Innovation, Second Mover
and Network System[*]

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Abstract

In global markets a new typology of firm is emerging. Such new kind of firm has been defined second mover as it combines strategies of innovation and imitation. The purpose of this paper is to identify which external factors of network system positively influence the business performance of a second mover firm by applying a PLS-Path Modeling analysis to the Chinese and Middle Eastern markets.

Our findings demonstrate that the presence of a supporting government, investment funds, and a collaborative competitive environment exercise a beneficial impact on the business performance of an second mover firm, while R&D and human resources do not represent predictors of a firm's success.

Keywords: Imitation; Innovation; Network System; Second Mover; China; Middle East

1. Global Markets and Second Movers: Imitation and Innovation

In today's global economic system, *Land, Labor and Capital,* as defined by Adam Smith (1776) are not the sole key strategic factors determining the efficiency of a firm. Some authors have added to them innovation (Schumpeter 1939), imitation (Levitt 1966) and knowledge (Drucker 1993).

Within such a context a new kind of firm emerges: second mover (Hoppe, Lehmann Grube 2001; Oded 2010).

This kind of firm combines aspects of both imitation and innovation strategies (Zhou 2009). It exploits the external resources and capabilities of its own network system in order to improve its business performance and increase its technological capabilities (Freeman 1987). The second mover firm takes inspiration from successful innovative products and partly imitates them while offering a product that is different from the original, with higher technical specifications and/or lower production costs. For the creation of a new product, the second mover firm typically exploits the knowledge available in its own network system. Such

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knowledge exploitation is defined as the process through which a firm acquires, absorbs, and combines existing knowledge, and transforms it into new knowledge. It includes a wide range of activities aimed at improving existing technology beyond the original design parameter (Kim 1997). Second mover firms, normally, pursue their objectives and their strategic actions by means of design copying, creative adaptation, technological leapfrogging and adaptation to another industry (Hobday 1995).

It has been argued that the business performance of second mover firms is determined from network system factors as government, R&D, human resources, competitive environment and investment funds (Amara, Landry 2005; Knudsen 2007; Li et al. 2010). These studies, however, do not clarify what is the respective relevance of such factors on the business performance of second mover firms.

The purpose of this paper is thus to scrutinize the extent to which government, R&D, human resources, competitive environment and investment funds positively influence the business performance of an second mover firm. To this end a PLS-Path modeling analysis of second mover firms in the Chinese and Middle Eastern markets will be undertaken. There is large number of second mover firms in the Chinese and Middle East, there is the growth of 80%. An example of second mover firms in these markets are in China Biadu's search, that it is born from idea of Google, while in Middle East Maktob, that it has originated by Yahoo's business view (Oded 2010; WEF 2011).

2. Literature Review

The second mover firm, characteristically, does not develop a distinctive internal innovative capability but, through a process of knowledge exploitation of other firms' or other organizations' (e.g. government, research center etc.) technological capabilities, successfully and rapidly reproduces a product that other companies have previously devised and launched on the market while improving the overall quality or cost-effectiveness of the product in question (Oded 2010).

This firm improves its business performance through network system factors such as government, R&D, human resources, competitive environment and investment funds. For example, Amara and Landry (2005) empirically show that the government and universities can increase the business performance of a second mover firm. Knudsen (2007) adds that the relationships with universities and research institutes have a positive effect on innovative performance especially in the long run. Hillman et al. (1999) suggest how executives' service of the Government had a positive effect on firm performance reducing uncertainty and transaction costs, and increasing the level of legitimacy and prestige of the second mover firm. Institutional forces can therefore influence profit and performance in many ways. The co-effect of social investment and the institutional *milieu* creates the context for firm strategy and rivalry (Porter 2000), and trust, norms and networks contribute to the efficiency of a firm by facilitating coordinated actions (Lorenz 1992). Not only will firms be influenced by the institutional environment, and be recipients of its input, but also that they will interact with the institutional environment for their own benefit as financial support or exploitation knowledge (Aragon-Correa 1998). Therefore the second mover firms can acquire knowledge,

particularly tacit knowledge, through hiring talented employees from foreign firms, by developing valuable business networks (e.g. supplier–customer networks) with foreign firms, and by accessing social networks of foreign employees in the same location (Li et al. 2010).

