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How to reduce risks when selecting suppliers in China:

Development of a process for a chemical company

With the view of getting the degree of Master in Management

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1) INTRODUCTION

China is known as the factory of the world, for example China accounts for 17.9% (in 2014) of the importation in the European Union (European Commission, 2015). Nevertheless sourcing in China can be difficult due to the poor knowledge of Western purchasers of the regulation, business culture and language in China. Hendricks and Singhal (2003) report that “disruptions from the contracted suppliers may generate a 12% decrease in the shareholders’ returns of the sourcing firms on average” (cited by Chen, 2014, P.127). This finding explains why it is deeply important to build a risk management system.

Global supply chains generate opportunities for companies; in the other hand these extended supply chains add risks and complexity to the company (Manuj, & Mentzer, 2008). Those risks can be exacerbated by the Chinese environment. Moreover China may sometimes look like as the “world sourcing heaven” that purchasers must enter, unfortunately doing business in China is not that simple. The number of B2B websites, blogs and sourcing companies specific to China shows the infatuation of firms to buy from this country. However, sourcing from China without taking any precautionary measures can result in a disaster for the buyer and his company.

Kaneka North America Apical Division is the case company for this research; they want to reduce their costs by looking for new suppliers. China having a competitive chemical sector, it is an attractive market for Kaneka. Nevertheless Kaneka is a highly technological firm focusing on quality of its products and services to customers. It is therefore important for them to find the less risky supplier to increase their risks as little as possible. Apical Division has not yet developed a research process for suppliers dedicated to China, and neither has the knowledge and the capacity to develop one.

The purpose of this research is therefore to develop a solution to help the apical division of Kaneka to find the least risky suppliers possible in China. The solution should fulfil Apical Division needs and be approved by its management. The result of the research has to be complete and be usable by the case company. The focuses of this paper are China and the supply risk, those two dimensions will therefore be entirely part of the solution, some other dimensions may be added to have a functional resolution but without being discussed into details.

To develop a solution a literature review will be done, this review will also focus on supply risk and China to gather all possible information about the core of this paper. Scientific document will be primarily used to find credible source of information, however newspaper and blogs will also have to be used to complete it with the newest changes in the Chinese environment. In addition to the literature review and to the information given by Kaneka North America Apical Division, interviews of purchasers will be conducted. Those purchasers should help us in giving practical information explaining the process used by their company to find new suppliers in China and manage their supply risks. A maximum of different companies will be interviewed with the condition that they source in China or looking to source in China. Companies with a deep knowledge of the Chinese environment, active in the same industry than Kaneka or starting a sourcing activity in China will have the priority.

Once the solution has been found, it will be tested at Kaneka to evaluate its convenience and applicability. This test will be made in a real situation of a research of suppliers in China, it is indeed obvious that a concrete and actual application is the best way to validate or invalidate a solution, especially when its aim is to be usable directly.

The following paper will start with the literature review; the specificity of sourcing in Asia will first be explained. The importance of the supply risk management, especially in global sourcing will then be developed. This review will end with the selection processes previously developed in the literature. Finally the gap into this literature will be described to be able to provide a new and innovative solution for the case company.

The methodology of the researcher will then be described and the choice of interviewed companies and purchasers explained. Kaneka North America Apical Division will be described with their needs and willingness. The companies interviewed will be described into fewer details to focus on their purchasing processes and their explanations of the Chinese market.

Finally the problem's solution for the case company will be presented into details to appropriate management teams with a focus on its specificity on the Chinese market and supply risks. The comments for the approval of the solution and the result of the test in an actual situation will also be presented before concluding this research. All the interviews will be transcribed to be available in the appendix of this paper among other useful documents for the reader.

2) LITERATURE REVIEW

A. SOURCING FROM ASIA

“Firms [in the Asia Pacific region] needed to manage their supply chains as an integrated process rather than as a series of discrete functions” (Kippenberger, 1997, p.24), to close the global delay of supply management between firms. Indeed in 1997, in most United States and European’s firms supply chain management was already a strategic function. Another study from McMullan (1996) has the same results and those researchers said that the first movers in the improvement of supply chain management will have a competitive advantage in this region. Afterwards, Williamson (2005) highlights the changes driven by the rise of China and the liberalization of international commerce. The firms that will understand those changes will be able to develop new strategies to succeed in Asia.

Missing opportunities to source in low cost countries, such as Asian countries, is a criticism that no company can sustain. The lost time compared to first movers may be difficult to balance as it can take time to be felt and be harmful over the long run. This complication increases the importance of not missing this transition (Boss & Zhao, 2004). Indeed “many Asian and Eastern European countries, with cheap and skilled labour, offer attractive opportunities for reducing component or system development and manufacturing costs.” (Canbolat, Gupta, Matera, & Chelst, 2007, p.1). For example the Pearl River delta in southern China attracted many firms with its low operating costs (Lo, Sculli, & Yeung, 2006). However “many executives are realizing that these extended supply chains are exposing their enterprises to an increased level of risk” (Elkins, Handfield, Blackhurst, & Craighead, 2008, p.57). Obviously sourcing in Asia considerably broadens supply chains. Moreover in several countries such as Malaysia, there are other issues that disturb firms such as “accountability, transparency, corruption, integrity and cronyism” (Hui, Othman, Omar, Rahman, & Haron, 2011, p.589). However these perceptions tend to decrease thanks to the improvement of the system, and the public intervention (Hui, Othman, Omar, Rahman, & Haron, 2011).

Rising costs and quality in China gives opportunities to source high quality products from China and gives opportunities to other low cost countries to attract companies (PricewaterhouseCoopers, 2008).

In the last decades China changed considerably, this country entered in the World Trade Organization (WTO) the 11th of December 2001. “Under the WTO, severe restrictions on foreign companies’ distribution rights should be removed over the next several years.” as well forecasted by (Jiang, 2002, p.187). In fact China had to relax over 7000 tariffs (The economist, 2011) and thanks to the WTO foreign firm does not have to give their technology to enter China, even if the pressure is still strong. The growth in China is declining but the growth in Gross Domestic Product (GDP) was still over the 7% in 2014, it was 2,4% in the United States and 1,4% in the European Union during the same year (1,3% in Belgium), according to the World Bank. Moreover the Chinese environment continues to evolve, such as the new Shanghai “上海” Free Trade Zone created the 29th of September 2013. This free trade zone offers new development possibilities. For example international cargo can be charter in Shanghai, rather than having to go to other ports in other countries for transfer. (Zakkour, 2014). Companies can then establish new factories and have direct shipment to Europe or America.

