

Innovation challenges: Paradoxes and opportunities in China

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Introduction

One of the targets set in the National Guidelines for the Medium-and Long-term Plan for Science and Technology Development is to raise the ratio of Research and Development to GDP to 2% by 2010 and to 2.5% or more by 2020 (OECD, 2008).

The economic meltdown forces companies to invest their cash flow to develop products to facing competition . Firms stay alert looking for opportunities to take advantage of R&D incentives around the world. Outsourcing, joint-venture, master franchising and strategic alliances are the most important techniques that are used to enhance revenues and decrease costs. China represents the El Dorado for international firms whose managers seek higher return on investment and better productivity. In the last decade, China has been grabbing the biggest part of global foreign investment. To encourage investors and companies to bring their money and their know-how and to develop its own innovative capabilities, China has implemented several innovation incentives. This paper tries to demonstrate that these incentives might have both opportunities and paradox effects on firms. As a Confucius faith orientation, China believes in harmony, cooperation and pragmatism. On the other hand, innovation means rivalry, competition and uncertainty. Recent foreign investments in China are not only seeking costs but also modernization and innovation which imply new knowledge and skilled people.

In the first part, we are going to have an overview on what authors and scholars have stated on the relation between innovation and competition. Economic theory regarding the relationship between competition and innovation is ambiguous. When it is difficult for firms to appropriate the value of their innovations, theory predicts that competition will reduce innovation incentives. On the other hand, theory also indicates that more competition should boost innovation in many situations. The empirical literature also reaches mixed results. Basically, some of them say that competition encourages innovation and some of them conclude that it reduces innovation, depending on various circumstances and assumptions. In this part, the paper will show, from western company's perspectives, what obstacles for innovation are and what conditions and variables let innovation to emerge.

As China is becoming a fertile land of competition and innovation, the second part of this paper presents main innovation policies that China has implemented. We try firstly, to understand what concepts of knowledge and innovation mean in China and what are conditions and factors that might influence the integration of creation and application of knowledge knowing that Chinese government has deepened sciences and technologies reform and promote national innovative system setup. Innovation goes hand-in-hand with abnormalities obstacles. This part will show us why innovation is sometimes seen as a contradictory concept with believes and faith even though Chinese traditional culture is know to profess professes much respect for knowledge.

In the third part of this paper, we are going to analyse and draw from framework model, which we will develop based on first what innovation requires to emerge in Western countries and in China, second what foreign firms might face in term of innovation paradoxes when they break into Chinese market and what should they do to overcome such obstacles and, finally and third what they should take advantage of in order to do more with less and be innovative In this part, we are going to demonstrate that in one hand, innovation needs contextualization, and on the other hand, requires from managers to be able to evolve in paradoxical environment.

Review of literature

How does innovation emerge within a country?

The goal of innovation is to create business value by developing ideas from mind to market (Alter, 2000) but partly based on irrational aspects, it is, for most companies, tremendously difficult to achieve because of uncertainty of “postdictors” that are predictors after facts (Arelly, 2010), the innovation path is full of obstacles which might be, among others, cultural, psychological or institutional (Davenport, 1993). Myriad obstacles or bias in the idea-to-cash process limit a company’s ability to innovate. When firms look for innovative products, they usually seek 2 main goals: reducing costs and increasing benefits or creating new market and enhancing sales (Spence, 2008). In the same idea, Alter (2000) argues that innovation is a way to optimize the potential benefits that is embedded in an idea which is new to you. From the organization perspective, authors have reached different conclusion on how innovation emerge and create benefits. Schumpeter (1979) says that big and dominant firms are more likely to innovate than smaller ones that lack market power but he argues also that in high-innovation industries, this market power is ephemeral. Arrow (1983) finds that a pure monopolistic organization has lower incentives to invest in process innovation than firms in a

