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Unfolding coopetition practices in a network: A resource interaction perspective

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Introduction

Coopetition, the paradoxical mix of cooperation and competition, has received increased attention among scholars and practitioners (Bengtsson and Kock, 2014; Brandenburger and Nalebuff, 1996; Chen, 2008; Gnyawali and Park, 2011). Past research has revealed that coopetition takes place within interfirm or inter-organisational relationships that are entangled with cooperative and competitive interactions (Bengtsson et al., 2010; Bengtsson and Kock, 2000), which in turn produce a varied degree of coopetitive intensity (Luo, 2007) and have different level of impact on business interaction spanning from a single dyad to a net or network (Fernandez et al., 2014; Peng and Bourne, 2009). Among different types of strategic actions, coopetition is an important strategic means because it enables firms not only to pursue value-creating and innovation purposes (Gnyawali and Park, 2011; Ritala and Hurmelinna-Laukkanen, 2009; von Hippel, 1987), but also create and sustain business opportunities (Bengtsson and Johansson, 2014), and enhance their performance (Peng et al., 2012). Although coopetition can be seen as the result of interaction between organisations that are embedded in wider social practices, few findings are reported with regard to the practices of coopetition.

In order to investigate how coopetition is practiced in an interactive and network context, this research departs from the IMP (Industrial Marketing and Purchasing) Group's resource interaction perspective (or the 4R model) and integrates it with coopetition literature to develop a theoretical framework. The resource interaction perspective is adopted because of its usefulness in explaining inter-organisational interaction in a network-like environment that is characterised by resource heterogeneity (Baraldi et al., 2012; Håkansson and Waluszewski, 2002). Additionally, the 4R model, which focuses on the dynamic interplay between organisational units, inter-organisational relationships, products and facilities, can be seen as part of strategy as practice because of its emphasis on utilisation of resources by human entities, rather than simply possessing them (Baraldi et al., 2007; Jarzabkowski, 2005; Johnson et al., 2003). That is, the 4R model facilitates the study of coopetition practices that result from the interaction between human (e.g. organisational units) and non-human (e.g. facilities) resources.

Our research question regarding coopetition practices was explored in a single case study that purposefully chooses the public transportation system of the Kaohsiung City

(the second largest city in Taiwan) as the research setting. Within this setting, we investigated the coopetition practices between GD-bus (a private bus operator) and the Kaohsiung Rapid Transit Corporation (KRTC, the metro company in Kaohsiung) by paying special attention to their resource interaction with other actors, including Transportation Bureau, Kaohsiung City Government (TBKC) and iPASS Corporation (an issuer of transportation electronic tickets). These actors formed a unique interaction and network context for the case study.

Addressing the above research question contributes to the existing knowledge in the following manners. First, it broadens our knowledge of coopetition from a practice perspective that focuses on resource interaction. Extant literature tends to study coopetition by looking at "activities" performed by the interacting parties that respectively lead to competitive and cooperative interactions within a coopetitive relationship (Bengtsson et al., 2010), leaving the role of resources in driving coopetition less researched. From the IMP's perspective, problem-coping organisations have to be engaged in interactions with other parties via relationships that combine and connect each other's resources and activities (Håkansson and Snehota, 1995); that is, activities and resources are equally important. Johnson et al. (2003) also call for more attention on dynamic utilisation of resources in order to understand the practice (doing) of strategy. Second, this research enhances our understanding of coopetition based on a network level analysis. Although some studies investigate coopetition using a network perspective (Fernandez et al., 2014; Peng and Bourne, 2009), our understanding in this area of research remains constrained, particularly with regard to the influences that originate from the practices among connected actors.

This research also makes a contribution to the research stream of strategy as practice by employing the IMP's resource interaction to look at a particular type of strategy (that is, coopetition). This research explicitly addresses one of the promising areas raised by Jarzabkowski and Spee (2009): the extra-organizational aggregators and macro-praxis (p. 80). In this research, coopetition practices are studied in an institutional field (Whittington, 2007), in which TBKC's transportation policies and iPASS Corporation's technology play a key role in driving coopetitive behaviours. This study also highlights the importance of non-human entities in the doing of strategy (Orlikowski and Scott, 2008; Vaara and Whittington, 2012). In other words, this research contributes by gaining "understanding particular types of strategy and strategy resources as institutionalized practices, as well as how these practices emerge, evolve and are modified through interaction between multiple actors" (Jarzabkowski and Spee, 2009, p. 80).

This paper continues as follows. We firstly provide our theoretical framework that draws a linkage between the IMP's resource interaction and coopetition literature. We then rationalize our methodological approach. Prior to the discussion of our theoretical and managerial implications, we illustrate our theoretical framework by presenting our case findings.