Sourcing from China is an important tool for firms, but it also brings important challenges, one of those challenges is the culture. For example the well-known concept of “Guanxi” “关系” it is the Chinese term for “connection; relations; relationship”. Personal relationships are very important in China and add a sixth challenge “culture” to the five others: delivery, flexibility, cost, quality, reliability (Towers & Song, 2010). According to this study, Chinese language and culture are important difficulties especially when specifications for the product (here garments in the study) are very precise. Misunderstandings that can happen are time consuming and can be source of frictions. Therefore in order to have a beneficial business between the suppliers and the buyers, it is important to have a favorable relationship and to communicate efficiently (Ganguly, 2013) and (Olso, & Wu, 2011). Those findings are even more important in the garment industry where the supply chain has to be responsive to adapt itself to the fast changing demand.

The end of 1990’s has seen the emergence of anti-sweatshops groups following the growing discontent about the social effect of globalization. Nowadays multinational companies are pushed to implement Corporate Social Responsibility (CSR) rules and corporate governance reform (Yu, 2008). Therefore many firms wrote a mandatory code of conduct for suppliers, reflecting values of the firm. These codes reflect environmental, labor and human right claims of the buying firm; they are often based on the conventions of International Labor Organization (ILO). When

sourcing in China, it can be really important to have a code of conduct of suppliers because China “... received the most intensive criticism of sweatshop labor abuses over the past several decades.” (Yu, 2008 P. 515) based on a study of Sethi (2003). In addition of the 44 hours a week allowed, Chinese law authorizes 36 hours of overtime per month (Article 36 and 41 of Labor Law of the People's Republic of China, retrieved from the China.org.cn website) however the suppliers studied by (Yu, 2008) recorded until 104-128 overtime hours per month. In addition the safety of the plant was not efficient and workers did not have the protection equipment according to the hazardous condition of their function.

When Fortune Sports (FS) (the studied suppliers) became suppliers of Reebok, it has to follow reebok's code of conduct and Chinese Laws. Labor laws in China are close to those of developed countries, yet the implementations of those laws are not really followed. Local governments who tried to attract foreign investments have a lack of willingness and capacity to enforce the law (Yu, 2008). The All-China Federation of Trade Unions (ACFTU) is deeply influenced by the government and the management of affiliated companies, and it is the only union organization supposed to sanction labor abuses. Consequently, the ACFTU suffers the same lack of willingness than local governments. It can explain why Chinese workers “take action independently of the ACFTU, and it is increasingly common for them to elect their own representatives” (Seymour, for The Guardian, 05th of February 2013).

Fortune Sports allowed its employees to vote to have representatives in a union of worker, but Chinese laws do not allow such a union to take any coercive actions against firms. Therefore those unions do not have any real bargaining power. However “From 2011 to 2013, China Labor Bulletin (CLB), a Hong Kong-based worker ‘rights group, recorded around 1200 strikes and protest across the country [China]. In 2014 alone, there were more than 1300 incidents.” (Griffiths, for CNN, 29th of March 2016). But censorship obstructs the information in China; therefore many workers do not know that strikes can have real results in China (Griffiths, for CNN, 29th of March 2016). Then the implementation of Reebok's code of conduct did not really improve life of Chinese worker but did improve the profitability of Reebok and protect him against anti-sweatshop activists.

This study showed that a code a conduct cannot rely merely on Chinese laws due to their low standards and minimum salaries. In most of the western countries buyers can only rely on the law

to be sure to not have any ethical issues. When sourcing in China suppliers need most of the times help (organizational and financial) to improve their working conditions. Buyers who want to start sourcing in China have to be aware of this issue and be ethical enough to ask for decent working and living conditions for their suppliers employees. Firms with great visibly or with activists against them, have to pay attention to this kind of matter. If a problem arises in one of their supplier productions sites or if information is released, it can hurt the reputation and the profit of the firm.

According to Hermerling and Lee for The Boston Consulting Group (BCG) (2007) the advantages of sourcing from China are multiple : Improved costs structures, innovations, low costs, skilled labor pool, national and local government incentives, fast-growing domestic market ... Nowadays, China is producing more and more high-value product as the quality of suppliers are improving.

In general companies followed a four steps process to source from China: testing the water, early engagement, full integration and making China a center. At the end of this process firms such as IBM have top procurement centers in the country. Even if firms studied by BCG are making huge costs saving in China, the part of their spending in China compared to their total volume is relatively low. However most of these firms would like to increase their sourcing volume in China.

China is a huge country with considerable differences between regions, firms, industries... you cannot work with every European company in the same way and it is the same for Chinese companies. This diversity of the Chinese market can add difficulties when looking for new suppliers, indeed the quality and the price can drastically change throughout China. However Hermerling and Lee (2007) identify 10 best practices to efficiently sourcing in China. Some of those practices can be and should be applied throughout China, such as:

- Defining a clear sourcing strategy with specific targets and plans: Chinese suppliers base are very heterogeneous in their type of ownership, quality, costs ... Huge differences can be found through regions in China in term of costs or regulations. The sourcing plan has to define what to source, where, with whom and defines clear objectives.

- Enabling collaboration across regional and functional boundaries: Most of the companies have a single center for export and local buying to benefit of economies of scale and attract suppliers' attention.
- Integrating suppliers and R&D into design: The gain from sourcing in China can be greater when the suppliers are involved in the product development to benefit from their capabilities. These practices can be implemented when the process of sourcing in China is well established.
- Systematically developing suppliers: As qualified suppliers can be in a limited availability, a way to avoid shortage is to develop its suppliers and help them to have the capacity and the quality required.
- Providing internal education to increase awareness and understanding: most of global procurement centers do not know the possible opportunities in China; therefore they can miss possible costs savings and profitable partnerships.

One of the differences among Chinese firms is their ownership. A study made by Millington, Eberhardt and Wilkinson (2006) assess the difference of behavior depending on the style of ownership, it can be state-owned enterprises (SOEs), private Chinese enterprises (PCEs), foreign-invested enterprises (FIEs) in the last category there is international joint ventures (IJVs) and wholly owned foreign enterprises (WOFEs).

