Absorptive capacity and performance: 
The role of customer relationship and technological capabilities

1. Introduction
In today’s knowledge-intensive business environment it is imperative for firms to acquire and use external knowledge to advance innovation and enhance performance (Abecassis-Moedas & Mahmoud-Jouini, 2008; Lane et al., 2001). Easy to say, hard to put into practice. The journey from the acquisition of knowledge to its productive use is not an easy one and many firms struggle, especially in high technology industries (Hull & Covin, 2010; McGrath, 2001; Rothaermel & Deeds, 2004; Smith, et. al, 2005). To address that, firms need, among other things, to develop their absorptive capacity (ACAP) (Cohen & Levinthal, 1989, 1990), a notion that is increasingly being recognized as a source of competitive advantage (Jansen et al., 2005; Zahra & George, 2002; Tu et al., 2006). ACAP reflects the firm’s ability to utilize external technologies through three interactive processes, namely exploratory, transformative and exploitative learning (Lane et al., 2006: 856).

Knowing that firms vary in the successful utilization of knowledge (Cassiman & Veugelers, 2006; Escribano, et al., 2009), scholars have urged for more research to elucidate the character, antecedents/determinants and outcomes of ACAP (Zahra & George, 2002; Lane, et al., 2006; Todorova & Durisin, 2007). Recent calls have directed attention to integrated perspectives whereby ACAP is not approached in a vacuum but within the wider context of a firm’s effort to develop and exploit innovations (e.g. Vega-Jurado, et al, 2008; Kostopoulos, et al., 2010; Zhou & Wu, 2010). Drawing lessons from a marketing management perspective, the recipe for success on innovation is best reflected in a balanced attention to the technological and customer related aspects of the innovation venture (Baker & Sinkula, 1999; Morgan et al., 2009). To achieve this firms invest heavily in acquiring, among other things, two seemingly distinct but inextricably linked capabilities, namely technological capability (TC) and customer relationship management capability (CRC). It may then seem logical to assume that innovation performance is associated with organizational contexts where the ACAP of the firm is driven by a strong TC and CRC. Or in practical terms, it is reasonable to assume that the more a firm has a clear ability to use various technologies (TC) and capitalize on a deep understanding of its customer base (CRC) the higher it will be its capacity to explore, integrate and exploit (ACAP) external technologies and by implication the better its product, market and financial performance will be.

In addressing the above mentioned assumption, the study contributes to the literature in three ways. First, by investigating the effects of TC and CRC on ACAP, this study introduces an important forerunner of ACAP which prior theoretical literature has indicated, though not spelled out (van den Bosch, et al., 1999; Cohen & Levinthal, 1990; Jansen et al., 2005; Lane et al., 2006). Second, the study contributes to the literature on the resource-based view of the firm (Jansen, et al., 2006; Kogut & Zander, 1992) by identifying and testing unique pathways through which managers can enhance their firm’s ACAP, as well as pathways through which ACAP contributes ultimately to the overall performance of the firm. Finally the study contributes to an increasing body of literature on ACAP’s outcomes (e.g. Arbussà & Coenders, 2007; Fosfuri & Tribó, 2008; Lichtenhaler, 2009) by adding empirical evidence from technology-intensive firms.

What follows is a review of the relevant literature leading to specific hypotheses, alongside an explanation of the research methods used to address these hypotheses and the discussion of the results emanating from this study.
2. Relevant Theory & Hypotheses

2.1 Absorptive Capacity and Organizational Performance

Firms are confronting an ever-changing and increasingly complex environment (Grant, 1996; O’Connor, 2008). ACAP enables firms to respond and persist better in such dynamic complexity (Cohen & Levinthal, 1989, 1990). ACAP acts as a funneling or screening mechanism to productively utilize external knowledge for organizational advantage (Lane & Lubatkin, 1998; Zahra & George, 2002). This utilization involves a pathway from the identification and acquisition of external knowledge (exploratory learning), through its assimilation, understanding and retention (transformative learning) to its transmutation and application (exploitative learning) (Lane et al., 2006; Lichtenthaler, 2009).

In exploratory learning, organizations continuously scan the environment to identify and collect industry information, observe technological trends, and identify sources of new and state-of-the-art technologies. However, knowledge acquisition is a necessary, but not sufficient condition for knowledge application (McGrath, 2001). Atuahene-Gima & Wei (2011) in the context of problem-solving competence argue that the mere generation of market knowledge will not affect new product performance unless project members have the ability to use the information (Cassiman & Veugelers, 2006; Daft & Weick, 1984). Knowledge application and use requires firms to be proficient in translating knowledge into new products and services. Exploitative learning of ACAP captures this translation process (Lane et al., 2006) through the transmutation of knowledge assimilated earlier and its subsequent application (Lichtenthaler, 2009). However, the pathway from the exploration of knowledge to its application is not as straightforward as it seems (Argote et al., 2003; Garud & Nayyar, 1994). It requires knowledge to be analyzed, understood and retained in forms suitable to its use. External knowledge is analyzed, understood and retained through transformative learning (Lichtenthaler, 2009).