Theoretical framework

Resource interaction as part of strategy practice

The theoretical foundation of the IMP's resource interaction has its roots in the interaction approach (Håkansson, 1982) and the actor-resource-activity (ARA) model (Håkansson and Snehota, 1995), both of which are grounded in Penrose's (1959) resource heterogeneity. While the interaction approach focuses on the engagement of two active actors in interaction episodes within a relationship that result in economic exchanges, the ARA model pays special attention to the function of relationships that ties and connects the interacting parties' resources and activities, within which individual and collective goals are pursued through adaptive and coordinative manners (Brennan et al., 2003; Wilkinson and Young, 2002). With this heritage of interaction and networks structured by relationships, Håkansson and Waluszewski (2002) drew on their longitudinal investigation of innovation networks and developed the model of resource interaction that distinguished four types of resources: products, facilities, organisational units and inter-organisational relationships. Baraldi et al. (2012) point out that resources are multi-faced and their features only can be activated in interaction with other resources spanning organisational boundaries. As a result, the value of a resource is interaction-dependent in a network context that is characterised by systematic combining of resources (Gadde and Håkansson, 2008).

The IMP's resource interaction has strategic relevance because it shares key aspects with the resource-based perspectives in strategic management. Although the seminal work by Barney (1991) is influential and has shifted our attention to the firm's internal resources for the attainment of competitive advantage, the latter work, including Dyer and Singh (1998), Lavie (2006) and Wassmer and Dussauge (2011), indicate that merely controlling important resources within the firm is not enough for gaining competitive advantage; instead, resources need to be combined by developing relationships or alliances in order to benefit from network resources. Such a relational turn accords to the IMP's tradition that resources are used *in relation to* others (Baraldi

et al., 2007; Håkansson and Snehota, 1995). The IMP's central notion of resources' interactive nature is supported by Sirmon et al. (2011) who stress that the creation of competitive advantage lies in how resources are deployed, orchestrated and used across firm boundaries. Through adequate management of resource interaction, a firm is able to cope with the changing environment, such as technological change (Chou and Zolkiewski, 2012), or develop innovations (Rusanen et al., 2014).

The above discussion leads us to argue that the IMP's notion of resource interaction can be seen as part of strategy practice. As Johnson et al. (2003) advocate, the importance of resources lies not in their being held within the firm but in their being used in actions. This school of strategy as practice is concerned with doing of strategy (Jarzabkowski and Spee, 2009; Jarzabkowski and Whittington, 2008), which is reflected in its interest in capturing incremental and emergent properties of actions. Similarly, the IMP's resource interaction view pays particular attention to interaction processes where resources are combined and recombined within and across organisational boundaries, resulting in the creation of value (Chou and Zolkiewski, 2012; Gadde and Håkansson, 2008). In addition, the IMP's resource interaction theoretically places equal emphasis on non-human (products and facilities) and human (organisational units and inter-organisational relationships) resources. The emphasis on the interrelatedness between non-human and human resources has been a central interest of research in the area of strategy as practice that aims at practice-based understanding of doing strategy in a wider social context (Orlikowski and Scott, 2008; Vaara and Whittington, 2012).

Coopetition as a strategic action

There has been a surge of research in coopetition that concentrates on the concurrent combination of cooperation and competition within the same relationship (Bengtsson and Kock, 2014). The management of coopetition is crucially important but remains difficult because the firm has to confront two contradictory logics (Chen, 2008; Fernandez et al., 2014); in which a cooperative logic aims to "generate benefits which are shared by the alliance partners" while a competitive logic attempts to "determine how these collective benefits are split between the partners" (Lavie, 2009, p. 28). A good illustration of coopetition practice is the simultaneous coopetition between Sony Corporation and Samsung Electrics who established a joint venture (called S-LCD) to produce LCD (liquid crystal display) panels for flat screen TVs, and at the same time, they strove to capture their respective LCD TV market shares through marketing activities; consequently their coopetition resulted in LCD technology's triumph over PDP (plasma display panel) technology as the dominant technology and both Samsung

and Sony became the leaders in the LCD TV market (Gnyawali and Park, 2011). This example also exhibits that the effects of coopetition could spread from a single dyad to the industry. Recently, more attention has been given to the study of coopetition at a network level (Fernandez et al., 2014; Peng and Bourne, 2009), showing the impact of different network structures on coopetition outcomes.

Coopetition is treated as a new paradigm of research (Bengtsson et al., 2010), and a new form of interfirm dynamics for competitive advantage (Dagnino, 2009), which moves beyond the conventional view of strategy that sees cooperation and competition as separate and opposing forces. However, extant literature tends to look at the positive outcomes of coopetition, such as innovation (Gnyawali and Park, 2009; Ritala and Hurmelinna-Laukkanen, 2009) and enhanced performance (Peng et al., 2012). Toward this deficiency in knowledge, Padula and Dagnino (2007) discuss the limitations of the cooperative paradigm and criticize its tendency to only consider the positive outcomes of cooperation, suggesting that the negative interdependencies that competition brings also need consideration. This is because the actors involved only have partially convergent objectives/interests and end up trading off competitive and collaborative issues. This often results in the need to manage the resultant tensions on a number of different levels (Fernandez et al., 2014).

