopts three alternative perspectives to explain their rationale: transaction costs, resource-based and embeddedness perspectives [11]. Transaction cost analysis [12] differentiates between internalization, subcontracting and partnering, focusing on transaction costs and asset specificity as major decision criteria. The approach is challenged by examples of companies, which pursue partnership strategies even when internalization remains a cheaper alternative. The resource-based or organizational learning perspective [13] interprets alliances as a way of gaining access to needed resources, controlled by another party, especially to specialist knowledge. Alliances are thus presented as dynamic *learning races*, where one partner tries to acquire the necessary knowledge and eliminate the dependence [14] – but the explanation is not valid for many cases (including NTT DoCoMo), where partnership networks form an inherent element of a company's business model. The third perspective – social embeddedness [15] – explains the partnering imperative by cultural factors, promoting trusting, non-contractual, long-term relationships (*embedded ties*) [16]. The "locus of innovation" resides therefore not in individual firms, but within "networks of learning" [17: 116], including academic institutions, suppliers and customers, state agencies and other organizations

forming industry clusters. Partners in embedded networks tend to "sacrifice rather than maximize on price, and shift their focus from the narrow economically rational goal of winning immediate gain and exploiting dependency to cultivating long-term, cooperative ties" [15: 37].

The embeddedness perspective corresponds also to the traditional Japanese institutional logic, which affects the operations of modern corporations [18] and the formation of business grouping [19]. Japan was strongly influenced by the Confucianism, emphasizing the importance of harmony in society, which resulted from naturally unequal relationships among people and mutual obligations [20]. Anthropological studies suggest that the logic of Japanese organizational alliances is rooted in the cultural construct of *ie* (home), representing the possessions and the organization of a family [18]. The world of an individual is divided into things and people, which are parts of one's *ie*, and the outsiders. Similarly, the historically dominant business groupings *zaibatsus*, replaced after the war by *keiretsu* groups, divided Japanese industries into family-like partnership networks, based on implicit obligations and multiple business ties. The stability of relations in *keiretsus* helped reduce costs and improve efficiency across supply chains, with partners sometimes accepting inconvenient commercial conditions, in return enjoying renewed orders and experience curve effects [21].

The present paper demonstrates that DoCoMo successfully combined the traditional embedded partnership logic of its corporate parent NTT with ambitious, forward-looking technology strategies. The existing perspectives on partnerships will be supplemented by a model of two partnership circles and *plural governance*, which combines the resource-based and embedded approaches. The model helps interpret the case data, and explains the relative stability of DoCoMo's partnerships in spite of technology and market changes.

2. RESEARCH METHODS

The research is based on single case study approach, involving an analysis of over 1,300 documentary sources with the help of qualitative inquiry software NVivo. The specific sources included media coverage, corporate press releases, interviews and Internet news concerning DoCoMo, its partners and competitors, as well as a broader industry perspective. The explorative character of the study resulted in a thick description of the role of partnerships in Japanese high-tech industry settings. To increase the generalization potential of the research findings, the case was subsequently contrasted with a parallel study of Microsoft's partner management

practices – due to the space limitations, the present paper will focus on empirical findings concerning one case only, but the comparative analysis of both companies revealed surprising similarities, transcending their different cultural and technological backgrounds.

3. RESEARCH FINDINGS

3. 1. NTT DoCoMo and its partners

NTT DoCoMo's technology strategy involved innovating *through* partners – new product and service offerings could not be created without significant cooperation with trusted third-parties, and DoCoMo preferred collectively developed innovations to “stand-alone”, in-house solutions. For example, the 3rd generation mobile telecommunication platform W-CDMA was developed by DoCoMo based on specialist knowledge of Western partners (Motorola, Lucent Technologies, Ericsson and Nokia), supplemented by the involvement of Japanese companies (NEC, Fujitsu and Matsushita).

DoCoMo intentionally restricted own activities in specific domains (e.g. content development, mobile phone manufacturing) to maintain a balance in the partner ecosystem. The company conducted nevertheless R&D activities in all of the concerned areas, maintaining probably the highest R&D budget in the industry and constantly building absorptive capacities [22], to understand technologies and cost structures in order to better control partners, as well as implicitly threaten them with a potential entry in respective markets.