The development of a new product can be originated from various sources, not only internal to the firm, but also external, including customers, competitors and others sources outside the industry, such as supporting companies, universities, government, and research centre (Kessler et al. 2000). These external factors are much more than background conditions, they are the predictors of success of a second mover firms (Ingram, Silverman 2002). They have an essential role in a market, supporting the effective functioning of the economic system, such that firms and individuals can engage in market transactions without incurring undue costs or risks (Peng et al. 2008; Corniani 2010).

3. Imitation, Innovation and Second Movers. The China and Middle East Cases

The Chinese and Middle East markets provide the perfect environment to observe how government, R&D, human resources, competitive environment, and investment funds do, in fact, positively influence the business performance of second mover firms. With the globalization of the market, the second mover firms principally are spread out in China and Middle East (WEF 2011). At the outset, it must be noted that the government is the leading driver of the economy thanks to reforms and investment to the research centre (Rose et al. 2009). For example, in China the government has introduced the Torch Program[1] and in some country of Middle East it has established Free Zones[2].

The quality of scientific research is also supporting second mover firms thanks to public and private investments. As a result, in China there has been an increase of 34% in patents registration (WIPO 2012). In Middle East, on the other hand, the biggest boost to innovation comes from the establishment of knowledge innovation cluster (e.g. Berytech in Lebanon, Oasis 500 in Jordan, and *Plug & Play* in Egypt).

The investment funds support the growth and efficient of second mover firms (Hu et al., 2012). In 2011, private investments has been increased of 37.1% in China and in Middle East of 44 % (WEF 2011)

Another of the external factor that positively influences the performance of an second mover is the competitive environment. In the Chinese and Middle Eastern markets it is articulated through strategic alliances between second mover firms and multinational, which are generally subdivided in equity alliances and non-equity alliances. The equity alliance is a partnership between two or more firms that establish a new company by combining some of their resources and capabilities and owning different percentages of this new company (e.g. joint venture). Differently, a non-equity alliance is a form of long-term cooperation where two or more firms share own resources and capability (e.g. R&D partnership) (Brondoni 2003; Gnecchi 2009). Interestingly, the share of alliance in United Arab Emirates of Middle Eastern market has a growth of 87.6 while in China of 20.4 (The Global Innovation Index 2012).

Finally, the situation of human resources is a quite peculiar one because the number of knowledge workers is particularly low when compared with the whole labour force. For example, in Middle Eastern markets knowledge workers are overwhelmingly foreigners.

4. Empirical Analysis: the Findings via PLS-PM

The abovementioned studies have largely left unexplored the impact that network system factors (e.g. government, investment funds, competitive environment, human resources and, R&D) have on the business performance of second mover firms.

The present analysis discusses and empirically estimates the correlation between these network system factors and second mover firms in order to verify the subsequent research hypothesis, formulated on the basis of current literature (Hillman et al. 1999; Hoppe, Lehmann Grube 2001; Amara, Landry 2005; Knudsen 2007; Oded 2010) and the data provided by the Centre for Global Competitiveness and Performance Organization World Economic Forum (2010-2011) concerning the competitiveness of the Chinese and Middle Eastern markets:

Hp1: Network system factors (e.g. government, investment funds, competitive environment, human resources, and R&D) positively influence the business performance of second mover firms.

Hp2: The government plays the part of second mover firms' provider.

Hp3: The public and private investment funds subsidize the relationship between firms or firm and research centres.

Hp4: The competitive environment facilitates the creation of strategic alliances so as to improve knowledge exploitation process.

In order to verify these hypotheses we have built following research model. First, we have selected 100 Middle Eastern firms and 100 Chinese firms on the basis of the succeeding parameters: 1. innovation level; 2. low level of specialized human resources; 3. inadequate R&D investments; 4. the presence of an intense network among firms; 5. all firms belong to IT and TLC sectors. These parameters have been chosen with reference to a literary review focused on second mover strategies.

Subsequently, we have taken in consideration the data regarding these firms in relation to five network system factors: i.e. government, investment funds, competitive environment, human resources and, R&D. The goal of the following analysis is to evaluate the respective impact of each of these factors on the business performance of second mover firms through the application of the PLS-Path Modeling.

