WORKING PAPER

"Intra-network knowledge roles and division performance in multi-business firms"

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Submitted to the Journal of Knowledge Management on March 22, 2014 (accepted for publication on June 26, 2014).

# INTRA-NETWORK KNOWLEDGE ROLES AND DIVISION PERFORMANCE IN MULTI-BUSINESS FIRMS

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<th>Multi-business firms are distributed knowledge systems in which business units are extensively involved in internal knowledge transfer processes. Business units play different roles within their respective corporate knowledge networks as knowledge providers, knowledge receivers, both or neither. This study deals with the performance consequences of business units that adopt varying knowledge roles within the internal multi-business network.</th>
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Knowledge transfer; knowledge sharing; knowledge dissemination; multi-business firms; absorptive capacity; business unit; corporate innovator; integrated player; implementer; differentiated innovator
1. INTRODUCTION

In the knowledge economy regime, firms have a critical dependence on their ability to transfer knowledge within and across organizational boundaries (van Wijk et al. 2008). The external and internal transference of knowledge has thus attracted the considerable attention of researchers and practitioners in recent years (Kumar and Ganesh 2009, Ribière and Walter 2013, Villasalero 2014). This includes the inter-organizational knowledge transfer processes in strategic alliances (Khamseh and Jolly 2013) and mergers and acquisitions (Azan and Sutter 2010), along with the intra-organizational knowledge transfer processes within multi-business firms (Tsai 2001) and multinationals (Gooderham 2007). The internal transfer of knowledge has been extensively studied in this latter case, and there is a large body of research on the determinants of knowledge transfer within the network composed of foreign subsidiaries and the parent company (Hansen and Løvås 2004, Lee and Wu 2010, Minbaeva 2007). The body of research on the performance consequences of these intra-organizational knowledge exchanges is, however, much more modest (Michailova and Mustaffa 2012).

The internal transfer of knowledge enables the mobility of valuable, rare, inimitable and non-substitutable knowledge resources within organizational boundaries (Fang et al. 2007) at the sole cost of incurring some internal adaptations of the knowledge exchanged (Szulanski and Jensen 2006). The evidence accumulated to date as regards the performance consequences of internal knowledge transfer processes has, however, been inconclusive, and findings support both beneficial (Agarwal et al. 2009, Ding et al. 2013) and detrimental effects (King and Zeithaml 2001, Song et al. 2005, Zander and Kogut 1995). The beneficial or detrimental effects of internal knowledge transfer processes are arguably more apparent at the business unit level.
at which the knowledge exchanged has to show its true bottom line, than at the corporate level at which many aspects may have confounding effects (Dess et al. 1995, Hauschild and Knyphausen-Aufseß 2013). A likely explanation for these contradictory results is therefore that they are derived from studies that take the corporation as the level of analysis, whereas more analytic studies based on the business unit level have rarely taken place.

The knowledge exchanged within organizational boundaries may pertain to different functions, be transferred in varying quantities and flow in different directions (Gupta and Govindarajan 1994, 2000). Although most studies deal with the magnitude of knowledge transfer through various functions, no study investigates the performance consequences associated with both the magnitude and directionality of intra-organizational knowledge transfer flows. The only exception to have addressed the performance implications of the directionality of knowledge flows is the work of Villasalero (2013) which detects that knowledge outflows have a positive impact on performance whereas knowledge inflows in some cases have a negative impact, thus suggesting the likely presence of interactions between knowledge inflows and outflows. However, the performance implications of these interactions in the form of the different knowledge roles that integrate varying levels of knowledge inflows and outflows have yet to be investigated, despite the fact that the four knowledge role framework advanced by Gupta and Govindarajan (1991) is a widely cited classification in this respect (Harzing and Noorderhaven 2006).

Another research gap in existing research concerns the paucity of studies analyzing the performance impact of knowledge flows within multi-business firms. Most studies that tackle the prescriptive implications of intra-organizational knowledge transfer have taken place in the context of multinational corporations. However, only a handful of studies has been conducted in multi-business firms, with one study including all sorts of multi-business firms (Tanriverdi and Venkatraman 2005) and another being limited solely to those multi-business firms that
follow a related diversified corporate strategy (Villasalero 2013). The context of *multi-business* firms might be a more homogeneous setting in which to explore the controversial issue of the performance consequences of internal knowledge transfer than that of *multinational* corporations, and an opportunity to shed light on this relationship is therefore presented.

This study carries out an empirical examination of the performance impact of knowledge roles on business division performance within multi-business firms, thus filling the research gap identified in the three aforementioned dimensions: the level of analysis (business unit level as opposed to corporate level), the knowledge exchanged (magnitude combined with directionality of knowledge flows) and the setting explored (multi-business firms in contrast to multinational corporations). In doing so, it extends the four knowledge role framework advanced by Gupta and Govindarajan (1991) to the prescriptive domain and applies it to multi-business firms for the first time. Following a multi-theoretical perspective, four predominant effects are identified: knowledge *signaling* and knowledge *learning* on the beneficial side, and knowledge *depreciation* and knowledge *isolation* on the detrimental side. These are subsequently matched with the four knowledge roles that business divisions could play within the corporate network, i.e., *corporate innovator* and *integrated player* with high knowledge outflows and *implementer* and *differentiated innovator* with low knowledge outflows, respectively.

Based on survey data from a sample of 225 business divisions, the results indicate that divisions which occupy knowledge roles that reveal the possession of unique knowledge (knowledge signaling) or guarantee the accumulation of new knowledge (knowledge learning) outperform those divisions that access spilled knowledge (knowledge depreciation) or have no access to any kind of knowledge (knowledge isolation). More specifically, Corporate innovators and Integrated players are found to outperform Implementers and Differentiated innovators, in conformity with theoretically derived expectations and in a manner that supports
the match between the performance effects of knowledge transfer and the knowledge roles that business divisions might play.

