



Open versus closed new service development: The influences of project novelty

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ABSTRACT

Open innovation has become a normative model. However, there is relatively little evidence on its efficacy in different contexts or the specific mechanisms needed to support its implementation. In this study we compare the development of two types of service across two contrasting approaches to development. The first approach, could be characterized as the more conventional or closed, whereas the other approach is much more open. The two types of service vary by the degree of novelty. Based upon 52 interviews with those directly involved in the new service development projects, including partners and suppliers, we identify the influences of project novelty on the effectiveness of open approaches to innovation. We find that higher levels of project novelty demand higher intensity of knowledge sharing and communication. In such cases the more closed new service development tends to reduce the development time, but the more open approach improves the variety and quality of innovation. However, rather than the narrow distinction between internal versus external sources, we find that it is the intensity and quality of such relationships which differentiates innovation outcomes, what we refer to as generative interactions.

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1. Introduction

The concept of open innovation is currently popular in the management and policy literature on technology and innovation. However, despite the large volume of empirical work many of the prescriptions being proposed are fairly general, rather than specific to particular contexts and contingencies. As [Huizingh \(2011, p. 9\)](#) argues in his recent review of Open Innovation, “case studies may contrast high and low performing open innovation adopters to increase our understanding of why and how the effectiveness of certain practices is context dependent. We still lack knowledge about how to do it and when to do it.”

However, proponents of open innovation tend to offer universal, and often universally positive, prescriptions, but recent research casts doubts on this view ([Trott and Hartmann, 2009](#)). More specifically, research on product and service innovation suggests that the specific mechanisms and outcomes of open innovation models are very sensitive to context and contingency ([Tidd and Hull, 2006](#)). We would therefore expect the nature of interactions with distributed external actors to be highly context

dependent ([Blindenbach-Driessen and van den Ende, 2006](#)). This is not surprising since the open or closed nature of innovation does not entail a simple shift from closed to open as often suggested in the literature ([Mowery, 2009](#)), but following [Pavitt's \(1984\)](#) taxonomy of sources of innovation we know that patterns of innovation differ fundamentally by sector, firm and strategy. Therefore there is a need to examine the mechanisms that help to generate successful open innovation in specific contexts ([Enkel et al., 2009](#); [Huizingh, 2011](#)). [Fredberg et al. \(2008\)](#) identify aspects open innovation requiring further research, including the locus of the innovation process, the extent of collaboration, and the organizational structures, capabilities and processes required. [Groen and Linton \(2010\)](#) ask for a clearer distinction or relationship between the concept of open innovation and supply chain innovation and management. [Gassmann et al. \(2010\)](#) propose that alliance structures for creating value in open innovation are not well understood, particularly in the service sector, and [Brem and Tidd \(2012\)](#) argue for management prescriptions for open innovation to be more sensitive to industry context and project type.

In this paper we contribute to a shift in the debate from potentially misleading general prescriptions, and provide some empirical insights into the precise mechanisms and potential limitations of open innovation in one particular context, new service development. We identify specific mechanisms that

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generate or restrict innovation, with a particular focus on the intensity and quality of partner and supplier relationships and interactions. In [Section 2](#) we review the literatures on service and open innovation, and discuss the influence of project type on effectiveness. In [Section 3](#) we present our research design and methods, which includes interviews with 52 actors directly involved in four development projects, to reveal the micro- and meso-mechanisms of open, user-centric innovation. [Section 4](#) describes the main findings and identifies the influences of project novelty on the effectiveness of open service innovation. Finally, [Section 5](#) offers some suggestions about the implications of our findings for technology and innovation management and policy, and highlights some avenues for further research.

2. Literature review

2.1. Open versus closed innovation

The original idea of open innovation was that firms should (also) exploit external sources and resources to innovate, a notion that is difficult to contest. However, wider dissemination of this thesis ([Chesbrough, 2003](#)) shows that it is difficult to research and implement ([Chesbrough et al., 2006](#)), to the point it has now become “all things to all people”, lacking explanatory or predictive power ([Tidd and Bessant, 2009](#)). The empirical evidence on the utility of open innovation is limited, and practical prescriptions overly general ([Trott and Hartmann, 2009](#)). Individual case studies are frequently not generalizable, while studies based on the various Community Innovation Surveys ([Laursen and Salter, 2006](#); [Poot et al., 2009](#); [Mention, 2011](#)) provide only simple counts of external sources and partnerships. Thus, they may suffer from survivor bias and also reveal little about the mechanisms of and limitations to open innovation.