Many projects were dependent on foreign suppliers of unique technologies, especially as innovative visions of DoCoMo often could only be shared by equally visionary start-ups. As Jeff Pancottine from F5 Networks, delivering specialist software to DoCoMo, explained, “You have to have a unique solution and get designed in. (...) It's a very technical audience that you are selling to. They love technology and want to understand it and internalize it” [23]. Nevertheless, there seemed to be a general preference for local partners, and a recent study of global alliance patterns confirms the tendency on a larger scale: while in the 1980s and 1990s, Japanese high-tech companies tended to partner with multiple Western firms, by 2000 they formed a tight national cluster, concentrating new alliances among themselves [24]. The overall industry tendency can also be identified within DoCoMo's partner ecosystem, privileging domestic companies. As Japanese partners were maintaining multiple levels of relations with DoCoMo, providing not only network infrastructure but also handsets and other solutions, they

were more committed to risky projects, and managed to gradually substitute their risk-aware Western counterparts. Businesses of Japanese partners were directly supported by DoCoMo, which helped them update technical knowledge through new key technology projects, granted export licenses for own platforms, or used as service providers for implementations of innovative technologies from Western vendors.

3. 2. Inner and outer circles of partners

DoCoMo worked closely with a small number of trusted partners (“inner circle”), implicitly guaranteeing them repeated orders and opportunities to work on new projects. Cooperation areas with a single trusted partner were as diverse as hardware (handset and network development), software and content (e.g. mobile music), potentially encompassing all segments of the high-tech value chain. The group of trusted partners was inherited from its corporate parent NTT [25] - in this respect, the company followed the tradition of long-lasting embedded ties within Japanese business groups [19].

Mobile handsets exemplify the differences between two categories of partners. In the early 1990s, first mobile phones were manufactured to the carrier's order, thus giving DoCoMo control over the brand, end user price and detailed specifications. The phones were sold through NTT's retail network and branded as DoCoMo *movaD*, *movaF* etc. to indicate by a single letter the actual manufacturer. The number of *mova* handsets released annually was constantly growing – unlike the number of contracted suppliers, which remained stable over the years. In this way, the “inner circle” of partners was established, consisting of: Fujitsu, NEC, Matsushita, Mitsubishi Electric and Japan Radio (incidentally, there were also two *mova* phones manufactured by Motorola and Ericsson).

With depressed Japanese economy and limited consumer demand of the 1990s, regular orders for mobile phones presented an important business opportunity for all electronics companies. Facing pressures from industry and regulatory bodies, DoCoMo agreed to work also with other suppliers, but used co-branding to differentiate between them and the trusted (and thus recommended) partners: third-party phones were procured like *mova* phones, but sold as “*DoCoMo by*” models (e.g. *DoCoMo by Sony*) to imply differences. Across the entire high-tech value chain, DoCoMo incidentally worked with numerous loosely related companies, which were able to attract the telecom giant's attention by offering unique technologies (“outer circle”). These companies were disadvantaged, not benefiting from the same stability and access to information as the trusted partners, what

resulted in inferior products and decisions to license own technologies to “inner circle” players, who could act as a sales channel, instead of developing own solutions.

The products from inner and outer circles were characterized by substantial technical differences – as Kanji Ohnishi from Sony Ericsson described the position of Sony at the time when the company was a “by” maker: “We were the readers of the text (...) rather than the writers” [26], referring to the close cooperation between *mova* makers and DoCoMo in analyzing emerging technologies, acquiring knowledge, developing concepts and defining specifications for new handsets before the details were disclosed to all other interested (and disadvantaged) parties. An example of the scale of disadvantages is the first PHS handsets, released in 1995: Sony’s model weighted 190g, and the battery life allowed for 5 hours of conversation or 95 hours of standby, while four “inner circle” handsets weighted 95-160g, with respective battery parameters of 3.2-5 and 80-400 hours, as well as additional innovative features. Nevertheless, some of “outer circle” partners managed to make contributions significant enough to become trusted partners – Sharp pioneered phones with embedded digital cameras and Sony mastered phone multimedia features. These promotions remained in a striking contrast to the Japanese practice of distinguishing between affiliated and independent companies, where outsiders were traditionally not able to become close partners [21].