PLS-Path Modeling (or Partial Least Squares approach to Structural Equation Modeling) is a program system for latent variable path analysis which follows the methods initially described by Wold (1966), elaborated by Fornell and Bookstein (1982), and fully programmed by Lohmoller (1984).

The concept of a Latent Variable Path (LVP) model is a combination of a factor model and a path model. The factor model part, often referred to as the outer or measurement model, represents the association between manifest (observed or measured) variables (MVs) and latent (unobserved constructs) variables (LVs) as a

linear equation system. The path model part, referred to as the inner or structural model, represents the association between the LVs as a linear equation system.

Mainly this methodology is used to predict a set of dependent variables from a large set of independent variables. Therefore the PLS-PM is also becoming a tool of a choice in the social and economic sciences and a multivariate technique for non-experimental and experimental data alike (Chin 1998).

The main characterizes of PLS-PM can be listed as follows:

- The LVs are estimated as linear aggregates or components.
- The LV scores are estimated directly. If raw data is not input scoring coefficients are estimated.
- Being a component method, PLS covers principal component, canonical correlation, redundancy, inter-battery factor, multi-set canonical correlation, multi-battery factor, and correspondence analysis as special cases.
- PLS-PM requires only "soft" assumptions about the distribution characteristics of the raw data.
- PLS estimation is as fast, simple, and generally as successful as a principal components analysis.

With regards to the present study, six latent variables and nineteen manifest variables have been individuated (Table 1).

Table 1: *Latent Variables and Manifest Variables*

Latent Variables	Manifest Variables
Second mover strategy	*technology absorption* *technology transfer* *new technology* innovation capacity
Investment funds	*local equity market* bank loans *venture capital*
Human resources	education *business woman* *knowledge worker*
R&D	investment in R&D from firm Scentific Publication relationship between research centre and firms
Competitive environment	strategy alliances *start up* multinationals
Government	public funds fiscal burden investment in ICT sector

We have used PLS-PM's quality indexes to evaluate the unidimensionality of blocks of latent variables in reference to their own manifest variables (analysis of principal component of the block MVs, Cronbach's alpha and Dillon–Goldstein's) and to estimate the correlation between the endogenous LVs (coefficient of determination R^2). Then we have adopted a bootstrap approach to measure the correlation between exogenous or independent LVs (e.g. government, investment funds, competitive environment, human resources, R&D) in relation to endogenous or dependent LV (e.g. second mover strategy) (Chin 1998).
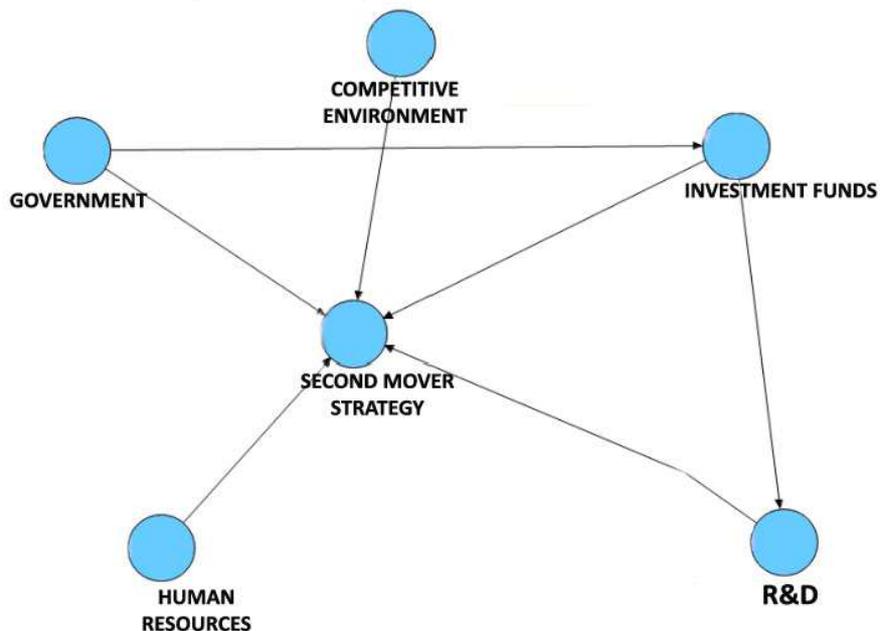
Examining the results of our analysis, we can see that the blocks of MVs and its VL are unidimensional because Cronbach's alpha and Dillon–Goldstein's are >0.70, and from analysis of principal component of the block MVs, the eigenvalue 1st is above 1 and the eigenvalue 2nd is below 1. This means that the MVs influence positively its LV (Table 2).