The phenomenon of open innovation is not new ([Mowery, 2009](#)) and innovation that exploits external networks through a process of recursive learning and testing is a classic organizational response to the complexity or uncertainty of technology and markets ([Freeman, 1991](#)). Thus, the well-established innovation networks literature potentially can contribute much to the debate on open innovation. Innovation networks are more than an aggregation of bilateral collaborative relationships or dyads ([Belussi and Arcangeli, 1998](#)). Variations in the degree and type of such interaction typically produces dynamic, inherently unpredictable sets of relationships, that make network based innovation fundamentally different from the trial-and-error process found within individual firms ([Bidault and Fischer, 1994](#)).

The open innovation model emphasizes why a firm acquires valuable resources from external firms and shares internal resources for new product/service development. But the question of how a firm sources external knowledge and shares internal knowledge in inter-firm collaboration is less clear. [Vanhaverbeke et al. \(2007\)](#) argue that a firm should develop routines and structures for knowledge transfer in order to access and assimilate valuable resources and facilitate the open innovation process. This means that a firm has to develop routines for knowledge to flow between firms to contribute to new product or service development. Managing different types and degrees of inter-firm relationship with external companies in order to create value, will involve different degrees of openness for innovation purposes ([Van de Vrande et al., 2006](#); [Dittrich and Duysters 2007](#)). Open innovation demands greater attention to the management of knowledge flows, and has to be accompanied by control to coordinate sources and activities that are not owned by the company ([Remneland-Wikhamn et al., 2011](#)), and maintaining the motivation of partners to contribute ([Klioutch and Leker, 2011](#)).

Some studies argue that the concept cannot be separated into a simple dichotomy between open and closed approaches ([Mowery, 2009](#); [Trott and Hartmann, 2009](#)). These suggest that further research should pay more attention to exploring the different degrees and types of openness and the extent to which a firm can benefit from external and internal resource/knowledge in the innovation process. This view provides an opportunity to investigate the use of various collaboration strategies open to a company and the types and contexts of sources of innovation ([Lazzarotti and Manzini, 2009](#)). Recently, some studies have begun to identify different types of openness, for example, [Lichtenthaler \(2008\)](#) defines two dimensions, the extent of external technology acquisition and the extent of external technology exploitation, to investigate a company's behavior in the innovation process. Some characteristics can be used to analyze a firm's conditions, such as more concentrated or dispersed knowledge, different degrees of control and different degrees of trust and reciprocity. [Von Zedtwitz and Gassmann \(2002\)](#) argue that firms need some degree of control, such as formal or informal relationships with partners in order to implement open innovation activities. At the firm level, this suggests that hybrid approaches may be more typical, between a traditional closed model and a fully open model ([Tushman and O'Reilly, 2002](#); [Birkinshaw, 2007](#)), in particular in more mature sectors and markets ([Chesbrough and Crowther, 2006](#)). However, this general “Goldilocks” prescription at the firm-level provides little guidance to management practice at the specific development project-level.

[Van de Vrande et al. \(2006\)](#) examine the choice of governance modes for external technology sourcing with external partners in terms of different degrees of uncertainty. They propose that, under a high level of technological and market uncertainty, less hierarchical governance modes should be adopted. The connection between different types and intensity of inter-firm relationships and development outcome has also been discussed in previous studies (e.g. [Littler et al., 1998](#); [Takeishi, 2001](#); [Von Corswant and Tunalv, 2002](#); [Bstieler, 2006](#); [Fliess and Becker, 2006](#); [Cousins and Lawson, 2007](#)). A few studies have gone further and found that the connection between different inter-firm relations and the development outcome may depend on different degrees of project complexity ([Meyer and Utterback, 1995](#); [Griffin, 1997](#)) and project novelty ([Eisenhardt and Tabrizi, 1995](#); [Ragatz et al., 2002](#)). Accordingly, the connection between inter-firm relationships and development outcome is likely to vary in certain circumstances, such as project complexity and newness.

2.2. Influence of context and contingency

The dominant management research and literature on new product and service development seeks to identify and to promote the notion of “best practice” management and organization (e.g. [Clark and Wheelwright, 1993](#); [Cooper et al, 1999](#)). Much of the best-practice new product development today has been derived from the “lean” approach to product development ([Womack and Jones, 1996](#); [Clark and Fujimoto, 1991](#)), based entirely on practices in the manufacturing sector, principally the car industry. However, the notion that different types of organizational structures and management processes are appropriate for different kinds of tasks dates back to the pioneering work of [Burns and Stalker \(1961\)](#) and [Woodward \(1965\)](#), and the development of the contingency theory. Central to contingency theory is the concept that no single organizational structure is effective in all circumstances. Instead there is an optimal organizational structure that best fits a given contingency, such as size, strategy, task uncertainty or technology ([Donaldson, 1996](#)). Therefore the

better the fit between organization and contingency, the higher the organizational performance (Donaldson, 1999).