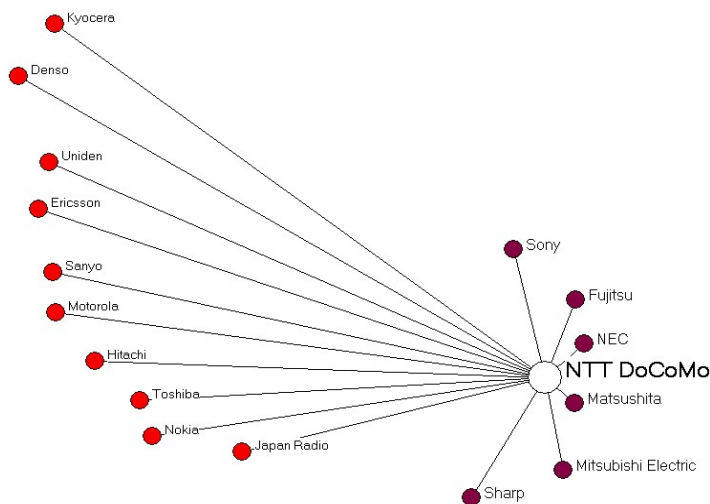


Figure 2. Inner and outer circles of DoCoMo's handset partners; source: own

Figure 2 presents the closeness of cooperation between the company and its handset suppliers, with graphical

distances depicting the repetitiveness of handset orders in the years 1992-2003 – 6 companies formed the “inner circle” as of 2003, with Sony and Sharp admitted to the group recently. The same partnership pattern characterized alliances with companies from other high-tech value chain segments. One day before the launch of *i-mode*, 2 out of 69 authorized partners were disqualified and their dedicated webpages were shut down because of low quality content [27]. DoCoMo's requirements included: updating the content more than once a day, making it “addictive” (to encourage users to return to the site) and enabling visitors to experience benefits (i.e. offering services, not merely information) [28], and obviously not every content provider was able to satisfy them. Official partners benefited from payment system, managed by the telecom company, and were listed on “*i-mode menu*”, launched whenever a user was accessing the *i-mode* service (thus facilitating site visits and potentially increasing subscription revenues) – but the process of becoming a partner was long and strenuous, with applications analyzed at DoCoMo's discretion and costly regional tests preceding country-wide roll-outs [29]. At the same time, the competition among official content providers became fierce due to the features of *i-mode* platform: the critical factor, driving customer subscription revenues, was the regularly changing position of a website on *i-mode menu*. Just like handset makers, content providers admitted to the “inner circle” had some confidence that the sole fact of being a preferred partner can generate revenues, but within the circle, they were experiencing

constant competitive pressures, being aware that other companies have similar offering. The importance of being highly ranked on *i-mode menu* cannot be exaggerated: in June 1999, there were 989 official *i-mode* content providers, and 9 months later, 9,337 sites competed for the attention of over 6 million users [30]. Similarly in the software domain, control of specifications for technology layers strengthened DoCoMo's bargaining position. While developing *i-appli* mobile Java platform to allow mobile phones run interactive applications in ways similar to personal computers, DoCoMo modified the technology licensed from Sun Microsystems in order to distinguish between authorized and non-affiliated developers. Detailed technical documentation of all Java classes implemented in new handsets was shared with official partners, as opposed to shortened and incomplete information available on public website, so that altogether only 38 *i-appli* websites were available at the platform's launch in January 2001.

3. 3. Plural governance form

DoCoMo's strategy was based on balancing the inner and outer circles to stimulate innovation and competition among partners. The dichotomy was rooted in Japanese institutional logic, differentiating between *kankei gaisha* (affiliated companies) and *dokuritsu gaisha* (independent companies) [21]. Affiliated companies benefited from experience curve effects, concentrating on continuous improvement and development of new technologies, and enjoying implicit guarantees of renewed orders – unlike in the cases of Western telecom operators, rotating suppliers to emphasize own bargaining power, and thus reducing partners' cost and technological advantages.