In China some sectors are dominated by SOEs, those firms rely heavily on the state planning. Even if the Chinese government recently undertook some measure to make those enterprises more efficient (Liu for the Chinese University of Hong Kong (CUHK) business school, 2016) the Chinese government might never want to fully privatize these enterprises. Multinational companies can have difficulties to find the quality or the responsiveness that they need among SOEs. Indeed they can suffer price fixing, quotas and follow preferred prices for other SOEs. Moreover the political ability is sometimes preferred than management capacity when looking for new CEOs (Liu, 2016). Therefore foreign firms are more attracted by the private sector, which is a growing sector in China. In 2012 the return on assets for SOEs was 4.9% and 13.2% in PCEs (The Economist, 2014).

Although PCEs are smaller enterprises and have less experience (Pyke, Farley & Robb, 2002), they can adapt themselves and respond to foreign demand faster than state owned ones.

Nevertheless it is important to take into account to cultural differences when dealing with these firms. Another way to source in China are the WOFEs, there are most of the time bigger than PCEs and more independent from the state. Moreover the cultural differences can be smaller and therefore the contact can be easier. In the People's Republic of China most of the International Joint Ventures (IJVs) are made between a SOE and a foreign company (Millington, Eberhardt & Wilkinson, 2006). Those joint ventures try to facilitate companies entry in China for foreign enterprise but diverging goals and culture can lead in a loss of efficiency. The performances of such suppliers are usually better than SOEs but lower than WOFEs.

The senior managers interviewed for this study say that the PCEs are cheaper and sometimes easier to talk to; however their quality, in time delivery and capacities are lower than foreign owned ones (Millington, Eberhardt & Wilkinson, 2006). A tradeoff had therefore to be made between a higher price and less problems or cheaper with the risk to have issues and to have to help the suppliers (which can lead at the end at a higher price). Managers make also a difference between SOEs and PCEs, SOEs have good competencies but are not responding and follow their own schedule. Moreover large companies are difficult to have relationship with and PCEs are usually smaller, therefore the relations is easy to create for the long term and they are inclined to make sacrifices for the buyer's firm. PCEs are more inclined to invest for their buying firms and are more flexible.

Purchasing managers in this study made by Millington, Eberhardt and Wilkinson (2006), express that the performance of SOEs were lower than the one of PCEs, the results "suggest that PCEs are competitive with FIEs. This contrasts with earlier results by Pyke, Farley & Robb (2002) which suggested that there were little significant differences between SOEs and PCEs." (Millington, Eberhardt & Wilkinson, 2006, p193). The lack of efficiency of SOEs seems to be due to institutional problems rather than cultural differences, indeed for example the role played by the "Guanxi" is quite the same in SOEs and PCEs. Therefore even if PCEs need more time and investment to become suppliers, this relationship will last on the long term and the suppliers is likely to show commitment and accept control during this relation.

B. SUPPLY RISK MANAGEMENT

Every firm needs inputs to achieve its objectives; these inputs can be services or goods. There are risks on this flow of inputs, those risks can be recognize, analyzed and managed or completely ignored (Zsidisin, Ellram, Carter, & Caninato, 2004). “The outcomes of supply risk were understood [by manager participating at the study] by the inability to meet customer requirements” (Ganguly, 2013, p91). Those managers highlighted that supply risks can damage the first goal of firms and have therefore to be cared of.

This risk is defined by firms according to their industry and to their framework (Baird & Thomas 1990). Therefore a chemical producer will not define the risk in the same way than an advertising company. Different definitions of risks in procurement are found in the literature; van Weele (2010) identifies four types of risks.

- Technical risks: These risks depend on the product that the supplier has to produce/deliver and in which extend this product is defined. For a technical product the requirement are specific, and most of the time the buyer’s company can analyze the product and therefore control it. These risks depend if the suppliers is able to deliver the desired product with the required functionalities and performance.
- Commercial risks: Commercial risks are the risks concerning the price and the cost of outsourcing. The Total Cost of Ownership (TCO) when taking a decision of sourcing has to be considered.
- Contractual risks: The contract agreed with the supplier is really important. The specifications of the product have to be well defined to be able to monitor them. The incentives or punishments have also to be clear, to manage it without harming the relation between the buyer and the supplier.
- Performance risks: The buyer’s company is dependent on the performance of its suppliers in term of quality, delivery times, etc. Therefore this performance is a risk for the company.

Some of the risks described above can be defined as suppliers risks, those risks arise when the supplier is unable to follow the demand fluctuation, the technology evolution and has quality or delivery issues. Indeed supply risks depends on the buying and the selling firm, if a firm manages perfectly his supply chain without asking the same from its suppliers, all efforts can be vain.

Risks such as quality, delivery, technical, financial and capacity can be reduced by questionnaire to the suppliers and better real time communications (Ganguly, 2013) and (Olso, & Wu, 2011) indeed good communication betters the relationship between the buyer and the seller. When having a good relationship and an easy communication supply risks can be managed as soon as they arise before passing a non-return point. Questionnaires will deepen the buyer knowledge about the suppliers, therefore the buyer will be able to choose wisely its suppliers and take the corrective measure needed to lower risks.

Risks lead to different type of disruption that can be modeled in different ways, such as “all or nothing” or the quantity delivered is a random fraction of the quantity ordered by the buyers. The first one is a modeling where the suppliers is able to deliver the needed quantity or is unable to deliver anything; in the second one the livered quantity is a function of the ordered quantity (He, Huang, & Yuan, 2015). These considerations are more in the case of a quantitative study which will not be the case here. However we will use the function type of disruption and consider the first case as an extreme but possible risk.

The purpose of risk management is to identify risks in order to avoid those, if not possible to avoid a risk, firms will try to reduce it or at least monitor and control it. Raiffa (1982) and Hertz and Thomas (1983) developed the Risk Management Process (RMP); it consists in five different steps: risk identification, risk measurement, risk assessment, risk evaluation and risk control and monitoring. The study of Tummala and Schoenherr (2011) focused on the three phase of the Supply Chain Risk Management Process (SCRMP), however “the other components, such as drivers, risk categories, supplier/logistics evaluation criteria and performance measures should not be neglected.” (Tummala & Schoenherr, 2011, p.475)

Phase 1 of SCRMP:

- Risk identification: the first step of the first phase is to identify the possible risks. The understanding of the risks is a mandatory step to be able to implement a mitigation process. This process can affect other risks; therefore the interdependencies between risks are also to be understood. The threats and the resources have to be identified in order to be able to address risks.