This study contributes to existent research on knowledge transfer and performance outcomes by demonstrating the usefulness of knowledge role as an integrating concept within this literature. It additionally extends the four-role framework to the prescriptive domain and tests its normative implications in an internal knowledge transfer intensive setting which has to date gone relatively unnoticed, as is that of multi-business firms.

2. THEORY AND HYPOTHESES

2.1. Knowledge transfer and performance

The performance impact of internal knowledge transfer is a controversial issue in which findings are contradictory (Ding et al. 2013). The internal transference of knowledge enables the mobility of core competences within the firm (Fang et al. 2007) at the expense of incurring some adaptations which are usually much less costly than those associated with building competences from scratch (Szulanski and Jensen 2006). This general view of internal knowledge transfer implies that its performance consequences for multi-unit firms should be favorable. This is not, however, the case since there are as many studies that find a beneficial effect (Darr et al. 1995, Ding et al. 2013, Epple et al. 1996, Mahnke et al. 2005, Manolopoulos et al. 2009) as those that support a detrimental effect (King and Zeithaml 2001, Song et al. 2005, Zander and Kogut 1995), whilst other studies even obtain mixed findings (Haas and Hansen 2005, 2007, Hansen 1999, Lee and MacMillan 2008, Letmathe et al. 2012, Levine and Prietula 2011, Rabbiosi and Santangelo 2013, Rhodes et al. 2008, Tsai 2001, Villasalero 2013).

This third stream of studies (Bennet and Bennet 2007, O’Dell and Hubert 2011) assumes an action-based definition of knowledge and recognizes that intra-organizational knowledge transfer has both benefits and costs. It also identifies some contingencies that tilt the balance
one way or another in situated contexts, such as the organizational task (Haas and Hansen 2005), environmental turbulence (Levine and Prietula 2011), unit characteristics (Rabbiosi and Santangelo 2013), network position (Tsai 2001), absorptive capacity (Tsai 2001, Villasalero 2013), organizational design (Ciabuschi et al. 2011), form of knowledge transfer (Haas and Hansen 2007, Letmathe et al. 2012, Rhodes et al. 2008), type of knowledge (Lee and MacMillan 2008) or directionality of knowledge (Villasalero 2013). However, the only work in which the knowledge role is included amongst these contingency variables is that of Ambos et al. (2006).

The role that semi-autonomous units might play within firm boundaries has a long-standing tradition in strategy research, particularly in the context of foreign subsidiaries of multinational corporations (Michailova and Mustaffa 2012). Despite the fact that many variations of subsidiary roles or subsidiary mandates abound (Ambos et al. 2006, Enright and Subramanian 2007, Gammelgaard et al. 2009, Li et al. 2013, Manea and Pearce 2006, Manolopoulos et al. 2007, Noorderhaven and Harzing 2009, Schlegelmilch and Chini 2003, Wang and Suh 2009, Yang et al. 2008), the pioneering classification advanced by Gupta and Govindarajan (1991) is that which is most widely used in this respect (Harzing and Noorderhaven 2006). Moreover, this framework has the virtue of being based on the magnitude and directionality of knowledge flows among units within firm boundaries, which allows it to delineate the knowledge roles that units might play within the internal knowledge network and to do so with sufficient generality for it to be applied to different settings.

Surprisingly, the performance consequences of adopting a concrete knowledge role has been analyzed in only one study in which this construct is entered as a control variable in the context of multinational corporations (Ambos et al. 2006). What is more, this study takes the perspective of the performance effects for the parents of the knowledge roles played by their subsidiaries, rather the performance implications for subsidiaries derived from adopting
different knowledge roles. The classification of knowledge roles has not been applied in the context of multi-business firms either, despite the fact that it can be easily generalized to this specific case of multi-unit organization. In the remainder of this section, the classification of knowledge roles proposed by Gupta and Govindarajan (1991) is extended to the prescriptive domain by combining resource-, knowledge- and dynamic capability-based views of the firm in an integrated framework and is subsequently used in the context of multi-business firms.

Multi-business firms are a special case of multiunit corporations in which the pattern of divisionalization principally corresponds to industries in contrast with a pattern based predominantly on locations in multinational firms. The internal transfer of knowledge is therefore notably different in both settings, with multi-business firms better reflecting the issue of crossing technological boundaries and multinational firms better representing the issue of crossing geographical boundaries (Miller et al. 2007). In both cases, the intra-organizational knowledge transfer is conducted via the internal knowledge network as opposed to the external knowledge network, but in the former case the knowledge network is composed of product divisions whereas in the latter it consists of geographic subsidiaries. The challenge of transferring technology-dependent knowledge from one unit to another is more prominent in multi-business firms than in multinational firms, in which the challenge of transferring context-dependent and culturally-bounded knowledge is more evident (Hansen 2002). The application of the classification of knowledge roles to multi-business firms may thus shed light on a different dimension of intra-organizational knowledge transfer as regards that traditionally considered in the research carried out in multinationals.

### 2.2. Effects of knowledge flows

Despite the long-standing tradition amongst professionals in the knowledge management field of using models such as Value Network Analysis (Allee 1999, 2000, 2008, 2009) or Social Network Analysis (Cross and Parker 2004, Cross and Thomas 2009) to study knowledge
directionality and interconnectedness, existing academic research on internal knowledge transfer and performance makes no distinction between knowledge inflows and knowledge outflows, and the knowledge provider or knowledge receiver role of business units is consequently not considered. Building on the logic underlying these models, the added value of this study is that the performance consequences of knowledge transfer vary depending on the division’s knowledge role within the corporate network as regards four effects: knowledge signaling, knowledge learning, knowledge depreciation and knowledge isolation. The advantages and disadvantages of internal knowledge transfer are generally symmetrical for business units that are knowledge receivers or knowledge providers.