ACAP has been associated with a firm’s innovative capabilities and innovation performance (Cohen & Levinthal, 1989, 1990). Studies argue that ACAP increases both the frequency and speed of innovations (Lane et al., 2006) in the shape of new products and services (Leonard-Barton, 1995; Leonard & Sensiper, 1998). The creation of new products and services involves the combination of external and internal knowledge of the organization (Nonaka et al., 2008). Therefore, one would expect that firms which have appreciated and developed their ACAP will be in a better position to capture and utilize opportunities in a dynamic environment (Jansen et al., 2006), and translate these opportunities into profitable products and services (Lichtenthaler, 2009, Fosfuri & Tribó, 2008; Escribano et al., 2009; Zahra & George, 2002). Following these, we suggest the following hypothesis.

Hypothesis 1: The higher the absorptive capacity, the higher is firms’ performance.

2.2. Technological Capability and Absorptive Capacity

Technological capability is the ability to perform any relevant technical function or volume activity within the firm including the ability to develop new products and processes and to operate facilities effectively (Teece et al., 1997: 521). Firms with well developed technological capabilities tend to be high performing (McEvily et al., 2004) because they are able to pioneer process innovations leading to efficiency gains (Teece et al., 1997). They are also more innovative (Afuah, 2002) and can achieve higher differentiation by innovating products in response to the changing market environment (Teece & Pisano, 1994; Verona, 1999).

Technological capability relates both to ACAP’s exploratory and exploitative learning (Zhao & Wu, 2010). Developing a firm’s technological capability requires investments in, among others, R&D which helps the exploration of new innovations (Afuah, 2002). When a firm develops its technological capability its receptivity to external information increases (Berkhout et
This receptivity further increases the ability of the firm to identify new technological developments and trends as a reinforcing cycle of exploratory innovation whereby the speed with which the firm is able to discover new opportunities increases (Rosenkopf & Nerkar, 2001). Thus, the higher the level of technological capability, the higher is the firm’s likelihood of engaging in exploratory innovation (Lavie & Rosenkopf, 2006). At the same time, developing a firm’s technological capability also involves knowledge to be accumulated and stored (Afuah, 2002). The accumulation of technological knowledge not only increases product innovation skills, but also the firm’s ability to evaluate, use and implement new technologies (Zahra & George, 2002). Similarly, Rothaermel & Deeds (2004) find that an entrepreneurial venture with strong technological capabilities tends to engage in more exploitation alliances to gain access to complementary assets such as manufacturing. As firms accumulate more knowledge and experience, they become more efficient in employing their existing knowledge (Benner & Tushman, 2003) and, thus generate more exploitative activities due to the self-reinforcing nature of learning (Zhao & Wu, 2010). Thus the higher the level of technological capability of the firm in a particular field, the higher is the likelihood that it will foster more exploitation in that field (Levinthal & March, 1993). Overall, technical capability of a firm helps the firm to identify, evaluate and select external information and technologies for adoption, i.e. ACAP. Thus, we suggest the following hypothesis:

Hypothesis 2: The higher the technological capability of a firm, the higher is its absorptive capacity.

2.3. Customer Relationship Capability and Absorptive Capacity
Customer relationship capability establishes and maintains value based relationships with end-users of a firm (Mentzer et al., 2001). With the increasing competition in the contemporary era, it is becoming imperative for firms to adopt a customer-focus (Payne & Frow, 2005). Customer relationships require firms to focus on key customers and fully understand as well as satisfy the needs and requirements of these customers on a continuous basis (Goldsmith, 2010). The aim is for the firm to ensure customer retention and loyalty (Kumar & Shah, 2004; Verhoef, 2003) based on customer satisfaction which is a key determinant in customers’ decisions on whether or not to continue a business relationship (Rust et al., 1995). The key in this process is the firm’s ability to deliver value which matches buyer’s expectations and perception of a product’s performance (Kumar et al., 2003). The greater this match, the greater is the customer satisfaction. But the more this match repeatedly occurs, the more customer loyalty is generated. The firm, therefore, is able to develop lasting, long-term customer relationship, which are based on cumulative customer satisfaction over time (Reinartz & Kumar, 2002). Critical in the customer relationship capability is the ability of the firm to acquire knowledge about customers and creatively using this knowledge to develop new products and services (Anderson & Srinivasan, 2003). Berkhout et al. (2010) note that the successful development and diffusion of innovative new products usually stem from the insights with respect to understanding potential customers and their marketing needs. Important also in this value creation for customers is the continuous adaptation of products and services based on the evolving needs and requirements of customers (Stringfellow et al., 2004). This entails that the customer relationship capability involves a continuous process of market search in order to identify customer needs and changes in customer tastes and preferences.