- Risk measurement: the purpose of the second step is to determine the consequences of all the supply chain risks even the lowest. Their impact and the predictability have to be identified.
- Risk assessment: in this third step, the likelihood of risks will be defined. As this is about uncertainties, the likelihood will be defined in a scale by subjective means such as experience in the industry and common sense.

Phase 2 of SCRMP:

- Risk evaluation: this step comprises the risk ranking and the risk acceptance. In the risk ranking the risk in the supply chain is defined as “Risk Exposure Value of Risk Factor = Risk Consequence Index * Risk Probability Index” (Tummala & Schoenherr, 2011, p478). Once risks are ranked, they have to be analyzed to decide, which ones is acceptable and do not require action, which ones is unacceptable and require immediate action, and in between which ones is tolerable and will need action when resource for it are available. Those decisions are part of the risk acceptance process.
- Risk mitigation and contingency plan: the first step of this stage is the risk planning indeed risk mitigation has a price and all the risk cannot be managed at the same time. The cost of this mitigation is therefore to be analyzed and the project classified by the necessity and costs. The second step is the Hazard Totem Pole (ATP) analysis, this method allows to combine the specificities of the evaluated risk. It consists of the sum of the three previous number assigned to each risk (consequence severity, probability of occurrence and implementation cost). This tool provides help to the supply manager, but as this is a subjective analysis and the condition can change over time, the analysis has to be modified and not followed with blind eyes.

Phase 3 of SCRMP:

- Risk control and monitoring: this last phase assess the measure previously taken and compares expected outcomes of the measures taken, then corrective actions can be introduced if needed. Of course the process does not stop here, as SCRMP has to be continuously assessed and improved.

“Risks in supply chains are dynamic in nature; the frequency and severity of risk events keep changing. Some risks can be reduced or even eliminated, while new ones may appear anytime.”

(Ravindran, Bilsel, Wadhwa & Yang, 2010, p.406) Therefore supply chain risks management process has to adapt itself all the time and be proactive, as it is always better to eliminate a risk before it is occurring.

This research will focus on the first steps of the risks management when the analysis of risks is done to potential suppliers. Therefore contingency plan can be made but cannot be evaluate except with previous cases. Ganguly (2013) found in its research that most of firms (4 up to 6 in his study) did not have risk assessment in the primary function of the supply management. They have quality issue, supplier improvement and supply interruption monitoring before discovering risks. However the respondents for this research tell that tools aiming to improve suppliers discover also risks and there is no clear separation between suppliers' assessment and risks discovering.

All of the companies studied by Ganguly (2013) have quality or lead times issues with suppliers that led to higher cost than estimated. These problems may be due to a not good enough relationship with suppliers that can be better off with more effective supplier selection and better risk management tools used. This research found techniques used by purchasing organization to manage supply risk "such as certifying suppliers, developing suppliers and implementing and using information systems." (Ganguly, 2013, P.96) Those techniques cannot be used for selecting suppliers, however after selection risks still have to be manage, those technique are then useful.

Another feature that is not well used and known is the speed of risks. This feature comprises the velocity at which the risk happens, the velocity at which the loss happens and the time before the discovering and the realization of risk. "Coupled with increased lead times, lead time variability, physical distances from sources of risk, and lesser control over the supply chain, speed increases the magnitude of global supply chains problems" (Manuj & Mentzer, 2008, p.197).

The risk management depends on the perspective of the management, short termism does not mean absence of risk management (Manuj & Mentzer, 2008) but its importance compared to long term management is considerably lower.

RISKS MANAGEMENT IN GLOBAL SOURCING

Risk is about uncertainty and given outcome, there is no not known risks (Lockamy, 2014). As managers have to reduce firm's exposure to uncertainty they need to implement systematic

management of supply chain risks (Oehmen, Ziegenbein, Alard, & Schönsleben, 2009). When a company is sourcing abroad to an external supplier, we can tell that this firm is “outsourcing” and “offshoring”, but it is important to not confuse “outsourcing” and “offshoring”. Outsourcing is a process of allocating a production to an external company wherever this firm is located. Offshoring is producing or buying something in another country, this production can be done by an affiliated or an independent company (Nassimbeni, Sartor, & Dus, 2012).

Sourcing abroad has several advantages but also some disadvantages for example more risks involved. Several reasons can encourage a company to offshore, Most of the time for costs reduction purpose. Global sourcing can lead to a cost saving until 40%, in fears competition industries these savings are really important. It can explain why most of the European garments firms have suppliers or plants abroad (Frear, Metcalf & Alguire 1992 and Zeng, 2003).

However it is important to mention that firms may also decide to produce outside for technical, legal or geographical reasons. Certain firms do not have the choice to buy materials in other countries, for example if the material is not produced in their home country. Outsourcing and Offshoring can also be a perfect way to increase the competitiveness of the company by focusing on the core business or having access to new technologies. When a company decides to source abroad, a larger potential supplier base is available and this firm can use the competition to have better price. Moreover the buyer can look for advanced technological suppliers with who invest and develop new products. In summary sourcing abroad is a way for firms to broaden the available choice of local suppliers and seek for new opportunities and development.

Nevertheless Global sourcing reduces control abilities. Indeed the supply chain is vulnerable to multiple layers and regulations. Uncertainties are also increased due to heterogeneity of the market condition and the greater lead times and distances (Ravindran, Bilsel, Wadhwa & Yang, 2010). Firms can also be victims of protectionism from their home countries, or willingness for their customers to have local made products. The decision to outsource or not, is an important matter and depends on the competitiveness of the firm and of the possible suppliers. This decision relies also on the political situation in the buyer’s country (tariff, importation rule, currency exchange...) and its geographical position (close to transportation route, close to low wage countries...).

SPECIFIC SUPPLY RISKS IN CHINA

Cultural differences and language barriers are the most obvious supply risks in China. According to Jia and Zsidisin (2014) cultural differences can lead to several issues between western firms and Chinese suppliers. For example hierarchical structure: Chinese firm are more hierarchized than western one, therefore when discussing with Chinese (and other Asian) companies, western companies have often to wait for the approval and the response of the management of the suppliers. Another good example is: in China; the typical answer is always “yes” or “maybe”, but this answer may mean “yes” or “no”. For instance if a Western client asks to a Chinese firm to produce in a certain way, the suppliers will most probably answer “yes” without thinking if he will change his procedure or not. Other issues are the fear of corruption of the purchasing staff, quality (Ting, 2004) and logistics (Goh & Ling, 2004).