competitive market would have. He says that the monopolist already enjoys supra-competitive profit. The author argues that product differentiation can generate supra-competitive profit in competitive market, making their innovation-based benefits incremental. However, high benefit might lead to less motivation and incentive to develop new products (Arrow, 2001). He concluded that competition provides better incentives for innovation than monopoly does. Hippel (2006) stated that if competition is vigorous, the most efficient firm will invest the most in R&D for a new process technology. If competition is weak, though, the least efficient firm will invest the most. Consequently, R&D efforts for new process technologies will tend to preserve the positions of dominant firms in industries with aggressive competition, whereas R&D will cause lagging firms to gain ground on their competitors in industries with weak competition. On the other hand, Carlin, Schaffer and Seabright (2004) examined firm-level performance after the privatization of State-owned enterprises in 24 transitioning countries. They conclude first, that a certain minimum level of rivalry is important for stimulating innovation. Secondly, they say that firms operating in markets that were exposed to foreign competition innovated more after being privatized. Finally and paradoxically, the presence of just a few rivals was more favorable to innovative performance than the presence of many.

How does innovation emerge within organizations?

Based on what Akrich, Callon and Latour (1988) have written about conditions that are required to facilitate innovation within organization (their study mirrors and explains the “Post-it” innovation success), Chesbrough (2003) suggested that innovation emerges when favourable “macro-social” and “micro-social” conditions are set up. He divided these conditions into many categories. The table below shows us Thuderoz’s research results:

Macro social Dimension	Description
Firm’s capacity:	<ul style="list-style-type: none"> • Recruiting strong competences • Creating partnership with research centers • Identifying and controlling extern information flow (economic intelligence, monitoring technological development) • Grabbing public or private investors and business angles
Firm’s quality :	<ul style="list-style-type: none"> • Managing effectively and setting right conditions • Mobilizing human resources and get them involve deeply • Efficient business processes
Organization’s culture:	<ul style="list-style-type: none"> • Technical culture (IBM) • Interne rules (permissiveness - Apple)

	<ul style="list-style-type: none"> • Managers' background and culture (3M) • Hierarchical organization of innovation process (coordination between services and department -) • Innovation lifecycle (may be short or very long – ZARA versus GAP)
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On the other side, “micro-social” variables that might influence innovation and creativity are presented in the table below:

Micro social Dimension	Description
Creativity	<ul style="list-style-type: none"> • Think differently, involving use of imagination, thing outside the box
Persistence	<ul style="list-style-type: none"> • Don't give up, start again
Modesty	<ul style="list-style-type: none"> • Trail and error, accept to make mistakes
Take risks	<ul style="list-style-type: none"> • Dare to do new things
Get out of the dominant paradigm	<ul style="list-style-type: none"> • Innovation requires new ideas, new way of thinking, challenge general believes

Innovation is in pendulum equilibrium between organizational culture, individual behavior and environmental conditions. As we have seen previously, innovation might be driven by looking for either reducing costs like Wal-Mart or achieving leader market position like Apple has been doing for the last decade with iPhone and IPode. The last iPhone 4G is the perfect example of what innovation procures to organization in term of actual market leadership, revenues and profits. Innovation shapes the customer's perception when he makes trade-off to choose one product over another (Hanssens, 2007). Innovation can also be a priori consumption trigger that we exemplify with lines of people waiting for Ipad2 in the fifth avenue of new in 2011, March 11th. Product or process innovations are supposed to give to organizations potential competitive advantages over competitors. Japan has been leading both the electronic and the automobile sectors because of its capability to turn innovation into market value for customers and stakeholders. Many western car makers tried to imitate the innovative Toyota manufacturing processes in the 80's. However, many western companies have faced obstacles in their temptations to innovate (Hargagon, 2003). Beside the fact that innovation has an opportunity cost, human resources qualifications and access to investors are, among others, what make innovation an unpredictable path (William, 1999). These reasons are those that make difficult for organizations to move forward with its innovation

achievement. Based on several studies that have been made in Canada, United States and Europe, we draw that innovation is not a simple and quiet process. It seems to be very complex and requires high level of risk seeking the table below resumes this idea.