With regard to the underlying resource base and the effect of knowledge signaling, the fact that a division is extensively involved in knowledge outflows indicates the presence of a rich resource base within the division’s boundaries. On the contrary, the fact that a division is active in knowledge inflows signals the lack of key resources and a poor resource base (Gupta and Govindarajan 2000). Monteiro et al. (2008) support this reasoning in the context of multinational corporations, and report that foreign subsidiaries that are extensively engaged in knowledge outflows to the rest of the corporation are highly rated by the receiving counterparts as having valuable capabilities, while Harzing and Noorderhaven (2006) detect that foreign subsidiaries with high knowledge outflows report higher relative capabilities than foreign subsidiaries with high knowledge inflows. Cho and Lee (2004) similarly find that the larger the foreign subsidiary’s competitive advantage, the greater the extent to which the foreign subsidiary is engaged in knowledge sharing with the rest of the multinational corporation.

The recombination of knowledge resources within the firm is an antecedent to knowledge learning, namely, the development of new knowledge through the cross-firm sharing of the knowledge resources residing within the divisions’ boundaries (Døving and Gooderham 2008). For knowledge learning to be optimal, the levels of knowledge inflows and knowledge
outflows have to be simultaneously high since the recombination of knowledge resources requires the mutual exchange of knowledge between divisions (Eisenhardt and Galunic 2000). A second best scenario for knowledge learning to take place occurs in the situation in which the level of knowledge inflow is high but the level of knowledge outflow is low, signifying that the receiver division adopts a more passive role in the learning process and the learning outcomes are not comparable to those that occur in the optimum scenario (Markides and Williamson 1994). Finally, low levels of knowledge inflows and knowledge outflows lead to the development of hardly any new knowledge within a division.

The repercussion of knowledge depreciation is also symmetric. Those divisions that embody strategic resources are usually reluctant to disclose their more valuable knowledge resources to other receiving divisions, thus protecting core knowledge from spillovers (Szulanski 1996) by behaving in a way that is known as knowledge hoarding (Husted and Michailova 2002, Husted et al. 2012, Michailova and Husted 2003). The receiver divisions are therefore usually the beneficiaries of devaluated knowledge resources which are probably subjected to spillovers to competitors (Kogut and Zander 1992). Existing empirical studies on learning curves indicate that the rate of knowledge depreciation is generally high in contexts as diverse as shipbuilding (Kim and Seo 2009) or pizza retailing (Darr et al. 1995), but the problem of knowledge depreciation is exacerbated at even higher rates when knowledge is transferred. In a study of the telecommunications industry, Williams (2007) finds that the value of knowledge that is transferred depreciates quickly just after the inter-unit transference takes place. Zander and Kogut (1995) similarly report that two-thirds of patented innovations which were internally transferred were imitated by competitors without permission from the patent holder.

Finally, knowledge isolation refers to a situation in which business divisions remain unconnected to the internal knowledge network. From the knowledge provider perspective,
knowledge isolation may only be justified on the grounds of protecting knowledge, even from internal peers. From the knowledge receiver perspective, knowledge isolation would allow exaggerated adaptation costs to be avoided, which consist of the time spent searching for the relevant knowledge within the firm along with finding ways to use that imported knowledge within the business division’s boundaries (Haas and Hansen 2005). These costs include the processing cost of adapting written materials in the case of codified knowledge or interacting with knowledgeable persons in the case of tacit knowledge (Haas and Hansen 2007). The existing empirical research shows that adaptation is a discouraging and costly process (Jensen and Szulanski 2004) which does not always render the expected performance gains owing to mal-adaptations, lack of novelty (Haas and Hansen 2005) or untimely implementation (Tran et al. 2010).

Overall, the effects of knowledge signaling and knowledge depreciation are symmetric for knowledge providers and knowledge receivers within the firm, whereas the effect of knowledge learning requires the division to play the roles of both knowledge provider and knowledge receiver simultaneously, and the effect of knowledge isolation implies that the division plays the role of neither knowledge provider nor receiver. The performance consequences of internal knowledge transfer consequently depend upon the knowledge role that a division occupies within the corporate knowledge network. The following hypothesis is therefore proposed:

\[ H_1: \text{The performance of business divisions depends upon the knowledge role that they play within the corporate knowledge network.} \]

It is worth noting that this is a general hypothesis in which the knowledge role played by a division is considered to matter as regards division performance owing to the presence of different effects with varying impacts. More details on the specific connections linking each
knowledge role with the effects of knowledge transfer and division performance are, however, provided below.

2.3. Knowledge role and division performance

In multi-business firms, each division uses knowledge from the rest of the corporation and provides the rest of the corporation with knowledge. According to Gupta and Govindarajan (1991), four knowledge roles might be distinguished depending on knowledge inflows and knowledge outflows: Corporate innovators, Integrated players, Implementers and Differentiated innovators.

In the Corporate innovator role, the division serves as the source of knowledge for the rest of the corporation. In the Integrated playe role, the division provides other divisions with knowledge in addition to receiving knowledge from other divisions. In the Implementer role, the division is rather passive in knowledge creation but it is still integrated into the corporate network through the knowledge provided by other divisions. On the contrary, divisions that adopt a Differentiated innovator role are outside the core of the corporate network since they operate on the basis of their own knowledge for their own purposes.