In the study made by Jia & Zsidisin (2014) cultural supply risks are classify in two categories those from the difference in the “institutional norms” and those from the “philosophical orientation”

Institutional norms:

- Risk associated with hierarchical structure: Delay can occur because in China it is mandatory to pass through the organizational structure. Problems cannot be solved rapidly and easily with counterparts in the suppliers company, without first talking to managers, who will give order to people involved. This process can be time consuming and harm the firm responsiveness.
- Risk associated with network governance: “...companies doing business in China must pay particularly close attention to business courtesy expenditures. Indeed, nearly one-half of all China-related corporate prosecutions under the FCPA [Foreign Corrupt Practices Act is a federal American law of 1977 which has the purpose to fight corruptions] since 2002 involved the provision of gifts, meals, travels, or entertainments.” (Warin, Diamant & Pfenning, 2010, p.59)
- Risk associated with the relationship-building process: the process of relationship building in China is mostly informal and flexible.

Philosophical Orientation:

- Risk associated with family orientation: Chinese culture has more a collectivism orientation, Chinese worker do not mind working on holidays or after working hours. It can lead to difficulties to agree on a common agenda between Chinese and Western workers.
- Risk associated with the Yin-yang principle and harmony: In China a “yes” can mean “yes” or “no”, this point is difficult to understand by western companies when dealing with Asian suppliers.
- Risk associated with time orientation: the Chinese culture is more a long term culture, therefore before working together the relation needs to be built. This relation will be hard to fracture and commitment hard to escape.

Of course cultural risks are not the only one in China, other issues can happen as in any other countries, for example “... the threat of quality risks hidden in the supply chain. It is very difficult, if not impossible, for firms to manage the visibility of a long supply chain, particularly, when there is a low traceability of material origin.” (Tse & Tan, 2011, p.141). Traceability is an issue in China especially in the food industry, for example due to “fragmented supply chains and inadequate food supply tracing technologies have compounded ketchup giant H J Heinz's problems in China, where the firm recently recalled some infant food over a lead contamination scare.” (Rochan for the International Business Times, 25/08/2014).

The transit time from China to Europe or the United States is usually between 25 and 35 days, on top of this, extra time to load and unload the cargo has to be planned, meaning much more days by operation. The extended total shipping time to import to China can be problematic for some industries, and firms need to forecast their input needs well in advance to secure the supply chain. Moreover the commodity can be damaged, it is important to have insurance and security stock if there are improper to use. To avoid this kind of issue, the packaging of the items is primordial; some suppliers in China don't pay enough attention at this step. It is part of the buyer mission to ensure that everything is safely packed. Buyers need also to verify that every documents and certifications are in order and ready for the authority (ChinaImportal, 2013).

Another concern often rose when speaking about sourcing in china is the protection of intellectual property. It was non-existent in 1970; nowadays it is seen as lever for economic

growth by the Chinese government (De Le Court, 2014). China is the country with the highest number of intellectual property right litigations (A really small part of them involve foreign firms). In China the first one who register trademark acquire the right, it can be very difficult to cancel that kind of decision. Therefore it is important to register trademark before going to China even before looking for partners or suppliers.

Security of working places still raises concern in China, especially after the blast that happened in Tianjin “天津” (which is the biggest port in northern China) on August the 2nd of 2015, indeed this explosion is believed to be due to an illegal storage of hazardous materials. Firms want to understand how such storage can still exist and how the Chinese government will ensure that it will not happen again (Bureau Van Dijk, 2015). Indeed Toyota and John Deere had to temporary stopped their production and 2700 Volkswagen’ and 1500 Renault’s cars were destroyed. More importantly 50 people of Toyota staff were injured among a total of 150 victims and 700 injured (BBC News, 2015).

C. SUPPLIERS SELECTION

The selection phase of suppliers is an important step, indeed choosing suppliers and suppliers’ changes costs and times can be huge. It is therefore primordial to take everything into account when selecting supplier, quality, costs, relationship, delivery and risks. Due to times differences, distance and cultural barriers, suppliers’ selection in China can take more times and therefore cost more to companies. It is then even more important to choose properly the first time. As China has plenty of suppliers that produce everything possible at every quality, costs or risks associated. It is then necessary to have a process to be able to find the right suppliers.

The process of selection needs several steps to find and analyze properly the suppliers and spend time only on quality suppliers. Before selecting suppliers, buyers have to decide what to outsource, the objective of this outsourcing process and keep clear measurements of these objectives (Hermerling and Lee, 2007). Then firms have to find suppliers by using their network, going to business fair or simply using internet with Google, Alibaba or specific website. The suppliers’ evaluation must follow a scalable process, removes quickly those who do not fit and allows more time on others. Finally one or few suppliers will be chosen according to their specificity and a beneficial relationship should start between companies.

OUTSOURCING DECISION

The first step is to take the “make or buy” decision according to the core competencies of the firm and its efficiency. The firm has then to decide with whom working and which quantity order from each supplier (Ravindran, Bilsel, Wadhwa & Yang, 2010). The following outsourcing matrix is a useful tool that can help firms to take decisions.

Figure 1: The outsourcing matrix

Level of competitiveness relative to suppliers	High	Maintain/Invest (Opportunistically) Competencies are not strategic but provide important advantages keep in-house as long these advantages are (integrally) real.	In-house/invest Competencies are strategic and world-class; focus on investment in technology and people; maximize scale and stay on leading edge.
	Low	Outsource Competencies have no competitive advantage.	Collaborate/maintain control Competencies are strategic but insufficient to compete effectively; explore alternatives such as partnership, alliance, joint-venture, licensing, etc.
		Low (non-core)	High (core)
Strategic importance of competence			

Chart from van Weele (2010), p.165.

One of the main reasons of global sourcing is costs savings, when sourcing for developing countries this reason is even more obvious. However it is important when taking such a decision to consider the real cost of outsourcing, indeed the savings can be lower than expected (Gilley & Rasheed, 2000). Manufacturing costs are often cheaper in developing countries but the transaction and transportation costs are most of the time higher. In China the culture differences add difficulties, but also the poor transportation system (Platts & Song 2010), moreover the “Guanxi” culture increases the number of obstacles and the time needed to source in China. Indeed build relationship in china take a long time and several long meetings will be needed (Millington, Eberhardt & Wilkinson 2006).