Obstacles to innovate from the Western perspective

Industries	Obstacles
	<ul style="list-style-type: none"> • High innovation costs • Lack of financial resources • Rigid organization structure • Lack of skilled people • Lack of information on technology • Lack of market information • Low flexibility in regulations and standards • Low customer's reactivity to new products • Imitation and fraud

Most western research has shown that the main obstacle remains lack of skilled human resources (Landry, 2005). The human resource factor is only one of many other criteria that slows down innovation. Diagnostics and evaluations recently made in some European countries about the barriers to innovation bring new evidence into light. In this current economic meltdown, financial resources become very rare. Furthermore, today's investors have lower readiness for risky investments. Moreover, the current business environment with the requirement for shorter return cycles has dramatically reduced available funding for driving trend-breaking innovations to the market (EPFL, 2009).

Paradoxically, by focusing on business efficiency and cost-effectiveness during the last decade, organizations suffered from limited resources allocated to the next cutting edge technology (Davenport, 1993). This dramatically appeals for a behavioral economy guidance to analyse firm's innovation barriers. Finally, academic and scholars research have been focusing on disciplinary domain that does not always favour opportunities of driving ideas to the market. In France, only 10% of the total academic research turn into market value and generates profits. Lack of cross-fertilization between universities and firms is regularly cited as an obstacle for creating new sources of economic as well as social benefits (Les Echos, 2008).

If innovation seems to be a risky and complex process, it requires set of favourable conditions to emerge. National culture and organizational culture, as well as the individual behaviour, are keys that unlock the door of innovation. Beyond these factors and assuming causality, many countries have implemented innovation incentives to encourage and attract creators and

innovators. China is one of these countries. Knowledge society and Innovation have become popular terms in China recently. This paper presents what China has done in this area.

China and the innovation environment

Chinese government tends to believe that modernization and competitiveness relies on innovation and new knowledge is an essential component of value creation and innovation. Supporting and encouraging enterprises to develop force in technological innovation is one of the biggest government priorities (Liua, Khalil, 2006). Increasing sciences and technology expenditure, developing regional innovative clusters, and strengthening the build-up of platform facilities might encourage foreign investors to come to China and foster local innovation talents.

Research and development centers in China have risen from 30 in 1999 to 750 in 2005 and 800 in 2007 (OECD, 2008). In 2005, hi-tech companies with foreign investment spent 15.26 billion Yuan (around 1.9 billion U.S. dollars) on R&D, 19.19 billion yuan (around 2.4 billion U.S. dollars) in new product developments. For instance, Microsoft bought land in Beijing and Shanghai to build R&D centers with more than 3,000 employees. In 2006, its investment in human resources in China reached 150 million US dollars, raise 40% in 2007 (OECD, 2008). Human resources for sciences and technology have been increasing rapidly over the past decade. Although they have grown less rapidly than Research and Development expenditure, China now counts the second highest number of researchers worldwide (OECD, 2008). These numbers are expected to be large innovations producers.

Generally speaking, they are 3 major actors in sciences and technology in China. They have been called “the Key performers”. These key performers of sciences and technology activities in China are government research institutes, the higher education sector and the business sector. Each one of them is playing a crucial role in boosting innovation, improving the market orientation and optimizing the resources allocated to R&D. Through this paper, we will try to measure to what extend each factor really influences innovation within organizations by asking foreign executive managers what are their felling and their opinion. The main goal here is to identify what criterion is more likely to influence innovation process. The purpose is to bring light into some paradoxical aspects of innovation issues that foreign firms might face when they break into China market

Chinese traditional culture professes much respect for knowledge. Lloyd and Sivin (2002) stated that concepts of innovation involve different aspects of life like treasuring up of knowledge, exploitation and transmission of scientific knowledge. But they argue that concept

of innovation and its institutionalization process is different in China from the one that emerged in Europe and North America. Here is a summary of what their research have shown:

	Western Innovation characteristics	Chinese innovation characteristics
• Focus on	• Nature and elements of nature	• Cosmic order and principles
• Innovation roots	• Exploring material objects and causes of phenomena	• Heaven, earth, society and human body interacted in a resonant universe
• Meaning of knowledge	• Sought knowledge for fame and livelihood •	• Chinese intellectuals used knowledge as advisors to rulers •
• Idea generation	• Contending ideas debated •	• Consensus rather than divergence •
• Usage of knowledge	• Few opportunities for practical use	• Practical application of knowledge

Source: based on Lloyd and Sivin - *The Way and the Word* (2002)