The four knowledge roles can be matched with the four performance effects of knowledge flows previously mentioned. Despite the fact that each knowledge role is associated with varying degrees of signaling, learning, depreciation and isolation, a predominant performance effect of knowledge flows is easily discernible for each knowledge role (Figure 1).

Corporate innovators, with high knowledge outflows and low knowledge inflows, play the role of knowledge providers for the rest of the corporation. They have the advantage of
possessing a rich resource base built around the core competences of the corporation which make it available to peer business divisions and the corporate office. The predominant effect for Corporate innovators is thus knowledge signaling. Moreover, they have learning advantages during the process of transferring knowledge to other divisions, avoid the disadvantage of having to import knowledge which may be subjected to spillovers, and circumvent the disadvantage of incurring adaptation costs derived from imported knowledge. On the opposite side, Implementers with low knowledge outflows and high knowledge inflows play the role of knowledge receivers from the rest of the corporation. Despite having the learning advantages triggered by knowledge inflows, their main concern is thus the quality of the internal knowledge to which they have access within the corporate network, such as when they receive somewhat devaluated knowledge that does not meet the VRIN (valuable, rareness, inimitability, non-substitutability) attributes because of its providers’ unwillingness to share this type of knowledge (Husted et al. 2012) and the spillover consequences of the internal transfer process (Williams 2007). The predominant effect for Implementers is therefore that of depreciated knowledge. Moreover, they must confront the disadvantages of having a poor resource base, thus incurring considerable adaptation costs during the process of using the knowledge imported from the rest of the corporation because of their lack of absorptive capacity.

Corporate innovators with high knowledge outflows and low knowledge inflows and Implementers with low knowledge outflows and high knowledge inflows will consequently have healthy and poor performances because of the predominant effects of knowledge signaling and knowledge depreciation, respectively. The Corporate innovators and Implementers represent the stylized cases of knowledge providers and knowledge receivers, respectively. The hybrid cases of Integrated players and Differentiated innovators require further elaboration.
Integrated players with high knowledge outflows and high knowledge inflows have the opportunity to learn quickly owing to their remarkable absorptive capacity (Cohen and Levinthal 1990) and combinative capabilities (Kogut and Zander 1992). The predominant effect for Integrated players is therefore that of knowledge learning. Moreover, the combination of a division’s own new knowledge with knowledge received from another division gives rise to causal ambiguity which, in turn, reduces the likelihood of knowledge spillovers to competitors (Barney 1991, Lippman and Rumelt 1982). They also have a rich resource base, as indicated by high levels of knowledge outflows, and mitigate adaptation costs because of their high levels of absorptive capacity.

Differentiated innovators, with low knowledge outflows and low knowledge inflows, are clearly isolated from the corporate knowledge network, and knowledge isolation is consequently the predominant effect for them. They minimize negative spillover effects, but their poor resource base and the lack of opportunities to learn from others within the firm limit their division performance. In fact, Tsai (2001) detects that divisions with peripheral network positions are less innovative and are poorer performers than divisions with central network positions within firms. In the context of international business, Monteiro et al. (2008) find that foreign subsidiaries that are isolated from knowledge-sharing activities within the multinational corporation network underperform in comparison to their peer foreign subsidiaries.

To sum up, Corporate innovators and Integrated players have a healthy profile as regards the four effects of knowledge transfer, thus benefiting from the favorable effects of signaling and learning while eluding the unfavorable effects of depreciation and isolation. Differentiated innovators and Implementers, however, have a notably poorer profile, and are able to benefit from only one favorable effect or elude only one unfavorable effect, respectively (Table 1).
Following the above reasoning and the overall interplay of the four effects of knowledge transfer for each division knowledge role, it is hypothesized that:

\[ H_2: \text{Corporate innovators and Integrated players outperform Implementers and Differentiated innovators.} \]

This study does not predict any a priori performance differences between Corporate innovators and Integrated players, or between Implementers and Differentiated innovators. In fact, Integrated players are very much like Corporate innovators with the relative advantage of knowledge learning and the relative disadvantage of knowledge adaptation. A similar picture emerges when comparing Implementers and Differentiated innovators, with the latter avoiding knowledge adaptation and the former taking advantage of knowledge learning. This study based on the indirect measurement (knowledge outflows and knowledge inflows) of underlying phenomena (knowledge signaling, learning, depreciation and isolation) does not allow us to determine the relative weight of each effect but only its directionality.
3. METHODS

A Rumelt (1974) classification schema of diversification strategy was applied to the 100 largest Spanish firms, which resulted in a population of 43 dominant, 46 related and 11 unrelated firms organized around 518 business divisions.

The variables were measured using archival data for firms and survey data for business divisions just prior to the financial crisis that hit the global economy in 2008. A questionnaire addressed to division general managers was refined and improved through a pilot study. After three mailing rounds, the research team collected valid information for 225 divisions belonging to 76 firms. The response rate was 76 per cent for firms and 43 per cent for divisions. No response biases were detected between respondents and non-respondents in archival variables such as division size or industry group. The respondents held the managerial positions of general manager (81.8%) and manager (18.2%). Most of them had risen to these positions through promotion from within (73.3%) and had held them for more than 5 years (mean value = 5.25 years) while having over 18 years of experience within the industry (mean value = 18.46 years). The typical business division from which the responses from general managers and managers were collected employed 2,646 people and had belonged to the corresponding corporation for over 30 years.