More specifically, Lawrence and Lorsch (1967) proposed that the rate of environmental change affected the need for differentiation and integration within an organization, and found support for this in their comparative study of organizational structures in three different sectors. Similarly, Galbraith (1977) argued that as task uncertainty increases, more information must be processed, which in turn influences the control and communication structures. A common theme of such work is that activities that are unpredictable or uncertain require relatively more interpersonal methods of coordination and control than mechanistic–bureaucratic methods. A review of 21 innovation research projects concludes “environmental uncertainty influences both the magnitude and the nature of innovation (which) suggests that future research should adopt environmentally sensitive theories of organizational innovation by explicitly controlling for the degree and the nature of environmental uncertainty” (Damanpour, 1996). In particular, perceptions of environmental uncertainty appear to affect the organization and management of new product development (Hauptman and Hirji, 1999; Souder et al., 1998).

Uncertainty is difficult to operationalize, so prior research has tended to examine either project complexity, assessed in terms of the number of tasks, functions or interactions involved, or project novelty, in terms of the newness of components or functions. Emmanuelides (1993) found that projects with a high level of technological complexity need more information to be processed between functions and therefore can increase development time. Previous studies also have similar arguments that greater project complexity increases development time (Meyer and Utterback, 1995; Griffin, 1997). This is because a complex task has many steps to complete and requires a great many connections between the different functions. The carrying out of a complex task requires the use and integration of different information, thus, increasing development time. Ragatz et al. (2002) propose that a high degree of technological uncertainty could hamper the outcome of product development as measured by cycle time, cost and quality.

Similarly, Moenaert et al. (1995) argue that a high degree of newness makes it difficult to reduce technological uncertainty and may lead to inefficient project development. This is because the project team must consider more design alternatives, new development processes and the new technology required for undertaking a new project. Therefore the development of more novel products is associated with greater use of heavyweight project management and cross functional teams (Tidd and Bodley, 2002; Hales and Tidd, 2009). In the more specific case of new service development, more novel projects are characterized by more dense communications and the co-location of different functions and suppliers (Tidd and Hull, 2006).

In order to reduce the technological uncertainty of a new development project, firms may seek closer relationships with their suppliers to pool their technological information (Auster, 1992; Hagedoorn and Narula, 1996). Petersen et al. (2003) propose that a firm should integrate suppliers depending on the degree of technological uncertainty. Nylén (2007) also argues that the impact of the intensity of collaboration on effectiveness will depend on the characteristics of the development task. When the development task is simple and sequential, a lower intensity of collaboration is sufficient, but more complex or iterative tasks demand more intensive collaboration. Nylén (2007) also shows that a higher degree of intensity leads to a higher level of innovation outcome because of the closer interactions between functions and professionals. The degree of newness determines how much information must be gathered from the standpoint of

information processing view (Verworn, 2009). Open innovation may be even more relevant in turbulent environments. A recent study found that supplier integration is more important when technological turbulence is high, whilst customer integration more critical in environments characterized by high market turbulence (Schweitzer et al., 2011). However, Mention (2011), using Community Innovation Survey data on service firms, found that co-operation had neither a positive nor a significant influence on innovation novelty, but concludes that “the finding on the negligible role of co-operation with suppliers and customers on innovation novelty is in contradiction with prior literature and is counter-intuitive”. Therefore we hypothesize that the relationship between the intensity of supplier integration and development outcome may vary with different degrees of project newness.

Hypothesis 1. More novel development projects are associated with higher levels of interaction with existing suppliers to communicate the requirements of more novel inputs.

Hypothesis 2. More novel development projects are associated with higher interaction with additional suppliers and new partners to expand the scope and function of new services.

Nylén (2007) argues that “intensity” is an important aspect that can be examined to understand the degree of interaction among partners. Fliess and Becker (2006) identify several possible types of cooperation design which can be distinguished according to the different type and intensity of the contractual relationship. The intensity of cooperation between firms ranges from internal development, know-how exchange, which has a lower intensity of cooperation, to coordinated development, joint development and contractual joint ventures, which have a higher intensity of cooperation. Bahemia and Squire (2010) found the depth of a relationship, variety of partners and the balance between new and longstanding relationships as critical dimensions that will depend on the degree of innovativeness of a project.