On the other hand, Munro (1996) in his book “*The Imperial Style of Inquiry in Twentieth-Century China*” has identified some other inside characteristics that might influence the emergence of knowledge and innovation. One of them is what he called ‘totalism’ which refers to an ordered structure integrating everything that exists. This order runs through both human and natural spheres. It provides justification for imperial authority that is responsible for universal harmony. According to Munro, “totalism” provides stability and self-discipline which strengthen the capacity of harmony but in same time, it is a weakness because it doesn’t give opportunity to recognize new knowledge outside established order. McConnell (2003) says that on one hand, innovation involves a break with the past and on the other hand, innovation requires an acceptance of individuals who deviate from the norm.

Although China has seen its number of innovation increasing dramatically, few actually are protected by any legal institutions such as IPR (Intellectual Property Right). Obstacles to innovate remain strong in China. Baark (2003) has given an overview of what causes delay and slows down innovation within Chinese organizations.

What influence innovation?	
Tradition	<ul style="list-style-type: none"> • Lack of “creative destruction” • Dominance of the linear model concept in policy • Deficient integration of research and development

	<ul style="list-style-type: none"> activities • Limited flow of knowledge
Environment	<ul style="list-style-type: none"> • Government interferes too much in innovation process • Financing of innovation weak • Exaggerated reliance on research institutes • Deficient flow of knowledge • Enterprises still not the center of innovation • Innovative potential of small enterprises ignored
Social context	<ul style="list-style-type: none"> • Way of learning and discovering • Confluence of knowledge and power relations • Focus on exploitation rather than exploration • Harmony versus maverick character • Weight of rules and norms versus creativity

As we have seen previously, China presents some paradoxical trends when come times for foreign organizations to innovate and think out of the box. Western companies face other natures of innovation issues related, among others factors, to their organizational behaviors and their lack of skilled human resources. Xie and Li-Hua (2009) argue that first, multinationals seek R&D in close proximity to their production bases in China, and secondly they tap Chinese's pool of lower-cost and highly skilled R&D personnel. These R&D centers in China are hiring primarily local scientists and engineers. This paper will try to come up with a generic framework that might help foreign firms to invest resources into innovation products in China taking into account the both sides of the innovation issue. The question that rises here is "How foreign organizations should deal with these contradictory and paradoxical currents if they want to innovate in China?"

Methodology of research

The first step that we have made is to define what might be statistical variables which we will use to measure why foreign firms are agree or disagree when comes time to answer on what influence innovation. To stay consistent with what has been done in the previous research and what authors stated and what we have presented in the literature part of this paper, we choose to divide this research in 4 axes. The first one is to measure, through 4 items, how much the market obstacle influences the innovation process. The second axis is to quantify, through 4 items, to what extend the level of human resources affects innovation. The third axis is to measure, trough 5 items, to what extend organizational structure and internal processes are adapted to the Chinese environment in terms of pushing ahead innovation and taking advantages of what the Chinese government has been implemented to enhance R&D investments. The last axis called "Environment" is to express trough 4 items, how much

business environment and social context influence innovation and R&D within organisations. Each axis or variable will be measuring through a number of questions (Table 1). To validate the internal consistency of each variable, we based our study on Cronbach's alpha. The Cronbach's alpha must worth at least 0,75 as the sample that is used for this research is not sufficiently large. The psychometric Likert's scale, which is defined in the tale below, based on 5 levels, will be used to measure to what extend answerers are agree or disagree with each question. The next questions that rises is how to measure the success of any innovation project given that each project is different. Some innovation projects need more than 10 years before being profitable while some others take only 1 or 2 years to give positives results. It might not be easy to compare an information technology project against a pharmaceutical one. Moreover, consumer's satisfaction need to be assessed to make sure that the project is really a success. To offset against this inherent bias, we came up with a general approach to evaluate benefits of an innovation project from the company perspective. As this study is conducted from outside China, it was not possible to get consumer's feedback. So, we defined one variable which we called Inno_Results through 4 items (Table 2)

Given the fact that the complexity of getting information from organization that runs business in China, we asked responders to contact their Chinese subsidiaries and try to get questionnaires filled out, but it was not easy to get questionnaires done (Table 3). There are causes for concerns. First, managers are not willing to give secret information on their innovation projects. Secondly, innovation and research projects are still on the way as managers answered questionnaires. Indeed, firms prefer to maintain secret on their projects even after completing all research phases. Thirdly, the manager who works in research centre is not necessary the one who is responsible for hiring skilled people. That's why we tried to get information from at least 2 people within each company. But another time, it was really hard to get information.