The price is an important factor in the outsourcing decision, however the price payed when outsourcing is higher than just the quoted price. Buyers have to pay attention at the terms of

shipment when assessing the price. Some examples are: EXW (Factory price, no shipping included), FOB (Export clearance and delivery to Port of Loading in China), CIF (Shipping to Port of Destination, excluding local charges), DAT (Shipping to Port of Destination, including local charges), DAP (Shipping to a specific address, all shipping costs included). The buyer can let the suppliers take care of the shipping, however in that case the shipping cost will probably be more expensive and the buyer has no control over the insurance, shipping time... Cost of shipping depend mostly of the volume and the weight, the price will drastically change if the firm import by container, FCL (Full Container Load) or LCL (Less than Container Load). There is no export tax in China, but the company will have to possess the export clearance papers. (ChinaImportal, 2013).

Platts & Sond (2010) classified costs into two categories the set up costs, which are the costs that you experienced at the beginning of the process and the ongoing costs. The later comprise extended price, administrative costs, logistics costs, inventory costs, quality issues, supplier management and other costs related to China. The finding in this study is that the costs of outsourcing in China were usually under-estimated, the estimation is around two third of the real price.

SELECTION PROCESS

Supplier evaluation and selection is becoming an important subject due to its complexity and the possible impact on firms. Indeed due to the globalization and the growing number of outsourcing firms, companies depend more on their suppliers for the financial results, quality, delivery time...

According to (Braglia and Petroni, 2000) this step is one of the most important in the purchasing process. However this selection are sometimes not consistent (Zhang, Lee and Chen, 2012) due to the numerous criterion that need to be taken into account and in different occasion one supplier can have diverse evaluations. Moreover indirect costs are not always considered and the different costing methods used add complexity, it can turn the evaluation of the profitability of a product in a difficult process. Nowadays most of the research focused on efficiency of the supplier or the total cost of sourcing, the research of Zhang, Lee and Chen (2012) uses a hybrid process for selecting suppliers.

The Data envelopment analysis (DEA) model is more often used because it can rank suppliers but also categorize them as efficient or not. Another method that help decision maker is the Analytic

Hierarchy Process (AHP) which helps them to reexamine their intuition, but the disadvantage of this method is that it take not into account the potential limitation such as the budget or the production capacity of the supplier. The combination of those well studied models is the Data Envelopment Analytic Hierarchy Process (DEAHP) although being more difficult to use or requiring more steps, the DEAHP deliver a better supplier selection.

Another model is the Activity-Based Costing (ABC) this method from the management accounting assigns a cost to each activity. Roodhooft and Konings (1996) used this method to the supplier selection process and proved that this method permits to select cheaper suppliers. However with ABC, only the cost factor is used without considering all others that have also an importance. Therefore this method can be difficult to apply in an environment with other restrictions than costs.

In the hybrid model used by Zhang, Lee and Chen, (2012) the DEAHP model is used to evaluate the efficiency of suppliers, compare them and define objectives and criterion, a cost evaluation is then made with the ABC model. Suppliers are later selected by a ratio efficiency score to cost. This method is helpful for manager to select suppliers and is flexible enough to involve different functional departments of the firm. However the data computation is difficult and relies mostly on the suppliers, moreover the risks related to the suppliers are not taken into account.

There are two main strategies in supplier selection, the market-focused and the relationship-focused ones (Xie, Peng & Zhao, 2012) in emerging countries uncertainties are coming from the market, but also from the institutional framework. Drivers for market uncertainties are demand uncertainty, competitive intensity and technological turbulence (Zhou, Yim & Tse, 2005). In an environment of high uncertainties, firms are more likely to adopt a relationship-focused supplier selection. Indeed in this kind of environment, flexibility is needed and relation based supplier selection bring more flexibility to the buying firm (Wathne & Heide, 2004). Flexibility has a cost but a more flexible supply chain allows the managers to better response to fluctuation or to unexpected events (Manuj & Mentzer, 2008), therefore more risky is the environment more flexibility is important.

Ravindran, Bilsel, Wadhwa & Yang (2010) divided supplier selection approaches into three categories: mathematical programming (MP) methods, artificial intelligence (AI) methods and game theoretic (GT) methods.

- MP method: This method is the most used (Cao, Luo, Kwong & Tang, 2014), and uses mathematical method to solve the supplier selection problem. The standards and objectives are set into mathematical formula, which turn this decision in an easier optimization process. However this construction can over-simplify the decision and be too far for the practical world.
- AI method: By imitating biological thinking this method is closer to the reality of the ground but is more difficult to use.
- GT method: The biggest advantage of this method is the fact that it will enable firms to select suppliers that gather the different opinion of the different department and that will optimize the overall goal of the firm.

Those methods are difficult to use, especially for a firm that has not a lot of mathematical or purchasing capabilities. The AHP method is a useful and not too difficult tool to use to take decision and can be part of a selection process but must include other elements to take into account limitation and firm's specific elements.

SUPPLIER EVALUATION

According to Hedderich, Giesecke and Ohmsen (2006) it is possible to find attractive and skillful suppliers in China, the difficulty is to find them among the variety of suppliers. The process to find the right one can take a long time and cost a lot of efforts, therefore being expensive. Moreover a potential supplier has to be evaluated on several usual criteria (Levary 2007) and other specific to China.

First of all not every product can or should be imported from China. The product must have several characteristics to be importable from china. The cost of importation, which has to be considered as TCO, has to be attractive in China. The savings are mostly made on wage costs; labor intensive products are most likely to be good candidate for importation. Most of large Chinese suppliers refuse small orders or make them expensive; therefore if the volume needed cannot be large enough, the product will have to be made by smaller producers. Those producers can lack of export skills and quality (Hedderich, Giesecke & Ohmsen, 2006).

It can be difficult to implement sourcing from China; therefore to gain from this process, products with a long life time have to be preferred. Moreover most Chinese suppliers work in high capacity and do not want to work with fluctuating quantities (Hedderich, Giesecke &

Ohmsen, 2006). Chinese suppliers may also lack of interest into investing for buying companies' specific products, especially state owned companies (Millington, Eberhardt & Wilkinson, 2006).