Additionally, despite the fact that coopetition is regarded as a strategic means to gain firm competitiveness (Brandenburger and Nalebuff, 1996; Dagnino, 2009; Lado et al., 1997), the studies that expand our understanding of how coopetition is practised are limited. Exception could include Bengtsson and Kock (2000) and Bengtsson et al. (2010). Bengtsson and Kock (2000) and Bengtsson et al. (2010) suggest an activity-based two-continuum approach to explore coopetition dynamics. Because of the paradoxical nature of coopetition, Bengtsson and Kock (2000) argue that the two logics in conflict need to be separated and emphasize that these two different types of interaction “are not divided between counterparts but between activities, as it is impossible to compete and cooperate with the same activity” (p. 415). Placing activities in focus, Bengtsson et al. (2010) contend that cooperation and competition within a coopetitive relationship are two different interaction processes that are underpinned by and divided between activities.

The activity-based two-continuum approach proposed by Bengtsson and Kock (2000) and Bengtsson et al. (2010) is heuristic and beneficial to the exploration of coopetition practices. However, the conceptualisation of this approach has two limitations. First, the activity-based two-continuum approach is, in nature, a dyadic level of analysis. The

approach restricts its attention on the firm's internal activities that result in the firm's cooperative and competitive interactions with the counterpart. Although this narrow view of coopetition "allows for a precise study of the co-opetitive interaction" (Bengtsson et al., 2010, p. 200), this is at the sacrifice of our understanding of coopetition occurring in a network context. From the IMP perspective, firms are not islands but are embedded in a web of relationships where a firm's operation is facilitated by *relating* its resources and activities to those of others. This "in relation to" feature points to another limitation of the two-continuum approach; that is, the interdependence between connected actors is little considered. Within a network, firms have to confront and cope with influences, both directly and indirectly, travelling within and between relationships (Anderson et al., 1994; Ritter, 2000). These influences affect how a firm relates their activities and resources to others, resulting in varied situations in which the firm could be working closely with some parties to pursue collective goals while dealing with tensions or conflicts with others. The importance of interdependence in coopetition research is as Dagnino (2009, pp. 25-26) argues that "cooperation and competition merge together to form a new kind of strategic interdependence between firms, giving rise to a coopetitive system of value creation." In this thread, the understanding of coopetition in a network context could be enhanced by employing a resource interaction perspective.

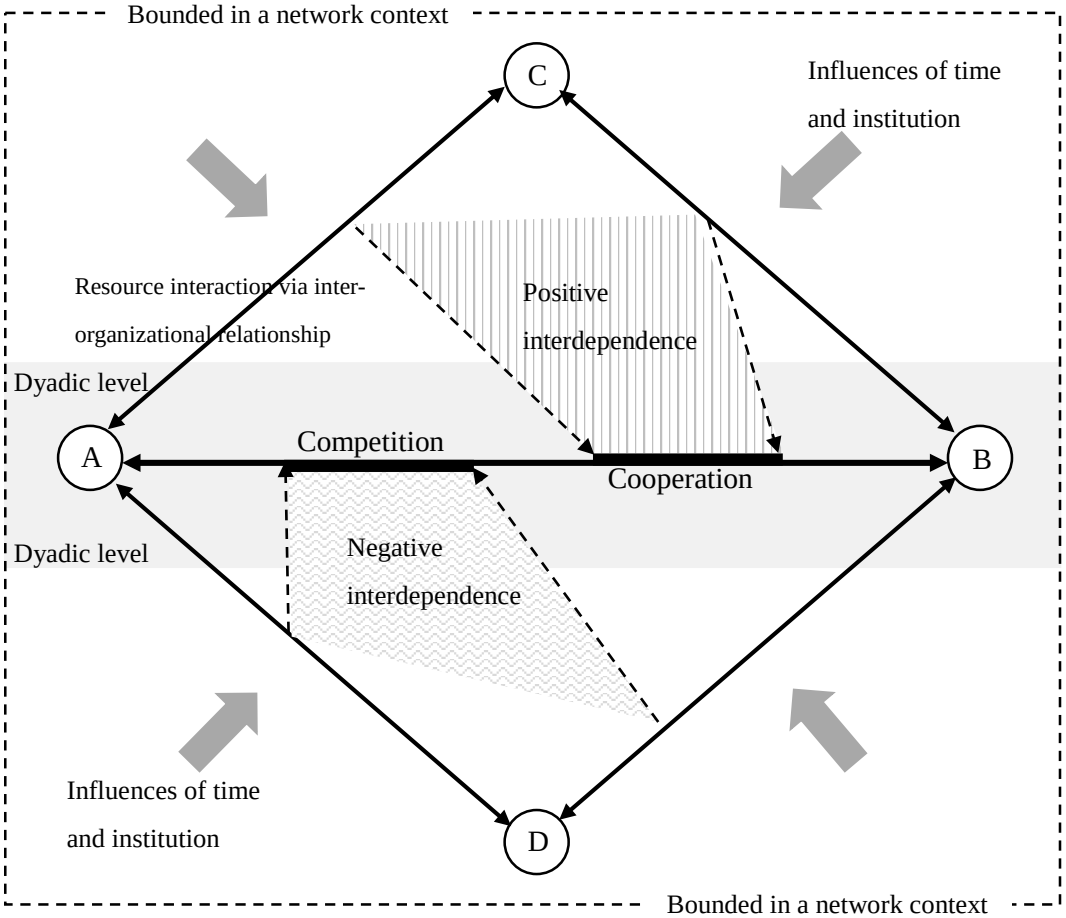
Linking resource interaction to coopetition