3.1. Knowledge role

The level to which a business division is involved in knowledge transfer with peer business divisions or the corporate office was measured using the scale developed by Gupta and Govindarajan (2000) in the context of multinational corporations. This scale captures the intensity and the pattern of knowledge flows (Ambos et al. 2006, Harzing and Noorderhaven 2006, McGuinness et al. 2013). General managers were asked to assess the degree to which their divisions are involved in knowledge inflows and knowledge outflows with peer business
divisions and the corporate office in 7 different areas such as knowledge regarding marketing, distribution, product delivery, product design, operations, supply and management. Other researchers have applied a similar procedure in order to operationalize the level of knowledge transfer in multinational corporations (Ghoshal and Bartlett 1988, Minbaeva 2007, Zhao and Luo 2005). For the purpose of the present research, two variables were created in which the knowledge flow patterns were used as a starting point. Knowledge inflow is the level to which a business division receives knowledge from either the corporate office or peer business divisions, while knowledge outflow is the level to which a business division provides either the corporate office or sister business divisions with knowledge (Gupta and Govindarajan 1994, Harzing and Noorderhaven 2006). This differentiation between knowledge inflow and knowledge outflow is subsequently used to categorize the divisions’ role (Gupta and Govindarajan 1994), as explained below.

The internal validity of the knowledge outflow measure is strong (Cronbach’s $\alpha = 0.892$, $n= 14$ items), as is the knowledge inflow measure (Cronbach’s $\alpha = 0.911$, $n= 14$ items). Content validity was studied by analyzing the correlations between the measurement used and other variables in a manner consistent with previous findings. Gupta and Govindarajan (2000) showed that formal coordination improves knowledge transfer among subsidiaries from multinational corporations. The measurement used is consistent with those findings since the level of formal coordination correlates (a) positively with the knowledge outflow ($n= 225$ divisions; $r= 0.324; p< 0.001$) and (b) positively with the knowledge inflow ($n= 225$ divisions; $r= 0.293; p< 0.001$). These tests support the applicability of a measurement instrument developed for multinationals by Gupta and Govindarajan (2000) to multi-business firms. The convergent validity based on 10 questionnaires was assessed using the inter-rater agreement rate. This rate was over 73 per cent for knowledge outflow and 76 per cent for knowledge
inflow, which suggests that there were no interpretation problems among internal observers when these instruments were applied.

### 3.2. Division performance

This study has not used a corporate measure of firm performance, but rather a relative performance measurement for each business division. The division performance variable was measured with the instrument developed by Gupta and Govindarajan (1986), which assesses the level to which a division is effective in attaining 10 objectives weighted by the importance of those objectives for the corporate office portfolio in areas such as rate of growth in sales, operating profits, market share, profit-to-sales ratio, return on investment, cash flow from operation, cost reduction programs, new product development, personnel development and political/public affairs. This instrument involves two related scales. First, a 10-item scale which allows an overview of the division’s balanced scorecard to be obtained. Second, a 10-item scale which provides information about the business division’s ability to do what is required in accordance with the balanced scorecard. The final measurement is a weighted mean to address the division’s effectiveness as regards performing its corporate-imposed role in the corporate business portfolio (Gupta and Govindarajan 1986).

The relative nature of this measure allows inter-industry and inter-firm division performance comparisons to be made with more confidence than when absolute measures are applied. Moreover, firms tend to revise the objectives attached to each division in the event of environmental shocks not correctly predicted at the beginning of the year, thus controlling unpredicted inter-temporal jolts. Finally, the corporate officers approve division objectives with the purpose of attaining a corporate-wide optimum and, in this respect, cast the divisions in the business portfolio in different roles. The ability of each division to perform its role is thus a better measurement of the degree to which that division improves corporate performance than absolute measurements (Gupta and Govindarajan 1986).
The content validity of division performance was analyzed by employing correlations between the measurement used and two accounting measurements. Most Spanish firms do not disclose information regarding business units, but 62 exceptions were detected. The correlation between the division performance measurement and ROA –return on assets– was high (n= 62 divisions; r= 0.432; p< 0.001), as was that between the division performance measurement and ROE –return on equity– (n= 62 divisions; r= 0.452; p< 0.001). These findings support the content validity of the division performance measure. The reliability was high (Cronbach’s α= 0.796; n= 10 items, computed before weighting) and the convergent validity was strong since the inter-rater agreement rate was over 81 per cent based on 10 questionnaires.

3.3. Control variables

Six variables were considered to control for division heterogeneity. The structural variable, consisting of Division size, was measured as the natural logarithm of division workforce (Keats and Hitt 1988). Two variables pertaining to the environment in which the business division operates were introduced, which were industry membership and environmental uncertainty. Industry membership was operationalized by using three dummy variables to capture four industry groups –water, energy and telecoms; banking and insurance; construction and real estate, and manufacturing– (Dess et al. 1990). Environmental uncertainty (Cronbach’s α= 0.835; n= 20 items) was measured by addressing the general manager’s capacity to confront the division environment, made up of the degree to which the suppliers’, competitors’, financiers’, regulators’ and workers’ actions were unpredictable (Buchko 1994).

Three strategy variables dealing with the corporate level, the business level and how both levels are related were considered. At the corporate level, the Diversification strategy was operationalized by using dummy variables to capture the dominant, related or unrelated diversification strategy adopted by the firm to which the business unit belongs (Rumelt 1974). At the business level, the Prospector orientation gathers key issues about the strategy and
organization of the divisions ranging from the defender profile to the prospector profile (Miles and Snow 1978), in accordance with the general manager’s self-typing as regards the degree to which the division tends to change products and markets (Shortell and Zajac 1990). At the interface between the corporate and business levels, Build strategic mission (Cronbach’s alpha = 0.567; n= 2 items) measures the role assigned by the corporate office to the business unit throughout the continuum between the extreme positions of harvesting (prioritizing short-term profitability over long-term market share) and building (prioritizing long-term market share over short-term profitability) (Gupta and Govindarajan 1984).