Table 2: *Outer Model*

	Type.measure	eig.1st	eig.2nd	C.alpha	DG.rho
Government	Reflective	2.66	0.29	0.93	0.95
Human Resources	Reflective	2.21	0.45	0.82	0.89
Competitive Environment	Reflective	2.03	0.70	0.75	0.86
Investment Funds	Reflective	2.53	0.30	0.90	0.94
R&D	Reflective	2.93	0.04	0.98	0.99
Second Mover Strategy	Reflective	3.05	0.68	0.89	0.92

In the structural model or inner model we have evaluated the relationship between LVs. The LVs are distinguished in: two exogenous LV (e.g. human resource and competitive environment), which never appears to be a dependent variable, one endogenous LV (e.g. second mover strategy), that it is only dependent variable, and three exogenous and endogenous LV (e.g. government, research and development and investment funds), that are both dependent and independent variables (Figure 1).

Figure 1: *Inner Model*

The first analysis concerns the evaluation of the R² (>0.5). R² is the quantity of variance of endogenous variables in relation to exogenous variables. R² is resulted positively for *second mover strategy* (0.93) and investment funds (0.68); differently R&D has a low variance (0.43) (Table 3).
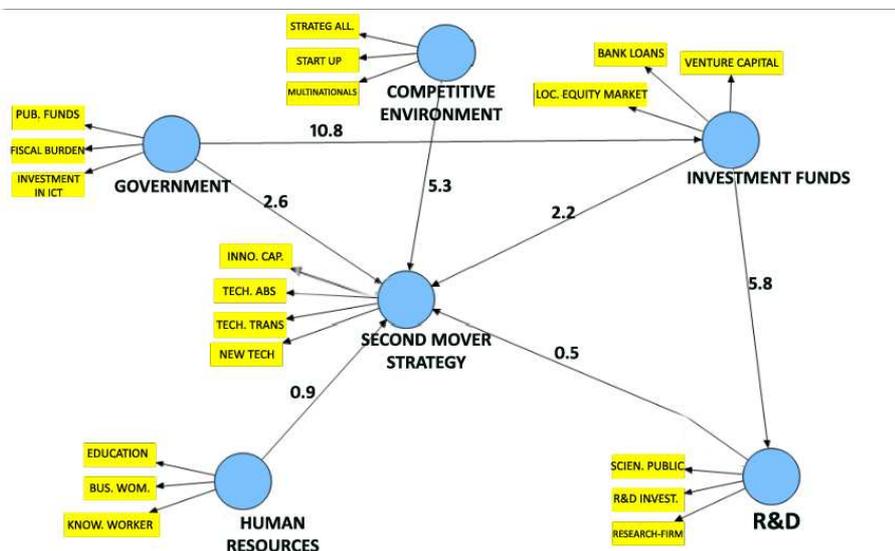
Table 3: *R²- The Value of the Correlation between the Endogenous LVs*

	Investment Funds	Second Mover Strategy	R&D
R²	0.68	0.93	0.43

Subsequently, we further analyzed the relationship between exogenous or independent LVs (e.g. government, investment funds, competitive environment, human resources and, R&D) and endogenous or dependent LVs (e.g. second mover firms) through the bootstrap approach.

This approach is a method of re-sampling of data resulted from PLS-PM where data will be significant if the score will be >2 (Efron and Gong, 1983). It emerges that the "T statistic bootstrap" is >2 in the relationships between government and second mover strategy (2.6), investment funds and second mover strategy (2.2) competitive environment and second mover strategy (5.3), government and investment funds (10.8) and investment funds and R&D (5.8). On the contrary, "T statistic bootstrap" is below two for the correlation R&D and second mover strategy (0.5) and human resources and second mover strategy (0.9) (Figure 2).

Figure 2: *Evaluation between Exogenous LV with Endogenous LV via Bootstrap Methodology*

In conclusion, we claim that the network system factors which most strongly improve the business performance of second mover firms are government, investment funds and competitive environment.