Seeing resource interaction as part of strategy practice, it is important to note that a firm's process of resource interaction could bring about not only cooperative but competitive elements within its relationship with a certain actor. The IMP's resource interaction highlights that firms who make any changes where resources interact have to tackle the friction between the involved resource interfaces, which in turn could lead to tension, conflicts or competition between the interacting parties (Baraldi et al., 2012). The friction, the forces of restriction to change, usually results from the history of interaction that constrain resource development to certain directions (Gadde and Håkansson, 2008; Håkansson and Waluszewski, 2002). An interaction perspective also suggests that the process of interaction accompanies varied atmospheres, including cooperation, competition, power, dependence, opportunism and conflicts, or even a mix of them (Håkansson, 1982). However, most of studies that draw on a resource interaction perspective tend to look at cooperative elements, such as combining boundary-spanning resources to bridge technological change (Chou and Zolkiewski, 2012), rather than competitive elements.

Drawing on the work by Dagnino (2009), we argue that the key to the linkage between resource interaction and coopetition lies in the notion of network interdependence. Network interdependence results from the process of interaction between connected actors, in which the interacting actors' interaction histories and self-interpretations function as important drivers (Ford and Håkansson, 2006). Additionally, the structure of interdependence may change over time mainly due to the evolving charactersitics of inter-organisational relationships, such as the establishment or ending of a relationship (Halinen et al., 1999). The work by Chou and Zolkiewski (2012), which is grounded in the IMP's resource interaction, demonstrates the importance of managing a firm's interdependence with others in the face of technological change. Their work also indicates that a firm's interdependence with some actors may turn into a negative state where tension and conflicts occur and, to an extreme, a cooperative tie may break.

Based on this understanding of network interdependence, both positive and negative, we develop a framework that looks at coopetition between two actors from a resource interaction perspective, see by Figure 1. In this framework, a coopetitive relationship (e.g. the A-B relationship) can be understood by separately investigating cooperative interaction and competitive interaction that are respectively caused by the dyad's positive and negative interdependences with other actors. For instance, the positive interdependence between A, B and C could be that A purchases materials from suppliers C and uses them in its production lines to manufacture tailored products for its OEM customer B. As for the negative interdependence between A, B and D, this could be that while doing OEM business with B, A also runs its branding business and approaches the same retailer D which also sells B's branded products. Additionally, it is important to note that a firm's interdependence with some other actors is subject to change influences of time and institution, in which the former takes into account the reflexivity and learning capability of actors from their past interactions while the latter is concerned with enablers and constraints to resource interaction. That is to say, a firm's cooperation, competition or simultaneous mix of cooperation and competition is driven by its resource interaction spanning organisational boundaries. It also needs to heed that performing the same activities (e.g. branding business) may not incur competition between two interacting parties (e.g. between A and B) unless their activities or resources are related to a third party, resulting in negative interdependence where conflicts and tensions take place.

Figure 1 A resource interaction perspective on coopetition



Research methodology

A case study was used to test our theoretical framework, through which our research questions are tackled (Eisenhardt, 1989; Yin, 2009). This case-based qualitative approach was appropriate because it facilitated the investigation of the complex phenomena of coopetition that resulted from resource interaction within and across organisational boundaries (Halinen and Törnroos, 2005). For empirical investigation, the public transportation system in Kaohsiung City, the second largest city in Taiwan, was chosen as the research setting. Within this setting, the case under study was the coopetition among iPASS Corporation (an issuer of transportation electronic tickets), two bus companies, GD-bus and U-bus, and the Kaohsiung Rapid Transit Corporation (KRTC, the metro company in Kaohsiung city), which was driven by policies implemented by Transportation Bureau Kaohsiung City Government (TBKC) during a time period from late 2012 to early 2015. The policies included TBKC's launch of a real-time bus arrival information system, an app which was called "i-bus", to enhance

the bus service quality and increase citizens' willingness to take bus.