Results of the study

Firstly, it is largely accepted that Chinese culture regards sciences and knowledge with respect and esteem. Innovation, as part of research and development of new knowledge, will help China to overcome economic issues and be a major player in applied sciences and technology. Foreign companies want to surf on this innovation wave. China is helping and encouraging both innovation investments and dozen of thousand Chinese researchers to develop new products. However, innovation and Research and Development require a

maverick personality and adventure spirit which are in contradiction with Confucius foundation.

To deal with this relative paradox, here are what our research shows in term of the way that foreign organizations manage their innovation projects in China.

At the first level, the statistical distribution shows that R&D costs are not really an obstacle to innovate. Only 36.4% of responders say that R&D costs might be an issue (Table 4).

Access to capital is not an issue for 27.3% of responders (Table 5) but integration costs and availability of information are both seen as an issue. Indeed, 45, 5% of responders say that they disagree with the assessment that both facilitate innovation (Table 6). From the human resources perspective, things are slightly different. If only 27.3% of managers affirm that lack of skilled human resources constitute a major obstacles for innovation, more than 54% have been facing hiring issues to find the candidate that match with the job requirements. The same percentage of managers argues that resistance to change has a negative impact on innovation process (Table 7).

Paradoxically, only 27,3 % of responders say that norms and rules might be an obstacle on their innovation route which means that on one hand, local human resources might be somehow reluctant to change but on the other hand, China has implemented rules and incentives to facilitate innovation. The conclusion here might be that Chinese workers have not yet assimilate the notion of change and adventure regarding to their believes and faith which advocate harmony and peaceful.

The next phase of this research is to try to find correlation between variables. The objective here is to draw from statistical data what variables influence on another and to what extend for instance the internal structure is related either to the environment or to the way firms manage their skilled Human Resources (Table 8)

We can draw from this statistical result (Table 8) that, firstly, Market_2 (R&D Costs and Access to Capital) is strongly correlated with Internal_Structure. One explanation might be foreign firms that have strong and solid internal R&D structure are able to manage effectively its R&D costs and tend to get access to capital in easier way.

The second significant correlation (Table 8) stands between Environment and innovation achievement (Correlation=0,779 with Sig=0,005). This strong correlation shows us that Environment variable (see definition of this variable on table 1) influences strongly the success of innovation project in China. At the first glance, we can conclude that items like innovation incentives and local norms and rules, which represent business environment and

social context, have been enhanced, and facilitate innovation project. In other words, foreign firms that operate in China have been taking advantage of innovation incentives that China has implemented. As an indirect result, the “Environment” variable helps foreign firms to succeed and make their innovation project thrive.

The variable that influences the most innovation performance (Table 8) is “Human resources” variable (Correlation=0,788 and Sig=0,004). Basically, the less human resources are trained and get ready for change, the less innovation will perform well which is obviously true in any true in any type of organization. So, to succeed in China environment, foreign firms are better to provide kind of organizational change training or how employees should deal with change. Managing the change remains big issue in western companies as well, and lot of research actually that have been done in this field tend to demonstrate that Change needs to be taught hand-on-hand with cultural challenges.

What is interesting in this study is that Innovation seems (Table 8), at the first glance, not to be impacted by the “Market” variable (see definition on Table C1). In other words, “R&D costs”, “Availability of information”, “Access to capital” don’t really influence the success of innovation project. However, at the deep level, if organization doesn’t master R&D costs and access to capital shrinks as we are seeing in this economic meltdown, innovation project might be put in the back burner. On the other hand, managing badly the R&D costs means that internal structure of organization shows weakness which may impact innovation’s achievement as this study has shown previously.