DoCoMo's approach eliminated at the same time the major drawback of close, long-term alliances: over-embeddedness, turning companies into “relief organizations” for own partners [15]. Changes in the number and intensity of ties with other organizations are regarded as an important source of influence in inter-organizational relations [31]. Management literature describes the so-called *plural governance form*, when a company pursues simultaneously two or more alternative governance structures, creating competitive tensions among partners and own organization [32, 33]. With several concurrent suppliers, DoCoMo's inner circle maintained high levels of competition on cost and technological features – “they would always remind us that they could go elsewhere if we didn't continuously improve” [21: 57]. This self-reinforcing control mechanism is referred to as *ratcheting effect*, where improvements by one party force all other partners to adjust, thus setting higher requirements [32: 289]. While remaining open to the outer circle, DoCoMo pressured trusted partners to constantly innovate. By setting the example of partners such as Sony and Sharp, promoted to the inner circle thanks to their achievements, DoCoMo motivated also other independent companies to come up with unsolicited innovative ideas. At the same time, the plural governance form facilitated a partner's self-selection [33: 25] by making her aware that joining the trusted circle will be very difficult. Not surprisingly, foreign firms including Motorola, Nokia or Microsoft in the early 2000s decided to refrain from substantial investments in relations with DoCoMo, and several Japanese electronic companies like Kyocera or Casio realized that their partnership prospects are limited, thus focusing on opportunities with DoCoMo's local competitors instead.

Moreover, at times DoCoMo was ready to substitute older generations of partner solutions by commoditizing them, offering at a low price as part of own service, and directing the trusted partners towards new, more promising technologies, so that they still can add value

to DoCoMo's business. DoCoMo's plural governance form can also be interpreted as rooted in the traditional “Confucian dynamism” [20], promoting perseverance and thrift, and similar competitive tensions have recently been observed also in the Japanese automobile industry [34].

Cooperation pattern	Rationale
Open technological platform with proprietary modifications	<ul style="list-style-type: none"> • encouraging newcomers while maintaining control • strategic focus on key, unique resources
Partnerships with companies across the entire value chain	<ul style="list-style-type: none"> • control of solutions for end users • similar governance forms applied to every relation
Commercial and technological preference for trusted partners (inner circle)	<ul style="list-style-type: none"> • promoting competence building and experience curve effects • embeddedness, inducing reciprocal loyalty
Competition among trusted partners	<ul style="list-style-type: none"> • limiting dependence on individual partners • driving innovativeness and cost reduction • avoiding over-embeddedness
Openness to ideas from other companies (outer circle)	<ul style="list-style-type: none"> • stimulating inflow of ideas from domains unexplored by trusted partners • development of new ideas and concepts at the cost of partners
Inhouse R&D related to technologies of complementors	<ul style="list-style-type: none"> • absorptive capacities in partner domains • ability to choose the right partners, set development directions and evaluate performance
Learning alliances with technology leaders	<ul style="list-style-type: none"> • inflow of key innovations from external sources, supplementing inhouse R&D
Substitution of partner products by own solutions	<ul style="list-style-type: none"> • stimulating innovativeness within the inner circle
Gradual institutionalization of relations with trusted partners	<ul style="list-style-type: none"> • long-term cost reduction through process innovations in mature technologies • gradual internalization of partner technologies