The case was purposefully selected using the following criteria. In the first place, the interactions between iPASS, GD-bus, U-bus, KRTC and TBKC formed a unique network context that permitted the study of resource interaction across organisational boundaries (Baraldi et al., 2012). Moreover, due to a focus on the TBKC's policies which could be seen as a product type of an organisation, we were allowed to investigate the interaction between human and non-human resources in the social practice, and thus facilitated the exploration of the role of materiality (Vaara and Whittington, 2012). Following the practice of TBKC's policies which aimed to boost public traffic, an investigation of the positive and negative interdependences created by resource interaction was permitted; and as a result, we were able to study a "coopetitive system of value creation" (Dagnino, 2009).

Data collection for building the case relied on depth interviews with key informants from the case organisations, including the interviews with the Director-general of TBKC and the Chairman of U-bus. A list of interviews was provided in Table 1[1]. The interviews were conducted using an interview guide, in which interviews questions were developed based on the key concepts that constituted our theoretical framework. In addition to interviews, we consulted archival materials, including documents of TBKC's policies and the news and statistics reports it released. The statistics reports, particularly with regard to bus and metro (KRTC) traffics per month, enabled us to investigate the association between resource interaction and value creation (the traffic of bus and metro systems). We also carried out participant observations through which we were able to develop a better practice-based understanding of interaction between human and non-human resources. For example, we observed whether i-bus APP was reliable and how a bus driver reacted to the situations when the bus arrived at a certain stop ahead or behind the schedule. These multiple sources of data allowed us triangulate between different perspectives to gain an authentic account of the case (Myers, 2009).

[1] This paper is work-in-progress. We are conducting follow-up interviews, with both new and the same informants, in order to verify key findings and enrich the description of the case.

Table 1 A list of interviewees

No	Organization	Interviewee
1	iPASS Corporation	General Manager
2	Kaohsiung Rapid Transit Corporation	General Manager
3	GD-bus	Chairman
4	Transportation Bureau, Kaohsiung City Government	Director-general
5	Transportation Bureau, Kaohsiung City Government	Senior Technical Specialist
6	U-bus	Section Manager
7	Bus heavy users	Passenger (A)
8	Kaohsiung Rapid Transit Corporation	Section Head (A)
9	Kaohsiung Rapid Transit Corporation	Section Head (B)
10	Ubus	Section Manager

The voice-recorded interviews were transcribed and the notes were kept for participant observations. Together with the archival materials, we organised these different types of data chronologically. We then began our data analysis in the following ways. Using the archival materials, we firstly identified important policies that were formulated and implemented by TBKC. In the following, we read through the interview transcripts and observation notes to search for evidence of resource interaction and coopetition. In this analysis step we labelled key passages with theoretical concepts, including the IMP's four types of resources and its relating of resources and activities, interdependence between case organisations, cooperation and competition interactions. We then sought for causality between policies, resource interaction and coopetition on the basis of our theoretical framework. It had to note that in the analysis we paid careful attention to the emergent properties, such as the impact of materiality (e.g. policies and technology) on resource interaction, and that such process was not linear but iterative between theory and practice, so as to advance theoretical development (Dubois and Gadde, 2002).