Finally, innovation success in China seems to be impacted by 2 major variables which are “Environment” and “Human resources”. But, descriptive statistics show that Resistance to change and Market (integration costs and availability of information) need to be, on the one hand, managed tightly by providing training and leading the change, especially from the human resources perspective, and on the other hand, knowing how to take advantages of what China has provided in terms of innovation incentives and facilities.

At this point, the most crucial result we have got is the following:

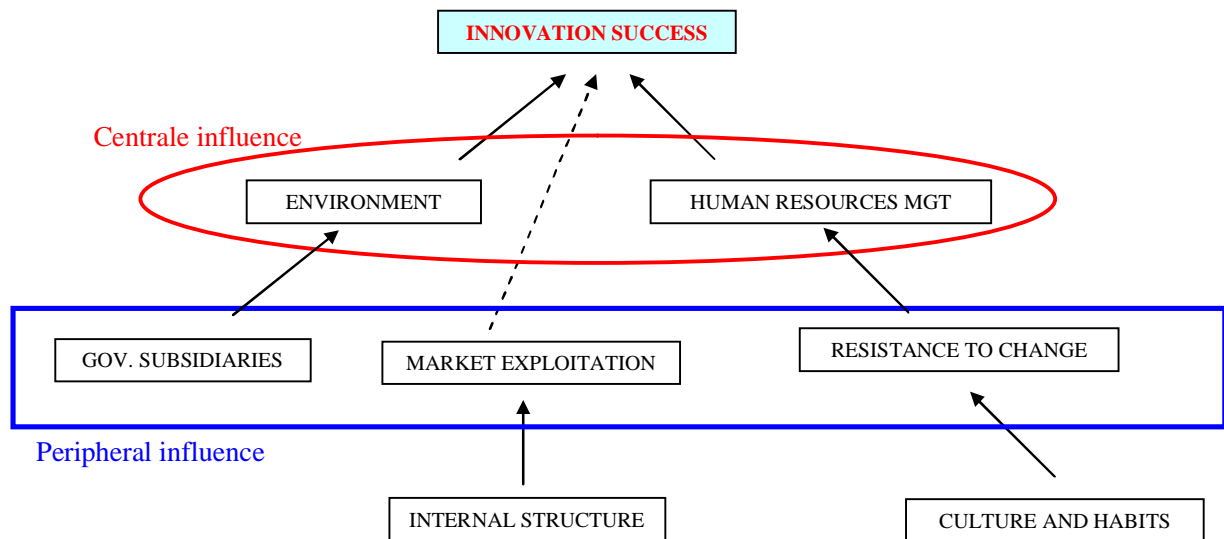


Figure 1: Key factors that influence the most innovation project in China

What we have done in this figure is that we divided all factors in 2 categories called Central factors and Peripheral factors. As we can see, the “Central factors” or CF are likely to influence innovation achievement directly as statistical results have shown. By mastering these CF, one foreign organization may focus more on Peripheral factors of PF which impact innovation success indirectly.

Discussion

This study is based only on numbers of cases. We can’t generalize unless we do a large statistical research on several other organizations, but these cases give us a first glance to analyze deeper and more closely strategies that are used by foreign firms to innovate in China and try to find what makes innovation a successful process. Global innovation strategy, as a relative notion, is based on many factors, but we tried to condense these factors into é main factors which we called CF (Central factors) and PF (Peripheral factors).

Another limitation is that responders are mostly reluctant to give information, especially on critical and secret project that they are working on which is something understandable given that innovation project might represent the future of the organizational life cycle . Yet, the social aspect of innovation success in emerging countries like China is a determinant factor. However, having a good estimation of what is the real impact of social dimension requires making a large study in the whole China. The China market is so fragmented, the number of foreign firms that are doing business, or they have or they will is so large that it will be unwise to come up with a general framework simply based on this study.

The statistical analysis might be debatable as far as they are many others statistical techniques like regression or ANOVA that might be used in this paper. However, statistics say what we want them to say and field experiment will never be replaced by statistics.

Conclusion

This study shows, as others have previously done, that innovating in China is very complex. Finding the perfect amalgam depends on multiple factors. There is no one best way to make innovation project a success in China. Instead, they are many “one best way”. Innovation requires maverick personality and sense of adventure which are inconsistent with Confucius spirit based on harmony and equilibrium. However, Chinese culture shows a great respect to knowledge and sciences. To be successful in China environment, foreign companies should take into account Central Factors or CF like the Environment or the way they manage Human resources issues which influence the most innovation process as well as Peripheral factors or PF like resistance to change or integration costs.