The study of Millington Eberhardt and Wilkinson (2006) identifies four filters use by managers to select one or few suppliers among a list that can be long. The first one is a pre-filter; it consists on using easy available information, for example information on their official website or B2B websites such as Alibaba.com. The second step is a questionnaire or self-assessment; these have to be adapted to the Chinese context and using Chinese criteria. During these steps, the buyer's company has also to sell itself to show themselves as an interesting customer. The personal relationship starts also at this time. During the next step the buyer will visit the potential suppliers; this visit is the perfect occasion to deepen the personal relationship and to verify that the supplier meets the requirements. Before this steps and sharing information it is important to ask for a protection for your information and intellectual property, and to register trademark (De le Court, 2014). The last step consists in a deep assessment of the suppliers, not only the quality of the product will be checked but his management, risks, logistics... during this step, especially in china, personal meetings will be done to strengthen the relationship between the buyer and the seller. The final selection has to take into account different factors such as quality control, culture, finance, relationship, logistics, production, risk... all the evidences have to be carefully checked for example false certification can be found in China.

Levary (2007) developed several requirements for suppliers. They have to be able to produce at the needed quality; they therefore need the technology and the skilled workforce accordingly. Their technical support and the sales team have to be able to respond to the buying inquiries. The quality of the product has to be constant or be improved over time and measured according to the standards of the buying firm (or translated). The quality has to be insured in the entire supply chain, the supplier must therefore assess its own suppliers.

The suppliers has to have enough flexibility according to the buyer needs, it includes the volume flexibility and the product flexibility. The volume flexibility is defined "as the efficiency with which a manufacturing process can be converted from producing one lot size of a given product to producing a significantly larger or smaller lot size of the same product" (Levary, 2007, p.392) and the product flexibility "as the efficiency with which a manufacturing process can be

effectively converted to produce a new product design and/or product having specialized features” (Levary, 2007, p.392).

The price of the buyer has to be adequate with assurance that the price will no skyrocket or increase without proper reason. Moreover the price has to be understandable by the buyer, by being precise enough and in the same metrics as the buying firm (or in metrics than can be translated to the buying firm’s one). The location of the supplier is also important, it has to be somewhere with acceptable risks and there is to exist fast enough and reliable routes of transportation between the production line and the sites where the buyer needs the product. The political stability and the import and exportation rules are also primordial when assessing a supplier.

The reliability of a link in supply chains depends on the reliability of all its predecessors, until the first step of these chains. To choose a supplier, managers have to consider tangible and intangible criterion, moreover the reliability of its supply chain will depend on its decision, but also on the decision of upstream managers (Levary, 2007). The Analytic hierarchy process (AHP) was developed to take decision in this kind of environment with several layers and managers (Saaty, 1990). However this decision method does not take into account the limitations such as price or capacity of the suppliers (Zhang, Lee and Chen, 2012). Therefore it has to be used to take intermediary decisions or used to take the final decision of a process where the limitations are previously taken into account.

FORECASTING SUPPLIERS EVOLUTION

Contracts are made to protect the buyer and the sellers to disruptions. Both of them should have backup stocks or other production possibilities. However these protective means can be not strong enough to well protected the firms, indeed misbelieves of the risks can happened in the buyer or the supplier’s firm. For example the eruption in Iceland in April 2010 affected plants all over the world that need key part from Europe (He, Huang, & Yuan, 2015). This kind of event is really difficult to forecast, as it is not directly related to the firm’s supply chain.

If the disruption is not well known, or hard to measure, the backup or other suppliers can be activated too late. For example if a big natural catastrophe happen, this event will be known worldwide, therefore every firm that has suppliers in the concerned region will be aware that it has to activate its risks assessment team. However a problem such as a local strike or an epidemic

in the workers will not be noticed before its effects on the production. In the second case the buying firm can be too late to solve the issue. This factor is included in the risk analysis made by Chen and Wu (2013) and by Cagnin, Oliviera, Helleni and Vendramini (2016). Another example is in case of quality issues, the recall can happen a long time after the products are sold.

According to Cagnin, Oliveira, Simon, Helleno and Vendramini (2016) the method developed by Chen and Wu (2013) which associated the Failure Mode and Effect Analysis (FMEA) with Analytic Hierarchy Process (AHP) allow to select suppliers with the lowest potential risks to the company. This method combines three characteristics of risks:

- The severity
- The probability of occurrence
- The detection probability

This method complete then the risk exposure value of risk factor of Tummala and Schoenherr (2011). However external risks or the speed of risks (Manuj & Mentzer, 2008) were not taken into account in this method. Yet external risks are important and can hamper heavily supply chains, for example the earthquake that hit Japan the 11 March 2011 affected a General Motors plant in Louisiana and also impacted Hewlett-Packard, Apple, Toyota... after such events companies re-evaluate their supply chain and switch the focus to reducing cost and just-in-time to buffering risks (Lohr for The New York Times, 2011).

Canbolat, Gupta, Matera and Chelst (2007) modified a Process Failure Mode Effect Analysis (PFMEA) where three factors were used (severity, occurrence and detection). They changed the severity factor by a dollar measure and used it in the automotive industry. This model was proved to be usable to select suppliers or evaluate risk management strategy.

ASSESSING RISKS OF CHINESE SUPPLIERS

The process of assessing risks of potential suppliers in China has to be composed of several steps: risks identification, risks measurement, risks assessment and risks evaluation (Tummala & Schoenherr, 2011). Such a process has to be continuously adapted to the changing environment (Ravindran, Bilsel, Wadhwa & Yang, 2010), especially in China where the growth is still huge (World Bank) and therefore the environment is changing quickly.

Risks in China included cultural risks (Jia & Zsidisin, 2014) (Towers & Song, 2010) that can be difficult to assess and measure and hidden risk difficult to find. Hermerling and Lee (2007) identified best practices to improve sourcing in China, and therefore make a better assessment, such as training and recruiting best people, be aware of differences throughout China (depending on region or ownership (Millington, Eberhardt & Wilkinson, 2006)).

In China an important part of the risks are coming from intangible criteria such as cultural differences (Jia & Zsidisin, 2014) (Towers & Song, 2010), “guanxi” and relationship (Warin, Diamant & Pfenning, 2010) or the traceability of the supply chain (Tse and Tan, 2011). The Chinese environment can also increase other risks by its local peculiarity, such as the reputational risks by its weakly enforced labor law (Yu, 2008) or affect the relationship or the performance following the ownership of the supplier (Millington, Eberhardt & Wilkinson, 2006) (Liu, 2016) (Pyke, Farley & Robb, 2002). Those risks or factors cannot be assessed by mathematical formula and need a tool that allows qualitative data. Moreover China is at an average of a month of shipping time (ChinaImportal, 2013), such a lead time and distance increase risks (Ravindran, Bilsel, Wadhwa & Yang, 2010) and the communication can be difficult due to the time difference or the difference of national holiday. These risks and factors make the risk assessment an important part of the supplier selection in China. The selection process and the way to evaluate the risk have to be flexible due to the fast changing Chinese environment.