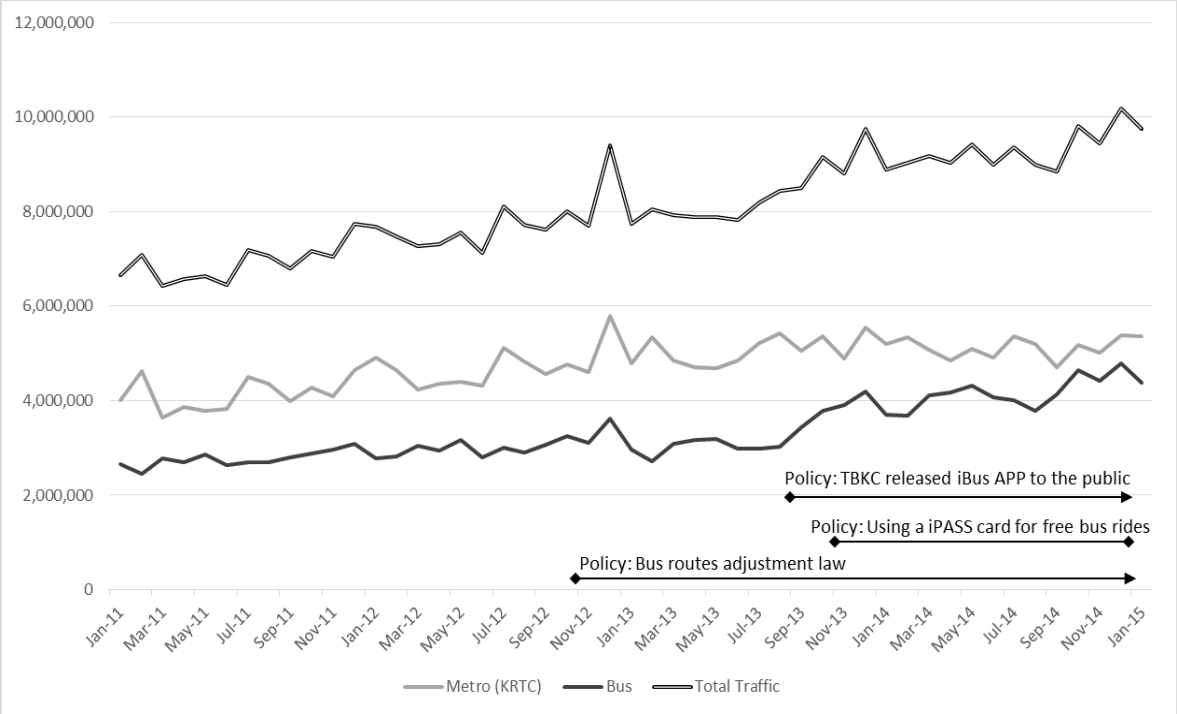
Findings

Our case[2] concentrated on the resource interaction between GD-bus, U-bus, KRTC (the metro) and iPASS (the issuer of electronic transportation ticket) that was driven by three of TBKC's important policies, covering a time period from late 2012 to early 2015. The interaction between these case organisations contributed to the growth of bus and metro traffic. However, the resource interaction also occasioned the coopetition between the bus and metro systems, resulting in that the traffic growth of bus was built on some expense of the metro's traffic loss while the total traffic of bus and metro kept

[2] The case remains under development owing to the ongoing data collection and analysis.

growing, as shown by Figure 2. In the following, we presented our findings of how each policy affected the resource interaction between case organisations, in which coopetition took place.

Figure 2 Bus and Metro Traffic in Kaohsiung City: January 2011~January 2015



Resource interaction driven by the policy: Bus Routes Adjustment Law

The Transportation Bureau Kaohsiung City Government (TBKC) enforced the Bus Routes Adjustment Law in November 2012, as a response to the fierce competition between the bus system and KRTC (the metro) caused by their routes' being parallel and close to each other. According to the law, the bus operators, such as GD-bus and U-bus, were allowed to adjust their bus routes in the condition when their routes were overlapped with the metro routes within 100 meters in parallel and when the length of overlapped routes exceeded 5 kilometers or reached 50% of the bus route.

The Bus Routes Adjustment Law functioned as an important mechanism for the bus operators to take some advantage of KRTC's infrastructure, including the entrances and exits of each metro station and the information board within the station. When a bus route was permitted to be adjusted, the bus operator was able to redesign this route by connecting it to the metro route to provide passengers and commuters with a better transit service. In other words, the bus operator could set up their bus stop just in front

of a certain entrance/exit of the metro station. Towards this cooperative end, both the bus and metro operators became happier to promote each other's service information in their facilities (e.g. carriages, boards, and the booth) and arrival announcements. As a result, the practice of the Bus Routes Adjustment Law lessened the bus operators' competition with KRTC by creating an opportunity to complement each other. The impact of the law was reflected in the gradual growth in the bus and metro traffic (see Figure 2).

Despite seeing the benefits of the Bus Routes Adjustment Law, the growth in the bus traffic was limited. This was partially because many of the bus routes in Kaohsiung City at that time were not planned in consideration of traffic volume and efficiency, but local political concerns. Additionally, the bus on-time rate (for both departure and arrival) was not high. Although in May 2012 TBKC developed and released a software application, called K-bus, that could be used either on iPhone or Android phones for tracking bus real-time information and planning a transit route, the app was running unstably, including the unexpected shutdown. In comparison to the metro service, the metro was much reliable, particularly for commuters at rush hours.

Resource interaction driven by the policy: TBKC released i-bus APP to the public

Boosting the bus traffic volume and improving bus service quality had been TBKC's strategic goal. To achieve this goal, TBKC placed their attention not on the expansion of bus routes nor on increase of bus runs, but on keeping the bus' arrival and departure "on-time". The Director-general of TBKC, who was on board in February 2013, argued that the priority was to build the confidence of the public in the bus transportation system and increase their willingness to use this system. One of the countermeasures was to make good use of "technology". Therefore, in September 2013, TBKC officially released its real-time bus arrival information system, called i-bus, which resulted from its continuous improvement of K-bus system. Apart from accessing to bus real-time information, passengers could use i-bus to plan their trips at ease and gain additional information, for example, tourist attractions.