Firms use a range of inter-organizational routines to share and exchange knowledge such as regular meetings, visits, telephoning and peer-to-peer discussion for sharing knowledge (Dyer and Nobeoka, 2000; Mante and Sydow, 2007; Hales and Tidd, 2009). Additionally, these different mechanisms possess different degrees of information richness for transferring knowledge between firms (Daft et al., 1987; Sheer and Chen, 2004). When a mechanism has more attributes, including feedback capability, language variety, availability of multiple cues and personal focus, it can be identified as higher in information richness and having greater capacity to transfer knowledge.

Hypothesis 3. More novel development projects are associated with mechanisms with a higher degree of information richness to exchange and share knowledge with suppliers and partners, such as project meeting and/or peer-to-peer discussion (e.g. the IT system supplier and logistics).

The process of supplier integration has been extensively studied, particularly in operations and production management, but in the case of new product development still warrants further research (Petersen et al., 2003, 2005), in particular to reveal the relationships between this more established body of research and the more recent work on open innovation (Groen and Linton, 2010; Brem and Tidd, 2012). Moreover, much of the work on supplier integration has been conducted in the manufacturing sector, rather than services (Tidd and Hull, 2006; Gassmann et al., 2010), and open innovation more in high-technology cases than more typical mature sectors (Chesbrough and Crowther, 2006). For these reasons, we examine the role of suppliers in the development of new services in the retail sector, and how project

novelty influences the intensity of relationships and richness of knowledge exchange.

3. Sample and methodology

The context of the study is new service development in chain convenience stores in Taiwan. This sector was chosen because research on open innovation in the service sector is rare compared to high technology or manufacturing industries, but new service development typically demands the integration of many external actors (Tidd and Hull, 2006). In Taiwan, convenience stores provide a range of services, including retail banking, and payment of government and utility services. Competition is significant, and many new services involve innovation integrating IT, commerce and logistics with suppliers and partners. Table 1 provides details of the firms and groups studied, and Table 2 their key suppliers and partners in the development projects. The simple binary distinctions between internal versus external, closed versus open and supplier versus partner are complicated by the group and affiliate structure of the companies. However, we followed Fliess and Becker (2006) to determine whether a company was classified as a supplier or a partner during development of the new service. We adopted a classification of intensity of inter-firm collaboration based on Fliess and Becker's (2006) research and incorporate the classification of coordinated development from Petersen et al. (2005). Three important forms of inter-firm cooperation were examined, i.e. contract development, coordinated development and joint development (Nylen, 2007). This provides a richer and more nuanced dimensional assessment than simple counts of numbers of external sources or partners adopted by survey approaches (Laursen and Salter, 2006; Poot et al., 2009).

3.1. Research design and case selection

The study consisted of a set of comparative case studies. First, two contrasting groups of firms were identified: one group was essentially closed, in the sense that for new service development it relied on internal resources and wholly-owned subsidiary companies. This we will refer to as group "C"; the other group used a wider range of independent suppliers and partners to help develop service innovations. This we refer to as group "O". Together these groups of firms accounted for just over 95% of the total market in Taiwan.

Secondly, for each group of firms we examined the development of two different services, one significantly more novel than the other. The more novel service innovation was a multi-media kiosk (MMK), which required the development of new hardware and software, new customer interfaces, payment systems and integration of business modules from third party content providers. The more routine innovation was an on-line shopping service with pick up at the local store (OLP), which involved mainly incremental logistical developments.

Table 1
Case study groups and firms.

Company	President chain store	Family mart	Kuang Chuan group	Feng Chun group
Allocated group	O=open		C=closed	
Number of stores in Taiwan	4,800	2,324	1,236	824
Market share (%)	52	25	14	9
Interviews with parent or suppliers	13	14	13	12

This cross-case research design allowed us to contrast and compare two dimensions: open versus more closed development processes; and the development of novel versus more incremental service innovations.

3.2. Methods

Information was collected by examining development documentation and by semi-structured interviews of those directly involved in the development of the new services, including suppliers and third-party contractors. In total 52 interviews were conducted. These were transcribed and translated, and then analyzed using thematic coding to help to identify patterns and relationships (Gibbs, 2008). Construct validity is particularly important in qualitative research, so the operationalization of key concepts was based upon prior studies (Table 3). Internal validity was improved by cross-checking documentation and interviews, and comparing the interpretations of two different researchers. Researcher interpretations were further externally validated and checked with key respondents to ensure fidelity and reliability (Bryman and Bell, 2007). However, we do not make any claims of or test for generalizability of these relationships beyond these specific cases and context (Pratt, 2009).