5. Discussion and Conclusion

Our research model has highlighted the relevance that some network system factors play in improving the business performance of second mover firms in Chinese and Middle Eastern markets through an analysis based on the methodology of PLS-PM. Our findings have verified our previously mentioned researched hypothesis as follows:

Hp1: Network system factors (e.g. government, investment funds, competitive environment, human resources, and R&D) positively influence the business performance of second mover firms.

Mainly government (2.6), competitive environment (5.3), and investment funds (2.2) have a positively impact on the business performance of second mover firms. Differently, the R&D (0.5) and human resources (0.9) have a low influence on the business performance of second mover firms even if the government invests in R&D.

Hp2: The government plays the part of second mover firms' provider.

The government establishes strategic alliances with multinational in order to introduce new technologies in the national market. It also invests in R&D and links the research's system with firms (Lee, Lim 2001; Maggioni, Del Giudice 2008). Particularly, the Chinese government plays a very important role in this area. On one hand, the government employs policies to encourage intimation as well as innovation by firms. On the other hand, as policy receivers, the Chinese firms trust and rely on the government for not only political and economic reasons but also for cultural ones. As a matter of fact, they think the government represents the country, and in Chinese the word, "country", means the national family. Not surprisingly, the department of public relation in most firms pays too much attention to the relation with the government.

This research highlights that the government supports second mover firms through public funds, Information and Communication Technology investments, and a low fiscal burden (bootstrap score 2.6).

Hp3: The public and private investment funds subsidize the relationship between firms or firms and research centres.

The investment funds support the growth and efficiency of second mover firms. They support the firms through subsidies so as to develop their innovation and improve their competitiveness (Hu et al. 2012). Furthermore, the investment funds incentivize the second mover firms to establish collaborative relationship with research centres and other firms in order to produce jointly new technologies.

Our findings show that the investment funds are both predictors and predicted. They are predictors of second mover strategy (bootstrap score 2.2) and of R&D (bootstrap score 5.8); they are predicted by government (coefficient of determination R^2 score 0.68 and bootstrap score 10.8).

Hp4: The competitive environment facilitates the creation of strategic alliances so as to improve knowledge exploitation process.

The competitive environment is characterized by strategic alliances in order to reduce the risks and costs of R&D, to decrease the time of market and to rapidly absorb technological capability and know how (Hobday 1995).

The second mover firms create the strategic alliances with other firms or research centres or the government in order to increase their own intangible and tangible

resources (e.g. knowledge, innovation, technology, etc.) (Aldrich, Sasaki 1995; Mothe, Quelin 1999). This kind of alliances involve technology and knowledge transfer through the knowledge exploitation model.

The positive correlation between strategic alliances and new technologies in relation competitive environment has been verified through the analysis of the principal component of the block MVs, Cronbach's alpha and Dillon–Goldstein's.

In conclusion, the market becomes an innovation and learning space where the second mover firms can readily acquire resources thanks to network system factors. In fact, these factors play a variety of roles towards market support, including risk mitigation and support of remote commerce (Clay, Strauss 2002), market success (Spicer, Pyle 2002) and legitimisation of new industry entrants (Rao 2002).

The present study is not without limitations. First of all, our analysis was restricted to firms operating in two specific markets. Hence it could be interesting to broaden this kind of research so as to include firms from other markets. Second we explored a correlation between some specific network system factors and second mover firms. Further research could be conducted to analyse the impact of internal factors on second mover strategy. In particular, moving to focus of this research from system view to individual one so as to investigate the organizational model positively influence the innovation process of second mover firms or the internal business conditions support the knowledge exploitation model.

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Notes

[1] Torch Program is China's most important program of high-tech industries. Retrieved from http://ie.china-embassy.org/eng/ScienceTech/ScienceandTechnologyDevelopmentProgrammes/t112841.htm.

[2] According to the WCO Revised Kyoto Convention (1999) the free zone is "outside customs territory" for duties, taxes, documentation, and issues to be covered by national legislation. Free zones are developed to support economic reform; to act as "pressure valves" to alleviate growing unemployment; to serve as experimental labs for the application of new policies and approaches, and to attract Foreign Direct Investment (Retrieved from http://www.wcoomd.org/Kyoto_New/Content/content.html).