Table 1. Characteristics of DoCoMo's plural governance model; source: own

3. 4. Partnership dynamics

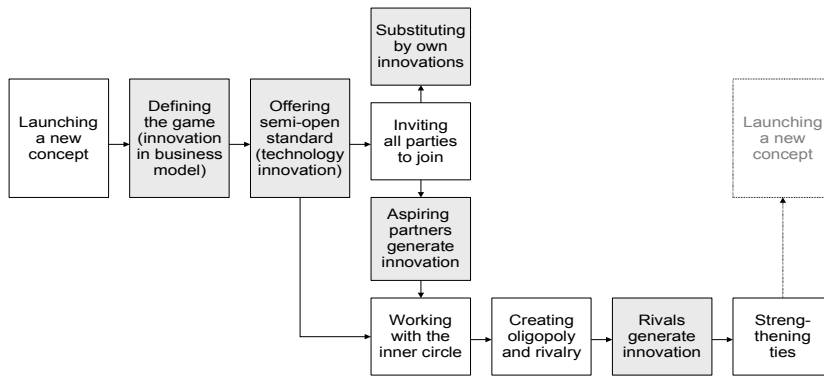


Figure 3. Dynamics of DoCoMo's partner relations;
source: own

DoCoMo's partnerships displayed consistent partner management patterns, used for new concepts or products. As presented by figure 3, the company was starting by defining the "game": setting business rules, and making sure the new area is attractive for partners. This business model innovation was followed by innovative technical designs of future platforms, adjusting widely accepted and open standards by proprietary modifications. Solutions based on these standards were relatively easy to deliver, as necessary skills and knowledge were available within the technical community, yet their proprietary elements made partners dependent on DoCoMo's authorization. In the further process, DoCoMo tried to maintain a balance between openness (inviting all potential providers to generate new solutions without actual reimbursements for their efforts) and close partnerships (working with the inner circle of trusted suppliers, who benefit financially), so that companies not enjoying intimate relationships were motivated to innovate, while official suppliers were competing one against another. For particularly promising markets, DoCoMo was launching own offerings, substituting solutions from partners. Certain trusted partners were also tied more closely by investments and other long-term commitments, including shared ownership of technologies. The model, confirmed for various new products launched by DoCoMo, inherently stimulated innovativeness of multiple parties in the technological ecosystem.

3. 5. Regional differences

In the recent years, Western telecommunication companies changed their partnership models, attempting to imitate the ecosystem of DoCoMo, but their approaches are still rooted in a different mindset, not paying attention to systemic interdependencies in the high-tech value chain. Telecoms are not truly motivated to support businesses of their partners, and outside of Japan, mobile phone manufacturers tend to drive the development of the industry thanks to their brand strengths and technological leads. Not surprisingly, DoCoMo's discussion partners in establishing new standards for the 3rd generation mobile telephony were

Western technology companies, not telecom operators. US and Europe's mobile markets could be presented as complex networks of independent actors, with competition and substitution relations at every level thanks to anti-monopolist regulations and the use of standard mediating technologies [35: 402]. In the U.S. telecom market, only 1% of all alliance agreements in the years 1999-2001 involved content providers, and projects were usually focused on infrastructure [36: 121], not new service development. As opposed to this, DoCoMo's system is streamlined by an asymmetric alliance with the dominant (but not monopolist) telecom operator – some parties are thus probably not able to pursue all of their ambitious goals, but the entire value chain experiences a steady growth and development of innovative products. A recent analysis of governance modes adopted by Western telecoms revealed a contingent division of tasks between telecom providers and partners, depending on the maturity of telecommunication network and services in question [37], while DoCoMo consequently pursued partner-oriented product and service development in various technological contexts.

Observers of the Japanese partnership system, particularly in the automobile industry, often ignored the commercial character of relations, emphasizing their apparent over-embeddedness. According to certain naive interpretations, companies were expected to work together regardless of the actual cooperation costs, solidarily supporting one another within business groups. As opposed to this simplistic interpretation, DoCoMo pursued its partnerships with good strategic justifications, and established a system, involving dynamic rivalry among suppliers based on quality and

innovativeness, where support for other parties was linked to business benefits, and partnerships were lasting because all parties were able to understand their premises. The company was setting its own directions, surely embedded in Japanese institutional logic, but not solely driven by customs or norms, allowing for creativity and strategic intent, which for the traditionalists could look like "significant cracks in the system of mutual obligations" [34: 684].

3. CONCLUSIONS

The paper summarized the characteristics of partner-oriented new product development processes at NTT DoCoMo, revealing their systemic character and social embeddedness. The analyzed case exemplifies potential benefits of complex alliance networks across the high-tech value chain in stimulating innovativeness. Moreover, the model proved not to be specific to the Japanese cultural setting only – a comparison with the practices of Microsoft revealed the existence of similar mechanisms, in spite of different technologies and corporate traditions of both companies. The presented plural governance form with inner and outer circles of partners helps overcome the deficiencies of trusted long-term relationships by introducing competitive pressures and motivating all parties to generate new ideas and products.

Managerial implications of the study include the barriers to direct imitation of individual elements of DoCoMo's business model – they should be regarded as a system of interrelated elements, involving the plural governance form and the long-term maintenance of the inner and outer circles of partners for various high-tech value chain segments. Western telecommunication firms replicated some external attributes of DoCoMo's relations with content providers, including revenue models and technologies, but none of them enjoyed as impressive diffusion of wireless data services as DoCoMo. While rethinking the role of partnerships in new product development at DoCoMo, interested companies should understand that imitating only superficial layers of DoCoMo's model is not sufficient, and consider a more complex benchmarking exercise.

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