To assess the degree of openness, we adopt a classification of intensity of inter-firm collaboration based on Fliess and Becker's (2006) research and incorporate the classification of coordinated development from Petersen et al. (2005). Three important forms of inter-firm cooperation were examined, i.e. contract development, coordinated development and joint development (Nylen, 2007). This provides a richer and more nuanced dimensional assessment than simple counts of numbers of external sources or partners adopted by survey approaches (Laursen and Salter, 2006; Poot et al., 2009).

The assessment of the degree of novelty was based upon the number of new inputs, components and functions necessary for development and delivery. The online shopping with pick-up at store service mainly uses the existing distribution system and IT systems of convenience store chains and integrates from external firms a different IT system, which transfers information. This service development integrates different functional actors (namely, convenience store chains, IT system suppliers, self-owned distribution companies, third party distribution companies and e-shops) to contribute this service development and provide consumers with another way to collect their orders from e-shops. In this service development the degree of complexity is higher. In contrast, the MMK service involved the convenience store chains in developing an IT platform and hardware and connecting it with an existing IT system (e.g. the POS system). This service development mainly focuses on connecting convenience store chains and service content companies by an IT system for transferring information. In order to enrich the service content of the kiosk, convenience store chains have to invite different service content companies (e.g. web-based and catalog shopping service content companies) to join this service and connect the two IT systems. The degree of novelty is higher in this development.

The intensity of cooperation between firms was assessed according to the different type and intensity of the contractual relationship, ranging from internal development, know-how exchange, which has a lower intensity of cooperation, to coordinated development, joint development and contractual joint ventures, which have a higher intensity of cooperation (Fliess and Becker, 2006). To assess the degree of knowledge transfer, we focus on the mechanisms used and richness of interaction. Firms used a range of inter-organizational routines such as regular meetings, visits, telephoning and peer-to-peer discussion for sharing knowledge (Dyer and Nobeoka, 2000; Mante and Sydow, 2007). Additionally, these

Table 2
Key suppliers and partners in the four development projects.

Group C	Group O
<i>Online shopping with pick up at store service (OLP service)</i>	
1. IT function Developed by internal department, then outsourced to two affiliated companies (2 companies).	1. IT function Outsourced to a partner firm for IT system development (1 company)
2. Logistic function Affiliate logistic company (1 company), and two third-party logistic companies (2 suppliers).	2. Logistic function Outsourced to one partner distribution company and then further outsourced to 2 distribution companies (2 affiliates). In addition three third-party partner logistic companies (3 supplier firms)
3. Marketing function Developed by internal department, then outsourced to an affiliated company.	3. Marketing function Member companies (4 companies) formed a joint venture company to develop the service
4. Channel function Convenience store chain (1 internal company)	4. Channel function Convenience store chain (3 member companies)
5. Product supplier Multiple independent e-shops. Group C	5. Product supplier Multiple independent e-shops Group O
<i>Multiple Media Kiosk (MMK) service development</i>	
1. IT function Developed by internal IT department.	1. IT and Marketing functions Outsourced service development to two external partner firms which coordinated with a hardware supplier-manufacturing company to develop the service (2 partners, 1 supplier).
2. Marketing function Internal cross-functional team.	2. Hardware manufacturing Developed by a single external partner firm.
3. Hardware manufacturing Developed by a single external partner firm.	3. Channel function Convenience store chain (1 company)
4. Channel function Convenience store chain members (2 companies)	4. Content Provider Multiple independent service content companies.
5. Content provider Multiple independent service content companies.	
Totals counts for group C: Internal departments 7 Affiliate companies 4 External suppliers 2 External partners 1 (excluding content providers)	Totals counts for group O: Internal departments 4 (+4 via new joint venture) Affiliate companies 2 External suppliers 4 External partners 5 (excluding content providers)

Table 3
Key constructs and operationalization of concepts.

Construct or concept	Operational indicators	Use in prior research
Openness of organization	Location and control of knowledge; number and formality of external relations Extent of external technology acquisition and exploitation	Birkinshaw (2007), Lichtenthaler (2008).
Novelty of innovation	Change of service concept, interface, process or delivery	Tether and Metcalfe, (2004); Den Hertog and Bilderbeek (1999); Forfas (2006)
Intensity of interaction	Radical, re-combinant, incremental or improvement Contractual, coordinated or joint development White, gray or black box or systems cooperation information richness	Gallouj and Weinstein (1997) and Fasnacht, (2009). Fliess and Becker (2006), Nylen (2007), Gorovaia and Windsperger (2010), Sheer and Chen (2004)
Knowledge transfer mechanisms	Peer-to-peer project meetings and supplier visits Cross-functional groups specifications and documentation	Dyer and Hatch (2006), Mante and Sydow (2007), Hales and Tidd (2009)

different mechanisms possess different degrees of information richness for transferring knowledge between firms (Daft et al., 1987; Sheer and Chen, 2004). When a mechanism has more attributes, including feedback capability, language variety, availability of multiple cues and personal focus, it can be identified as higher in information richness and having greater capacity to transfer knowledge.