4. RESULTS

The levels to which business divisions provided the rest of the corporation with knowledge and were users of knowledge from the rest of the corporation allowed the 225 business divisions to be grouped into four categories corresponding to the knowledge roles. As has occurred in previous studies (Ambos et al. 2006, Gupta and Govindarajan 1994, Harzing and Noorderhaven 2006), the median values for knowledge outflow and knowledge inflow were used to categorize the sample in accordance with the typology presented in Figure 1 (Table 2).

A covariance analysis of division performance was carried out by using the division knowledge role (with division size, industry membership, environmental uncertainty, diversification strategy, prospector orientation and build strategic mission as covariates). This multivariate analysis allowed tests to be carried out regarding whether the performance of business divisions depends upon the role they play within the corporate knowledge network as predicted in hypothesis 1, whereas other explanatory variables were used as controls. The main
effect of the knowledge role was significant, as was the total model with significant covariate effects of division size, industry membership, prospector orientation and build strategic mission, thus supporting the first hypothesis. The covariate effects of diversification strategy and environmental uncertainty proved to be non-significant (Table 3, section I).

The second hypothesis contends that Corporate innovators and Integrated players outperform Implementers and Differentiated innovators. The post hoc in the analysis of covariance allowed vis-à-vis comparisons between the different knowledge roles that a business division can play. The results provided support for hypothesis 2 with varying degrees of significance (Table 3, section II). The performance superiority of Integrated players over Implementers and Differentiated innovators is stronger than that of Corporate innovators. The comparisons were significant at levels of 10%, 5% and 1% in accordance with the most conservative method, i.e., that which detected the smaller division performance differences. Consistent with the expectations derived from the theoretical framework, no performance differences were found between Corporate innovators and Integrated players or between Implementers and Differentiated innovators.

5. DISCUSSION AND CONCLUSION

The results support the importance of the knowledge role in understanding performance within multi-business firms. The beneficial effects of knowledge signaling and knowledge learning provide Corporate innovators and Integrated players with performance advantages over Implementers and Differentiated innovators which suffer from the detrimental effects of knowledge depreciation and knowledge isolation, respectively. The findings are therefore consistent with the proposed framework which matches knowledge roles with knowledge
effects in order to derive prescriptive implications (see Figure 1). Previous studies dealing with the performance consequences of internal knowledge transfer do not make the distinction between knowledge inflows and knowledge outflows, and neither do they consider their integration using the concept of the knowledge role, which could explain the contradictory findings derived from these studies (Ding et al. 2013). The results suggest that future studies would benefit from considering not only the intensity but also the directionality of the internal knowledge transfer processes.

5.1. Research implications

The results also contribute to the ongoing research regarding the link between internal knowledge transfer and absorptive capacity (Chang et al. 2012, Kumar et al. 2009, Mahnke et al. 2005, Minbaeva et al. 2003, Tsai 2001), which has been identified as the strongest linkage in the research on cross-unit knowledge transfer to date (Minbaeva 2007). In a study that explicitly addresses the receiving unit’s absorptive capacity and the business performance impact of knowledge inflows from other within-firm sending units, Mahnke et al. (2005) state the need to consider the role of both knowledge inflows and outflows in the analysis of the performance consequences of internal knowledge transfer processes. They suggest that units which benefit from high knowledge inflows in the presence of a high absorptive capacity probably also provide the rest of the corporation with key knowledge. This profile overlaps with precisely the Integrated player category analyzed in the present study. Future works may investigate whether absorptive capacity varies throughout knowledge roles, with Integrated players outperforming the remaining categories in this respect.

A further avenue of research in which the four knowledge roles look promising is the link between social capital and internal knowledge transfer (Kumar et al. 2009), which is the second strongest linkage to account for cross-unit knowledge transfer (Minbaeva 2007). One of the major determinants of social capital within organizations, such as the place a business
unit occupies within the internal network, can be straightforwardly related to this framework. Both Corporate innovators and Integrated players have network centrality and have the corresponding advantages of being well connected to the internal knowledge network. On the contrary, Differentiated innovators and, to a lesser extent, Implementers occupy peripheral positions within the internal knowledge network and are consequently at a disadvantage in comparison with their centric counterparts. Future studies may extend this classification by comparing the level of social capital and network centrality in the different knowledge roles.

5.2. Managerial implications

This work has several implications for both corporate officers and division general managers. The results show that there are winners and losers in the quest for corporate synergies based on knowledge assets. Knowledge-creating divisions within the knowledge network take advantage of knowledge transfer by mobilizing their own resource base (Corporate innovators) and learning from the rest of the corporation through a strong absorptive capacity (Integrated players). On the contrary, divisions that are weak in knowledge outflow are isolated from the knowledge network (differentiated players) or occupy peripheral positions that relegate them to a passive role as users of knowledge from the rest of the corporation (Implementers).

From the perspective of division general managers, it is useful to trace the knowledge role of their divisions by employing the easy-to-use schema outlined in Figure 1. If the division occupies a differentiated innovator role, the general manager could seek opportunities to integrate his or her division into the knowledge network by means of (a) new products within the division based on knowledge from peer divisions, (b) new products from within other divisions based on knowledge from the focal division, or (c) completely new businesses based on the recombination of knowledge from the focal division and peer divisions. Otherwise, the likelihood of being sold to other corporations would appear to be high. If the division plays an
implementer role, the recipe is to strengthen its absorptive capacity with the purpose of learning as much as possible from the knowledge inflow from the rest of the corporation. The adoption of concrete initiatives to make the division a learning organization may provide it with the opportunity to become a corporate innovator or an integrated player in the medium to long term.