Customer relationship capability is an important source for a firm’s ACAP. The primary input of ACAP is external knowledge inflows (Kostopoulos et al., 2010). ACAP also involves how this external knowledge is used for exploring new ideas, and integrating and implementing these ideas (Lichtenthaler, 2009) for their translation into useful products and services (Zahra &
George, 2002). Customer relationship capability enables the firm to do just that. It is inherently focused on customers and by identifying their changing needs and requirements it essentially involves a constant search for market knowledge (Berkhout et al., 2010), which helps firms to select strategies to match these needs by developing innovative products and services that deliver real value to the customers (Lane et al., 2006; Zahra & George, 2002). Thus, we suggest the following hypothesis:

_Hypothesis 3: The higher the customer relationship capability of a firm, the higher is its absorptive capacity._

3. Method & measures

Primary data collection took place in South Korea’s semiconductors industry by attending two major industrial exhibitions. Semicon Korea and Led Korea 2011 were organized by the Semiconductor Equipment and Materials International (SEMI) and are the region’s largest exhibitions dedicated to advanced microelectronics manufacturing. Questionnaires were distributed to all exhibiting firms by means of a drop-and-collect-survey method. This survey method has advantages in terms of achieving high response rates (Ibeh et al., 2004). To address any common method bias (Podsakoff & Organ, 1986) we collected data from two informants in each company. Four hundred and fifty nine companies (459) attended the two exhibitions. We dropped a pair of questionnaires to 445 companies and collected them by the end of the exhibition. Of the 228 firms that responded, we received a usable 219 matched pairs, (438 questionnaires) thus providing us with an effective response rate of 49.2%.

Variables measurement was achieved by means of likert-type scales ranging from 1-5; where 1: strongly disagree and 5: strongly agree. Scales were adapted or developed from existing literature. Absorptive capacity (ACAP) was measured with the use of 18 questions adapted from the works of Jansen et al. (2005), Todorova and Durisin (2007) and Lichtenhaler (2009). Technological capability (TC) was measured with a four item construct based on insights from the works of Tsai (2004), Ortega (2010), and Zhou and Wu (2010). Customer Relationship Capability (CRC) was measured with a four item construct based on insights from the works of Ryals (2005), Reinartz et al. (2004), Reimann et al. (2010). In both TC and CRC measures the scales used ranged from 1 to 5, where 1: much worse than competitors and 5: much better than competitors. Finally performance was measured with 16 items reflecting three constructs, namely performance of the NPD programme, customer satisfaction and profitability compared to major competitors (Scale 1 to 5 as above), as in Vorhies and Morgan (2005).

To avoid common methods bias (Podsakoff & Organ, 1986) we employed a number of steps. First, depended variables were included at the end of the questionnaire to avoid post-hoc rationalization. Second, we used Harman’s one factor test and we found no single one factor. Finally, during the analysis we used performance data (dependent variable) from one of the two respondents and data for the independent variables from the second respondent (ibid.).

4. Analysis and results

We used Structural Equation Modeling in MPlus 6.11 (Muthen & Muthen, 2010) to test for the hypothesized relationships. For the measurement model we employed Exploratory Structural Equation Modeling (Asparouhov & Muthén, 2009) which combines exploratory and confirmatory factor analysis in one procedure. The technique was employed for an eight-factor structure, which were clearly identified and with excellent fit to the overall data, ($\chi^2=460; df=343$ RMSEA=0.040; CFI=.994; and WRMR=0.397). The existence of second order structures for model measurement was confirmed for the constructs of absorptive capacity (consisting of
exploration, transformation, exploitation) and performance (consisting of new product development, customer and profitability performance).

The overall structural model is presented in the following figure 1. Fit statistics for this model are ($\chi^2 = 680; df=548$ (base model: 21224, $df=595$) RMSEA=0.033; CFI=.994; and WRMR=0.771) (Browne & Cudeck, 1993; Yu & Muthén, 2001).

![Figure 1: The structural model.](image)

The resulting model provides confirmation for the influence of technological and customer relationship capability on the absorptive capacity of the firm as well as the direct relationship between absorptive capacity and performance. Interestingly, the best fit of the structural model is obtained when the relationships between technological and customer relationship capability with performance are taken into account, as well as the interaction among themselves.

5. **Conclusions and implications**

Notwithstanding the limitations of this study (a small sample size in one country’s single industrial sector) our research provides important evidence in support of the interplay between absorptive capacity, technological and customer relationship capability and how it contributes to the firms’ overall performance. The structural pattern that emerged points to the fact that better performance should be expected by firms that have managed to accompany their effort to utilize externally held knowledge with a clear capability to identify, evaluate and recognize important technologies as well as engage in this effort with a clear customer value imperative. Interestingly the model directs attention to the interaction between technological and customer relationship capability as a precondition for the best fit of the model. In other words neither of the two capabilities seems sufficient on its own. Rather it is firms that adopt a balanced approach (i.e. technological capability alongside attention to customer relationships) that get the better performance.

For managers of technology-intensive firms, there is a very useful lesson alongside associated resource allocation guidance. This is, if you wish to have the best possible performance for your firm, you should navigate your firm’s exploration and exploitation of external technologies effort through the lenses of a balanced approach to your technological and customer relationship capability.
References