4. Main findings

4.1. Open versus closed

We found that the simple dichotomy between open and closed approaches to new service development was more difficult to

identify in practice than the conceptual and survey-based literature would suggest. In new service development both groups of firms relied upon an extensive range of internal and external sources and organizations. Therefore a more relevant distinction would be the intensity and quality of these external relationships, and their capacity to influence project outcomes. Table 4 compares and contrasts the practices across the two groups of firms and two types of development project.

Both groups adopted a lower degree of intensity (e.g. contract development) in their inter-firm collaboration with some suppliers, such as e-shops and some of the service content companies. Coordination meetings were typically used with suppliers to define the task to be done and the specifications to follow, leading to contractual relationships for services or content. However, for some critical functions, such as IT or logistics integration, a higher degree

of intensity of inter-firm collaboration was adopted, leading to coordinated development or systems partnerships with suppliers.

A manager from one of the third party distribution companies for the development of the OLP service for company O said:

“Our company cooperated and helped them to invite e-shops to join this service, provide a logistics service and manage them. Our company helps them in forward integration which provided a total logistics service to the e-shops and delivered goods from them to the convenience store’s self-owned distribution companies.”

In contrast, company C adopted a hierarchical contractual relationship with its suppliers during development:

“The cooperation between our company and partner firm is simpler than coordinated development because there is no problem of system integration. The speed of developing new services tended to increase because our company designed specifications for partner firms to develop and directly connect with our system.”

An advantage of this more formal closed approach was a reduction in the interaction with suppliers during development, which compared to the more open approach, reduced development time.

4.2. Influences of project novelty

We found support for Hypothesis 1, that more novel development projects demand higher levels of interaction with existing suppliers to communicate. Comparing the intensity of interactions across the two projects reveal significant differences, the more novel MMK project required higher intensity interactions such as systems partnership and gray-box coordinated development.

For the more novel MMK development projects, the convenience stores provided an IT platform (kiosk) and identified different business modules to cooperate with the various service content companies in order to expand the scope of the MMK service. Depending upon the degree of newness in different

business modules, the companies used a higher intensity of inter-firm collaboration with some of the service content suppliers because they had to mutually adjust their IT systems to develop a new business module for the kiosk. For the development of the more novel MMK service, a marketing manager from one of the companies in group C adopted a hierarchical contractual relationship with suppliers:

“Our company developed a software system, hardware and business modules by ourselves. The specification of hardware was designed by our company and outsourced to hardware manufacturer to produce kiosk. But our company relied on some of the cooperators such as banks to release their resources to develop new business modules.”

Another convenience store chain company from group C used a similar approach to developing the MMK modules:

“our company used contract development with the service content companies, they simply followed the specifications that our company gave for connecting the systems. The new services were developed more quickly.”

A developer from one of the service content companies confirmed the nature of this relationship with group C:

“Our company cooperated with the convenience stores by contract development. The contract development mode reduced the development time because our company did not have to spend too much time developing the interface and communicating with them. Our company just followed its specifications and requirements to develop it.”

In one extreme case, one of the convenience store chain companies within the more closed group C did not directly cooperate with any service content providers for new module development. Instead it relied entirely on external partners to develop new modules. However, following a regional test of the new MMK service the company was forced to suspend the service

Table 4
Constructs and concepts by company group and development project.

	Degree of openness of project	Novelty of project	Intensity of interaction	Richness of knowledge-sharing mechanisms
Group C, OLP project	3 Internal departments 3 Affiliate companies 2 External suppliers 0 External partners	Incremental, change of customer interface, via independent e-shop portals. Integration of existing and third-party IT, distribution and logistics	<ul style="list-style-type: none"> • Internal project team • Joint development with affiliated companies • Contract specification with group owned distribution company 	Internal cross-functional meetings Supplier Specifications
Group O, OLP project	3 Internal departments 2 Affiliate companies 3 External suppliers 2 External partners 1 joint venture (4 companies)	Incremental, change of customer interface, via independent e-shop portals Integration of existing and third-party IT, distribution and logistics	<ul style="list-style-type: none"> • Joint venture company established • Systems partnership with external IT company • Contract development with third party distributors 	Functional peer to peer project meetings with suppliers and partners Shared supplier and partner documentation
Group C, MMK project	3 Internal departments 0 Affiliate companies 0 External suppliers 1 External partner	Radical, change of service concept, interface, service mix and delivery	<ul style="list-style-type: none"> • Internal development of service concept • Black-box specified development with hardware and IT suppliers • Contract development with content providers 	Cross-functional meetings Supplier documentation
Group O, MMK project	1 Internal department 0 Affiliate companies 1 External supplier 3 External partners	Radical, change of service concept, interface, service mix and delivery	<ul style="list-style-type: none"> • Systems partnership for service concept development • Gray-box coordinated development with hardware and IT partners • Gray-box coordinated development with content providers 	Cross-functional project meetings with partners Peer-to-peer functional meetings with supplier