TBKC's provision of i-bus service required each bus vehicle to install a real-time information system, a device that integrated GPS (global positioning system) and GPRS (general packet radio service) technologies. The device was wirelessly connected to the host set up in the control room at TBKC; that was, the real-time on-the-go data would be collected by the device and transmitted to the host. This enabled TBKC to monitor the bus service quality with regard to on-time rate. To ensure the stable offering of on-

time service, TBKC would penalise the bus operator, depending how many delays were caused. In order not to break this regulation, each bus operator had to train their drivers with standard operation procedures concerning the usage of the real-time system and to frequently audit the actual usage.

TBKC's implementation of i-bus policy, as an important measure to improve the bus service quality, strengthened the interaction between the bus operators and passengers. Despite the increased difficulty in management, the bus operators could benefit from adopting i-bus service. One benefit was that they were able to dynamically dispatch bus vehicles if an emergency occurred, such as a traffic accident or bus breakdown. Besides, using i-bus system facilitated a bus operator to promptly respond to the problems of passengers' lost properties on the bus. This thus allowed the bus operators to offer better service. On the other hand, when i-bus became reliable, passengers could use i-bus app running on their mobile handheld device to search for a nearby bus stop with Google Map information, check bus schedule and its real-time information and plan a trip (including a transit to the metro). In addition, TBKC provided QR code at the stops on the main bus routes, as an alternative way for passengers to check bus real-time information.

Consequently, the enhanced service quality resulted in an increase of bus traffic, as indicated by Figure 2. Although the launch of i-bus service allowed the bus operators, to some extent, to cooperate with KRTC in terms of transit service, it had attracted not only new riders (including tourists) but also some of KRTC's existing users (e.g. students). KRTC's loss of customers was due to that the bus's zone fare (NTD 12 per ride) was cheaper than the metro's (NTD 20 per ride) and that many of bus stops were closer to the passengers' destinations. The resulted in intense cooperation and competition between the bus operators and KRTC.

Resource interaction driven by the policy: Using an iPASS for free bus rides

Following the launch of i-bus service, TBKC soon enforced another important policy: using an iPASS card for free bus rides, which lasted from September 2013 to February 2015. iPASS was an electronic transportation ticket which was issued and promoted by iPASS Corporation, a spin-off from KRTC. iPASS could be used not only for public transportation in Kaohsiung City (including the metro, buses, public bikes and ferries), buses in Western Taiwan and Taiwan Railway, but also for multi-functional payment business (small transactions) and citizens', employees' and students' identification cards. Due to the connectivity and a wide application of iPASS card, TBKC attempted

to leverage the card's advantage to create a leap in the metro's and bus' traffic volume. TBKC thought that utilising this free-ride policy could create a considerable amount of new iPASS card holders. The enlarged installed base of iPASS card would then reinforce the traffic growth both in the metro and in the bus.

The introduction of iPASS increased the complementarity between the bus and metro systems mainly because it connected the two systems and users (passengers) in a more efficient manner. With this technology-enabled smart card, users needed not to queue up for ticket purchase. This facilitated the provision of seamless transit service between the bus and metro. The adoption of iPASS also allowed each transactions to be automatically transferred to a designated bank to cut down the operating cost and avoid the risks of cash retention; in particular for bus operators. Additionally, the data of iPASS-based transactions enabled the bus and metro operators and TBKC to study user behavior and route performance, and thus to offer better transportation service.

TBKC's implementation of its policy of using iPASS for free bus rides made a contribution to the growth of total traffic volume, as shown by Figure 2. Meanwhile, the volume of iPASS card circulation kept significantly growing. The policy did attract new iPASS card holders who used the card in the public transportation. However, comparing to the traffic volume growth between the bus and metro systems, the latter's growth was quite limited. According to KRTC's General Manager, TBKC's policy of using iPASS for free bus rides made them to lose some portion of passengers to the bus system. These passengers included students who usually tried their best save living costs and those who did not rely on the metro in rush hours. As a result, the policy of using iPASS for free bus rides intensified the bus operators' competition with KRTC, while they kept close cooperation, such as offering transit services.