From a corporate officer perspective, the viewpoint must change toward the whole division knowledge role portfolio. An important concern for corporate officers would be to determine whether Differentiated innovators and Implementers are necessary for the corporate knowledge network to perform well. This study does not provide a definitive answer to this question because it has analyzed some divisions belonging to different firms rather than all the divisions from each firm, but it appears that the corporate cast involves the distribution of both winning and losing roles. Future works could compare the performance outcomes of knowledge role portfolios from different multi-business firms.

5.3. Limitations and future research

This study has some limitations which are also avenues for future research. The first limitation deals with the business divisions into which the sample firms were organized. As indicated in the theoretical section, business divisions from multi-business firms represent the issue of crossing technological boundaries in knowledge transfer better than foreign subsidiaries from multinational firms, with the latter firms better reflecting the issue of crossing geographical/cultural boundaries (Miller et al. 2007). Most divisions in the sample were built around a product and/or technology, but some variations as regards the geographical scope or customer type were also observed. This study makes a contribution to the underexplored setting of multi-business firms by taking business divisions as the unit of analysis. Future studies may consider both business divisions and foreign subsidiaries as the unit of analysis in order to differentiate between the challenges of crossing technological and geographical boundaries. In
particular, it may be possible that the prescriptive framework based on the four effects of knowledge transfer entails different implications when crossing geographical rather than technological boundaries.

The concept of knowledge role adopted in this study is based on the amount and directionality of actual knowledge flows among business divisions, notwithstanding other important dimensions such as the explicit or tacit knowledge transferred (Lee and MacMillan 2008), the eccentric or central position of the divisions involved in knowledge transfer (Tsai 2001) or the organizational distant or proximate positions amongst divisions (Boschma 2005). Future studies may extend the concept of knowledge role to some of these dimensions, or may alternatively investigate how these dimensions vary throughout the four knowledge roles. It might, for example, be interesting to use the research done on inter-organizational collaboration (Capaldo and Petruzelli 2014, Knoben and Oerlemans 2006) to address how different forms of proximity are associated with the knowledge roles.

A further limitation of this study lies in the fact that external knowledge flows are not taken into account. Business divisions may source knowledge not only from internal peers but also from external partners, suppliers or customers, and may similarly be providers of knowledge to partners, distributors or suppliers according to open business models in multi-business firms (Chesbrough 2003). Using the expressions coined by Rosenkopf and Nerkar (2001), this study considers only internal boundary-spanning activities in order to conceptualize the four knowledge roles, thus discarding external organizational boundary-spanning activities. Future studies may extend the classification of four knowledge roles to the external domain, particularly in the light of recent evidence suggesting that internal boundary-spanning activities are not always conducive to performance improvements, at least in the case of innovative outcomes (Capaldo and Petruzelli 2014).
This study delineates the four knowledge roles and develops their prescriptive implications around knowledge signaling, learning, depreciation and isolation, but does not deal with the reasons why a business division adopts one knowledge role or another within the knowledge network. Future studies may investigate the strategic and organizational correlates of the different knowledge roles in order to shed further light on this integrating concept in the knowledge management field.
FIGURE 1

Knowledge role, predominant effect and division performance

| Outflow of knowledge from the focal division to the rest of the corporation |
| --- | --- | --- |
| Low | High |
| \[ \text{INTEGRATED PLAYER} \]
\[ (+) \]
\[ \text{KNOWLEDGE LEARNING} \] |
| \[ \text{CORPORATE INNOVATOR} \]
\[ (+) \]
\[ \text{KNOWLEDGE SIGNALING} \] |
| \[ \text{DIFFERENTIATED INNOVATOR} \]
\[ (-) \]
\[ \text{KNOWLEDGE ISOLATION} \] |
| \[ \text{IMPLEMENTER} \]
\[ (-) \]
\[ \text{KNOWLEDGE DEPRECIATION} \] |

Inflow of knowledge from the rest of the corporation to the focal division
# TABLE 1

## Division knowledge role and performance effects of knowledge transfer

<table>
<thead>
<tr>
<th>Knowledge role</th>
<th>Knowledge SIGNALING(^{(1)})</th>
<th>Knowledge LEARNING(^{(1)})</th>
<th>Knowledge DEPRECIATION(^{(2)})</th>
<th>Knowledge ISOLATION(^{(2)})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate innovator</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Integrated player</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Differentiated innovator</td>
<td>−</td>
<td>−</td>
<td>+</td>
<td>−</td>
</tr>
<tr>
<td>Implementer</td>
<td>−</td>
<td>+</td>
<td>−</td>
<td>−</td>
</tr>
</tbody>
</table>

\(^{(1)}\) A positive sign denotes that benefits are obtained from the corresponding favorable effect, whereas a negative sign denotes that the division does not obtain the beneficial effects of knowledge transfer.