roll-out for two years because it offered too few services and service integration was inadequate. This may illustrate the difference between a pure out-sourcing model and the more intense collaborative co-development relationship adopted by the companies in group O. In contrast a project manager for MMK development from Company O described how their relationship with suppliers depended on the novelty of the development project:

“The different levels of intensity of inter-firm collaboration influence the speed of new service development in terms of the degree of newness in different business modules. Our company categorized different business modules and, in the first instance, spent much time on development with a supplier through coordinated development in order to identify the IT requirements and restrictions of the business module. After that, any similar content companies just used contract development and followed the existing specifications to develop it. This speeded up the process of developing new services.”

This provides only partial support for *Hypothesis 2*, that more novel development projects are associated with interaction with additional suppliers and new partners to expand the scope and function of new services. Turning to *Hypothesis 3*, we do find support that the quality or richness of knowledge-sharing and exchange within such relations is also an influential factor. The choice of knowledge transfer mechanism was influenced strongly by the degree of project newness. The degree of newness determined how much information had to be gathered in a new project development from the standpoint of information processing view (Verworn, 2009). A task with more new elements required the collection of richer information from different individuals and organizations. Thus, a higher degree of information richness of knowledge transfer mechanism (e.g. project or peer to peer meetings) was adopted when the degree of project newness was higher. For the more novel MMK, we did observe a higher degree of information richness in the exchange and sharing of knowledge with suppliers and partners (*Hypothesis 3*), such as face to face project meetings and peer-to-peer functional interaction (e.g. the IT system supplier and logistics). For example, the marketing manager of Company O confirmed the following approach:

“Our company used project meetings with partner firms (once or twice a week) to discuss user-interface design, consumer’s opinions and feedback and development requirements. Partner firms also provided specifications and an operation manual to our company in order to connect the two IT systems and train store staff to operate this service.”

“Our partners played a central role in developing the MMK service. Our company just provided space and staff to help consumers use this service. Our company signed a contract with them after we defined the rights and responsibilities of both sides. Our company co-developed with them when they connected with our system.”

This account is consistent with the view of the MMK hardware supplier for O:

“Our company set up a team (five or six people) to develop hardware with Company O. We used project meetings (three or four times a week) to discuss and confirm the hardware specifications based on different considerations such as development cost and modularization. We also shared technological documentation with Company O in order to be clear about and confirm its requirements.”

Company O typically used project meetings or peer-to-peer discussion with their IT system suppliers and logistic companies to discuss service requirements and to transform these into different functional requirements when they wanted to develop their service operation procedure and specifications and to connect the systems used by different actors.

In contrast, for the lower novelty OLP project, Company O adopted less rich knowledge-sharing and transfer mechanisms, such as documentation and contracts: “we used web-based documentation and presented these in different formats for use by different actors, such as the logistics, e-shops and store chains”. The joint-venture company formed by O also adopted standard specifications and contracts for third-party distribution and independent e-shops. In this respect, for the low novelty projects, the practices of Company O and C were closer than those for the more novel projects.

In simplistic terms both approaches could be categorized as being open, as they both rely on external actors, but clearly the development processes and intensity of relationship are very different. In *Table 4*, the column headed “degree of openness” compares the number and types of actor, but reveals only relatively minor differences between groups and project types. The column headed “intensity of interaction” provides information on the structure of the relationships, and identifies more significant differences in practices. The final column “richness of knowledge-sharing” provides evidence of a diversity of mechanisms used within these collaborative structures. This suggests that the number and type of external relations, the most common indicators used by survey-based studies, do not fully-capture differences between open and closed development practices. In addition, we need to understand the intensity of interactions and richness of knowledge-sharing mechanisms. This strengthens our argument that a simple distinction between closed and open innovation is unhelpful, and is insufficient to guide management research or practice.

5. Discussion and conclusions

In this paper we believe that we have made two contributions to a better understanding of the practices and limitations of open innovation. First, the novelty of development projects can influence the practices adopted, which demonstrates that open innovation is not a universal best-practice. Second, simple counts of external sources or partners do not capture the variety of practices within open innovation, in particular the role of intensity of interactions and richness of mechanisms for knowledge-sharing.