Concluding discussion

A discussion on case findings

The case findings support our theoretical framework that conceptualises the IMP's resource interaction as a type of strategy practice, through which cooperative and competitive interactions could be simultaneously produced within a certain relationship. Our findings reinforce the notion that coopetition occurs only when the same actors are "involved simultaneously in *both* coopetition and competition" (Bengtsson and Kock, 2014, p. 181, emphasis in original), but extend the existing understanding of coopetition by taking into account the related and interactive nature of resources and their

interaction spanning organisational boundaries. Drawing on this resource interaction perspective (Baraldi et al., 2012; Håkansson and Waluszewski, 2002), our empirical evidence shows that coopetition occurring within a relationship between two actors cannot be fully understood by merely investigating what resources are devoted and used within this relationship; instead, a better understanding of such coopetition is facilitated while looking at how the two actors' resources are interrelated to other actors in their broader networking environment. In this manner, this research supports Dagnino's (2009) emphasis on the firms' interdependence that is entangled with cooperative and competitive interactions, and adds knowledge into coopetition that takes place at a network level (Fernandez et al., 2014; Peng and Bourne, 2009).

This research provides a practice-based understanding of coopetition which is less investigated in the existing studies. Our case findings, which departs from the practice at an inter-organisational level (Baraldi et al., 2007; Jarzabkowski and Spee, 2009), points out that coopetition between two actors within a relationship results from their respective relating processes in which other actors get involved and in which human and non-human resources interact. Particularly, by highlighting the role of non-human resources (materiality) in a strategy practice (Orlikowski and Scott, 2008; Vaara and Whittington, 2012), this research illustrates how materiality (e.g. policies) drives simultaneous competitive and cooperative interactions that merge together into a relationship. Due to its concentration on the dynamic interaction between resources spanning organisational boundaries, this research moves beyond a static typology of coopetitive behaviours, such as Luo's (2007) typology of coopetition intensity.

Theoretical implications

The above discussion on the case findings further enables us to draw the following theoretical implications. Firstly, we find that materiality is not merely the outcome but also the enabler of resource interaction that constitutes social practices. In our case TBKC (an organisational unit) formulated transportation policies and developed i-bus information system, both of which were non-human entities out of human actions. These things produced by TBKC then enacted upon the subsequent interaction among the metro and bus operators and passengers. That is to say, human and non-human resources are seen as interdependent systems, rather than discrete entities, that shape each other in a continuum of interaction. This finding accords to a processual logic "where interactions and outcomes are seen to be mutually dependent, integrative, and co-evolving over time" (Orlikowski and Scott, 2008, p. 446). Our empirically-grounded evidence also gives a solid support to the IMP's resource interaction model (Baraldi et

al., 2012), in which properties of products, facilities and organisational units and inter-organisational relationships are not predetermined but emerge from a mutually-shaping process.

Secondly, we find that materiality is able to drive the coopetition between two actors due to its capability of altering interdependence structure in the ongoing process of resource interaction. As our case shows, TBKC's bus routes adjustment law drove the interaction between the metro and bus operators in a way that permitted the complementarity between the metro and bus routes to be created, and hence reduced the intensity of their competition. Additionally, TBKC's policy of using an iPASS card for bus free rides enabled the technology of electronic tickets to exert crucial influences on the bus operators' services (including their routes) and on the passengers' willingness to use bus service which to some extent caused the traffic loss of the metro. These examples point out that the impact of materiality on coopetition within a relationship lies in its acting upon the interaction between other resources in a broader environment, which in turn cooperative interaction takes place in the focal relationship's positive dependence with some relationships while competitive interaction results from the focal relationship's negative dependence with other relationships. By adopting a resource interaction perspective, this research explicates how coopetition takes places in an interdependence system (Dagnino, 2009), which is driven by materiality. The research also complements Bengtsson et al. (2010) whose emphasis on the investigation of activities that produce competitive and cooperative interactions may result in limited understanding of coopetition in certain contexts, such as Kaohsiung City's public transportation system.

Managerial implications

This research also provides implications for practitioners and policy makers. In the first place, our result reminds practitioners to pay careful attention not only to what valuable resources they have within the organisation but also to the important resources that are in control of other organisations. More importantly, practitioners need to realise the fact that their organisational performance as well as the value they aim for results from how their internal resources, both human and non-human, are used in relation to external resources. And thus, how to allocate, mobilise, combine and use resources spanning organisational boundaries in an appropriate and dynamic manner becomes a strategic imperative for practitioners. Additionally, when attention is paid to boundary-spanning resource interaction, practitioners have to heed that their use of resources in relation to others could be involved not merely in cooperative interaction but in competitive

interaction or a mix of cooperation and competition with the same actor. We suggest practitioners to constantly review their interdependence with key stakeholders, so as to make the best use of their resources in the coopetitive games.

For policy makers, our empirical findings suggest that the importance of policies lies in its capability of driving the cooperation, competition and coopetition between human and non-human resources, through which value can be co-created for the public welfare, such as a more sound transportation system. While recognising the importance of resource interaction and the policy's institutional power, policy makers could benefit from influencing or changing interdependence within and/or between value systems by formulating and implementing a proper policy.

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