\(^{(2)}\) A positive sign denotes that damages from the corresponding detrimental effect are avoided, whereas a negative sign indicates that the division suffers from the unfavorable effects of knowledge transfer.
### TABLE 2

Division Knowledge Role based on Knowledge Flow Patterns

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Knowledge Outflow Mean (SD)</th>
<th>Knowledge Inflow Mean (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differentiated Innovator&lt;sup&gt;(1)&lt;/sup&gt;</td>
<td>087</td>
<td>1.897 (0.459)</td>
<td>1.644 (0.377)</td>
</tr>
<tr>
<td>Corporate Implementer&lt;sup&gt;(2)&lt;/sup&gt;</td>
<td>028</td>
<td>2.206 (0.379)</td>
<td>2.780 (0.430)</td>
</tr>
<tr>
<td>Corporate Innovator&lt;sup&gt;(3)&lt;/sup&gt;</td>
<td>027</td>
<td>3.179 (0.427)</td>
<td>1.849 (0.331)</td>
</tr>
<tr>
<td>Integrated Player&lt;sup&gt;(4)&lt;/sup&gt;</td>
<td>083</td>
<td>3.266 (0.396)</td>
<td>2.977 (0.475)</td>
</tr>
<tr>
<td>Total</td>
<td>225</td>
<td>2.710 (0.783)</td>
<td>2.421 (0.737)</td>
</tr>
</tbody>
</table>

<sup>(1)</sup> Knowledge outflow less than 2.642 and knowledge inflow less than 2.285.

<sup>(2)</sup> Knowledge outflow less than 2.642 and knowledge inflow greater than 2.285.

<sup>(3)</sup> Knowledge outflow greater than 2.642 and knowledge inflow less than 2.285.

<sup>(4)</sup> Knowledge outflow greater than 2.642 and knowledge inflow greater than 2.285.
## TABLE 3

**ANCOVA of Division Performance using Knowledge Role**

### I. Analysis of Covariance

<table>
<thead>
<tr>
<th>Effect</th>
<th>Source</th>
<th>N</th>
<th>Mean (SD)</th>
<th>F-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main</strong></td>
<td>Differentiated innovator</td>
<td>87</td>
<td>3.560 (0.461)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Corporate implementer</td>
<td>28</td>
<td>3.511 (0.595)</td>
<td>05.132**</td>
</tr>
<tr>
<td></td>
<td>Corporate innovator</td>
<td>27</td>
<td>3.865 (0.574)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integrated player</td>
<td>83</td>
<td>3.848 (0.499)</td>
<td></td>
</tr>
<tr>
<td><strong>Covariate</strong></td>
<td>Division size</td>
<td>225</td>
<td>5.746 (2.291)</td>
<td>03.325*</td>
</tr>
<tr>
<td></td>
<td>Water, energy &amp; telecoms</td>
<td>33</td>
<td>0.150 (0.353)</td>
<td>08.303**</td>
</tr>
<tr>
<td></td>
<td>Banking &amp; insurance</td>
<td>59</td>
<td>0.260 (0.440)</td>
<td>14.224**</td>
</tr>
<tr>
<td></td>
<td>Construction &amp; real estate</td>
<td>73</td>
<td>0.330 (0.470)</td>
<td>07.339**</td>
</tr>
<tr>
<td></td>
<td>Environmental uncertainty</td>
<td>225</td>
<td>2.535 (0.444)</td>
<td>02.400</td>
</tr>
<tr>
<td></td>
<td>Dominant diversification</td>
<td>57</td>
<td>0.250 (0.435)</td>
<td>00.231</td>
</tr>
<tr>
<td></td>
<td>Related diversification</td>
<td>118</td>
<td>0.520 (0.501)</td>
<td>00.099</td>
</tr>
<tr>
<td></td>
<td>Prospector Orientation</td>
<td>225</td>
<td>4.530 (1.316)</td>
<td>08.880**</td>
</tr>
<tr>
<td></td>
<td>Build strategic mission</td>
<td>225</td>
<td>3.020 (0.994)</td>
<td>03.058*</td>
</tr>
</tbody>
</table>

| Total**         | Corrected Model**           | –  | –           | 05.256**|

### II. Post Hoc (Scheffé)**

<table>
<thead>
<tr>
<th>Source</th>
<th>Comparison</th>
<th>Difference</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporate Innovator</td>
<td>Differentiated Innovator</td>
<td>0.300*</td>
<td>0.114</td>
</tr>
<tr>
<td></td>
<td>Corporate Implementer</td>
<td>0.354*</td>
<td>0.140</td>
</tr>
<tr>
<td></td>
<td>Integrated Player</td>
<td>-0.020</td>
<td>0.114</td>
</tr>
<tr>
<td>Integrated Player</td>
<td>Differentiated Innovator</td>
<td>0.320**</td>
<td>0.078</td>
</tr>
<tr>
<td></td>
<td>Corporate Implementer</td>
<td>0.374*</td>
<td>0.112</td>
</tr>
<tr>
<td></td>
<td>Corporate Innovator</td>
<td>0.020</td>
<td>0.114</td>
</tr>
</tbody>
</table>

**p < 0.01;  * p < 0.05;  + p < 0.10

(1) Means and standard deviations are corrected values through the use of a linear regression model with division size, industry membership, environmental uncertainty, diversification strategy, prospector orientation and build strategic mission as explanatory variables (R²=0.240).

(2) Industry membership dummy variable; the effects must be interpreted in contrast with the omitted ‘Manufacturing’ category.

(3) Diversification strategy dummy variable; the effects must be interpreted in contrast with the omitted Unrelated diversification category.

(4) Model significance including the main effect of knowledge role and the effect of covariates (division size, industry membership, environmental uncertainty, diversification strategy, prospector orientation and build strategic mission).

(5) Levene’s test does not reject the null hypothesis of variance homogeneity (F= 1.440; p = .232).

(6) The 12 methods based on the variance homogeneity assumption detect significant differences. This study presents the results using the Scheffé method since it is the more conservative, that is to say, it is that which detects the smaller differences in division performance.
REFERENCES


Cross, R. and Thomas, R.J. (2009), Driving Results through Social Networks: How Top Organizations Leverage Networks for Performance and Growth, John Wiley & Sons, San Francisco, C.A.