We expected to find a more significant contrast between the open and more closed approaches to a new service development, and moreover that the relevance of these approaches would be influenced by the novelty of the project. Our selection of contrasting groups of firms was designed, *ex ante*, to reveal such differences. To some extent our expectations were confirmed by the empirical evidence, but in other respects other factors appeared to be even more important. We found that higher levels of project novelty are associated with a higher intensity of interaction between actors and the use of more rich mechanisms for knowledge-sharing. This suggests that open innovation is not a universal prescription, but may be more relevant to more novel development projects. Moreover, it demonstrates that simple counts of external sources and types of external innovation do not fully capture open innovation practices, as favored by survey-based studies such as Laursen and Salter (2006), Poot et al. (2009) and Mention (2011).

For the more routine or incremental service development, OLP, there was less contrast between the closed and open approaches.

Both resulted in incremental service innovation outcomes, although the closed approach required less intensive interaction and communication with external organizations, which in turn resulted in a higher control of project specification and reduced development time to a little extent. However, for the more novel service innovation, the MMK, the contrast between closed and open approaches was more evident. The service outcomes were similar, but the approaches adopted were very much different. The open approach to the more novel development project was characterized by less control of specifications and suppliers, but a higher intensity of interactions with partners and third-party suppliers, and richer knowledge-sharing mechanisms than the closed case, consistent with Verworn (2009). This suggests that open innovation does not necessarily represent best-practice, but instead depends upon the characteristics of the context and contingencies, such as the novelty of the project (Tidd and Hull, 2006; Trott and Hartmann, 2009).

Moreover, the distinction between open and closed development processes cannot simply be assessed in terms of the number or variety of external sources or partners, but also requires consideration of the qualitative nature of these external linkages, in terms of the intensity of interactions and richness of mechanisms for knowledge-sharing. This is more than passive absorptive capacity, but an active capability that involves the interaction of actors to generate solutions and innovations (Paulraj et al., 2008). Lane and Maxfield (1996) suggest that successful innovative collaborations result from situations where two organizations with different perspectives and capabilities share commitment to a common direction, interact in a recurring manner and value, and monitor and nurture their relationship. Such generative relationships can “induce changes in the way participants see their world and act in it and...give rise to new entities, like agents, artifacts, and even institutions” (Lane and Maxfield, 1996: 216). Importantly, Lane and Maxfield emphasize that the precise nature of the benefits deriving from generative relationships cannot be anticipated. Swan and Scarborough (2005) refer to generative interactions to describe situations involving successful innovation in which knowledge integration is facilitated by network co-ordination. Such high intensity knowledge-rich interactions appear most relevant where complex, tacit knowledge needs to be exchanged (Colombo et al., 2011).

This contributes to the recent and growing evidence that it is this generative potential of such relationships that is a critical condition for the success of open innovation (Hopkins et al., 2011; Remneland-Wilkhamm et al., 2011), rather than the use of open innovation or external sources *per se*. Indeed, our study confirms that traditional internal knowledge routines and capabilities, such as cross-disciplinary working and complementary assets, in combination with external knowledge networks and partnerships, can promote such generative interactions (Schleimer and Shulman, 2011). This active interaction is very different to simply out-sourcing development or importing external knowledge, or passive absorptive capacity as traditionally conceptualized. An obvious implication of this is that open forms of innovation are not a substitute for building internal capabilities, but rather act as valuable complementary capabilities (Caloghirou et al., 2004; Knudsen and Mortensen, 2011). Therefore a better understanding of the mechanisms that contribute to generative interactions and outcomes will result in more precise prescriptions for open innovation (Huizingh, 2011).

An important limitation of this research is the generalizability of its findings. This is because it studied only two selected services in the retail industry in Taiwan. In order to improve its generalizability, this research should be replicated in different sectors and other national contexts. Moreover, this research infers the processes of new service development by interviews and

examining documentation, *ex post*. Such detailed interactions are better studied through a real-time longitudinal research design which allows the regular episodic observation of authentic interactions between individuals engaged in developing a new service over an extended period of time (Hales and Tidd, 2009; Whyte et al., 2008). Further research is still necessary to identify the relationships and interactions which contribute to open innovation, and also under what conditions these influence innovation outcomes (Trott and Hartmann, 2009). However, we believe that this paper has demonstrated the benefits of closer integration of established research on supply-chain innovation (Groen and Linton, 2010) and more modal research on open innovation (Brem and Tidd, 2012), to help to create new research agenda and insights.

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