In fact, it seems that managing innovation project and make them thrive requires a global mindset and a global approach that take into account multiple variables. One of the most important variables is to overcome cultural challenge human resources issues.

Certainly, this paper needs to be improved as long as innovation project are on the way. The sample used in this research is far to be representative of what actually is being done in China but it's a nod in the direction of how foreign firms should deal with paradoxes and contradictions when comes time to invest in China. Finally, this study might be a pathway for further and deeper research to demonstrate what we have surfaced here. The sample studied is not enough to be representative of what the majority of firms challenge in terms of Innovation in China but it gives a general framework that needs to be validated with more research. We also recognize that Chinese are not homogeneous and that an idiosyncratic fit, nourished by individual beliefs and preferences is one of the aspects to take into account when firm are seeking innovations. That is human motivations are complex and, as Ariely (2010) argued, it can't be reduced to a simple « work for money trade-off »

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Annexes

Table 1 : Definition of variables

Variable	items	Questions
Market Exploitation	<ul style="list-style-type: none"> • R&D costs • Integration costs • Information availability • Access to capital 	<ol style="list-style-type: none"> 1. Do R&D costs facilitate innovation? 2. Do integration costs make easier innovation? 3. Does information availability influence positively innovation? 4. Does access to capital act as a brake on innovation?
Human resources (HR)	<ul style="list-style-type: none"> • Lack of skilled HR • Training issues • Hiring issues • Resistance to change 	<ol style="list-style-type: none"> 5. Do you think that local HR skills are sufficiently developed for R&D in your organization? 6. Does your company provide training to enforce HR skills? 7. Does your company face issues to hire high potential people? 8. Do you agree with the assessment that Human Resources don't resist to change?
Internal structure	<ul style="list-style-type: none"> • Technical culture • Interne rules • Managers' background • Hierarchical organization Innovation lifecycle 	<ol style="list-style-type: none"> 9. Does technical culture influence innovation within your company? 10. Does your company allow idea debates and permissiveness? 11. Does Managers' background encourage innovation? 12. Do you think that coordination between services and department enhance innovation? 13. Do you agree with the assessment that innovation lifecycle is short in your organization?
Environment	<ul style="list-style-type: none"> • Norms and rules • Government subsidiaries • Availability of equipments and materials • Cooperation with universities and others research centres 	<ol style="list-style-type: none"> 14. Do Chinese norms and rules facilitate innovation? 15. Does your company take advantage of innovation incentives? 16. Have you easy access to R&D equipment? 17. Is your company able to cooperate with universities in innovation project?

Table 2: Definition of Inno_Results

Variable	Items	Questions
Inno_Results	<ul style="list-style-type: none"> • Timing • Budget • Achievement • Benefits 	<ul style="list-style-type: none"> • In general, did your R&D projects match the timing? • In general, did your R&D projects respect the budget? • In general, did your R&D projects achieve the expected quality and characteristics? • In general, did your R&D projects give the return on investment as it was more or less expected?

Table 3 : List of organizations interviewed

Nature of business	Number of Responders
Sport wear and equipments	17
Medicines	13
Information technology	15
Food	11
TOTAL	56

Statistical results

Table 4 : Frequency : R&D Costs

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	5	8,9	8,9	8,9
2	16	28,6	28,6	37,5
3	10	17,9	17,9	55,4
4	20	35,7	35,7	91,10
5	5	8,9	8,9	100,0
Total	56	100,0	100,0	

Table 5 : Integration Costs

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	10	17,8	18,2	18,2
2	15	26,9	26,9	44,7
3	21	37,5	37,5	82,2
4	10	17,8	17,8	100

Table 6 : Information Availability

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	6	10,8	10,8	10,8
2	20	35,7	35,7	46,5
3	20	35,7	35,7	82,2
4	10	17,8	17,8	100
Total	56	100,0	100,0	

Table 7 : Resistance to change

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 1	15	26,8	26,8	26,8
2	16	28,6	28,6	55,4
3	14	25,0	25,0	80,4
4	7	12,5	12,5	92,9
5	4	7,1	7,1	100,0
Total	11	100,0	100,0	

Cronbach's alpha analysis

The consistency of each variable is done rapidly by using SPSS software. As a result, we will be able to put together items that represent the best each variable. The first variable that was analysed is "Market". The "Market" variable is represented by 4 items. SPSS gives us the first result below:

Table C1 : Communalities

	Initial	Extraction
RDCosts	1,000	,765
Integr_Cost	1,000	,789
Infor_Avail	1,000	,838
Access_Capit	1,000	,691

Extraction Method: Principal Component Analysis.

Beside access to capital, it seems that each other item explain more than 75% of the variance. But in the next table, we get 2 components that might represent best this variable.

Component

	Component	
	1	2
R&D Costs	-,285	,827
Integr. Costs	,876	,148
Inform. Avail.	,889	-,218
Access Capital	-,417	-,719

By using the rotation method based on Kaiser Normalization, we are able to select correctly the 2 factors that are more likely to explain the total of variance of the “Market” variable.

Structure Matrix

	Component	
	1	2
R& D Costs		,817
Integration Costs	,874	
Information Availability	,891	
Access Capital		,733

The first factor brings together R&D costs and Access to capital. The second factor brings together Availability of information and costs integration. The Cronbach’s alpha technique shows us that only the second factor might be reliable.

Reliability Statistics

Information availability and costs integration

R&D costs and Access to capital

Cronbach's Alpha	N of Items
,782	2

Cronbach's Alpha(a)	N of Items
,771	2

Finally, the first variable, which is “Market” will be best represented by 2 factors, “Market 1” and “Market 2” that put on one side together “Integration costs” and “Information availability” in Market 1 and on the other side “R&D costs” and “Access Capital” in Market 2

We followed the exact process to put together items in order to simplify the others variables. Here is what we got after using all the techniques described in this paper.

Component

Reliability Statistics

Variable	Component
HUMAN RESOURCES	1
Lack of HR	,777
Hiring issue	,886
Change Resistance	,839

Cronbach's Alpha	N of Items
,782	3

For the Human resources variable, the items that are likely to grab the variance are the 3 listed as Cronbach’ alpha worth more than 0,7.

With regard to the Internal structure variable, only the 3 first items which are Internal rules, life cycle and manager background are likely to represent it the best as we can see in the table below.

Component

Variable	Component	
	1	2
Internal structure		
Internal rules	,864	
Life Cycle	,769	
Manager	,867	
_background		
Hierach		,864
organization		
Technical culture		,866

First component : Reliability Statistics

Cronbach's Alpha	N of Items
,784	3

Second component: Reliability Statistics

Cronbach's Alpha	N of Items
,682	2

The last variable, which is Environment, shows the following results:

Component Matrix(a)

	Component
	1
Innov.	,724
Incentives	,640
Avail.	,640
Equipment	,640
Coop. University	,514
Norms & rules	,972

Reliability Statistics

Cronbach's Alpha	N of Items
,718	3

It seems that only 3 items are more likely to grab the total of the variance: Innovation incentives, availability of R&D Equipments and Norms & Rules

Correlation analysis

Table 8 : Correlation bivariante

		Market_2	Market_1	Environment	Internal Structure	Human Resources	Innovation Results
Market_2	Pearson Correlation	1	-,386	,246	,641(*)	-,050	-,045
	Sig. (2-tailed)		,241	,465	,034	,885	,896
Market_1	Pearson Correlation		1	-,548	-,184	-,150	-,208
	Sig. (2-tailed)			,081	,588	,659	,540
				56	56	56	56
Environment	Pearson Correlation			1	,112	,484	,779(**)
	Sig. (2-tailed)				,742	,131	,005
Internal Structure	Pearson Correlation				1	-,283	-,086
	Sig. (2-tailed)					,399	,802
Human Resources	Pearson Correlation					1	,788(**)
	Sig. (2-tailed)						,004
Innovation Results	Pearson Correlation						1
	Sig. (2-tailed)						

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).