Once all those risks criteria are assessed, the Analytic Hierarchy Process (AHP) developed by Saaty (1990) is a useful tool that allows to have a final evaluation easily comparable with other suppliers. This “method is based on three principles: first, structure of the model; second, comparative judgment of the alternatives and the criteria; third, synthesis of the priorities” (Özkan, Başligil & Şahin, 2011, p.2). To apply this method four steps need to be followed: first definition of the goal, then analysis of the situation and decision condition, thirdly definition of supplier selection criteria and finally realization of chosen method for supplier selection (Hudymáčová, Benková, Pócsová & Škovránek, 2010). This method with the right criterions can be well adapted to the Chinese environment, and the criteria can be easily adapted to the industry or the environment.

D. GAP IN THE LITERATURE AND CONCLUSION

Sourcing in China is well describe and analyzed in the literature, nevertheless Chinese environment and companies change and evolve very quickly. Past research is therefore getting outdated at a fast pace. Analyses on business, environment, behaviors or risks have to be done frequently to keep sense. Some dimensions of risks are not commonly used by scholars and the definition should be specified. For example, the speed of risk is defined as follow in the literature:

Speed of risk can be divided into the rate at which the event leading to loss happens, the rate at which losses happen, and how quickly the risk event is discovered. Coupled with increased lead times, lead time variability, physical distances from sources of risk, and lesser control over the supply chain, speed increases the magnitude of global supply chains problems. (Manuj & Mentzer, 2008, p.197)

This definition does not include an important factor, which is the speed of the solution. The importance of risks depends on the speed of consequences and the time before going back to a normal situation. Both definitions should be included in the definition of speed. According to Handfield, Blackhurst, Elkins and Craighead (2008), if a disruption is quickly identified the mitigation plan can be rapidly implemented; another important factor is the effectiveness of this mitigation plan. Companies that have plans ready to use with their resource will respond more efficiently and quickly to potential disruptions.

Almost nothing has been done on the forecast of risks in business. Forecast on demand has been analyzed and processes have been done to improve it. But on risks, questions stay: Where to forecast? How make “what if?” plans?

Even if sourcing in China and selecting suppliers in this country have been deeply analyzed, most of the times studies focus on one or two issues. An entire process that uses several dimensions on risks, usable easily by firms, without complicated formulas and that do not need a lot of time has not been created.

The process studied by Cagnin, Oliveira, Simon, Helleno and Vendramini (2016) on the process developed by Chen and Wu (2013) is proved to select to suppliers with the lowest potential risk. This process uses a FMEA with three factors (severity, probability of occurrence and detection probability) and the AHP method to select a supplier. This process can be used at the end of an

entire selection process but should be completed with a speed dimension of risks instead of a detection of risk probability. Indeed the speed factor of risks when wholly defined adds more criteria and is more complete than the factors use by Chen and Wu (2013).

3) METHODOLOGY

DATA ANALYSIS

Questions were raised, during the writing of the literature review, on the way people behave in firms and if the theory and the practice follow the same path. Are firms using the findings of the literature to reduce risks? Do they use the tools developed in it? Do firms have the same concerns as the literature raised about China?

The main sources of information for the literature review were scientific papers such as researches, books and articles from scientific periodicals. However, as China changes quickly and has changed considerably during the last 10 years, newspapers and blogs had to be used to have more recent observations. We were therefore able to take into account the last important changes and events such as the blast in Tianjin 天津.

Kaneka North America Apical Division serves in this research as case study. The research question was raised and the solution was approved and tested with this company. To develop the solution the literature review was a great source of information and permitted to develop a new process using the previous research as a base. Practical data were also collected to have ideas from practitioners and knowledge on how companies actually work and look for new suppliers in China. To be able to have as many sources of information as possible and of different kinds, four ways of collecting data were used:

- Participant observation
- Interviews
- Questionnaires
- Self-analysis of suppliers.

PARTICIPANT OBSERVATION

Three months were spent at Kaneka North America Apical Division as an internship. Among other tasks specific to the internship and not related to this research, the researcher worked on how the Apical Division could find new suppliers. No interview has been made in Kaneka, indeed the information was collected through normal discussion with employees and

management. The research question itself was found through discussion and work with employees.

When the process was finished, it was presented to the senior managers of Apical Division, their comments, advice and critics were collected to improve it. It was not presented into details to the entire top management, but its objectives and general ideas were. However it was deeply explained to few managers to have more precise comments. After the needed modifications, this process received the approval of those senior managers, and was allowed to be used in Apical Division.

Kaneka North America Apical Division looked for new suppliers of a chemical product; the process newly created was used to find them. This supplier search was done by the researcher and the involved departments according to criteria; the process was therefore well known by the user and used as it should be. Nevertheless it can raise question about the subjectivity of the validation, the process should then be tested in a different company by an independent team.

SAMPLE

Several purchasers or people active in the purchasing department of firms were interview to analyze the purchasing process of their companies. All the interviewees received the questions previously of the interview. Some of them responded to the questions by email before the interview, to be able to focus on the main criteria during it. As all the interviewees work in other cities or countries, all the interviews were made by Skype. Thanks to this way of communication, different ideas, from different countries were collected (China, France, USA, Taiwan and Canada). The interviewees work in small, medium and multinational companies active in different industries and have different positions (owner, purchaser or consultant).

This motley panel permits to have different and sometimes contradictory ideas on the way to search and manage suppliers in China. The main differences were on the relationship criteria, indeed people having Asian or Chinese origins do not see the cultural and relationship differences in the same way than others.

Each interview was transcribed, and the purchasing or selection process was analyzed. However one interviewee asked for confidentiality, therefore his interview and analysis are not in the paper.

Moreover the received documents are kept confidential as they contain some critical information, except the document “China Sourcing” received from Russ Doak.

Mainly for a question of time of the interviewees, some of them decided to only respond by email. The quality and precision of information are therefore not the same but it permits to have more different answers. All the questionnaires have been analyzed together as the amount of information is lower than in a real interview. However ideas from other countries, other nationalities and other industries were collected and therefore lowered the subjectivity of the received information.

The interviewees for the analysis of purchasing process and the questionnaire were found by network but also thanks to LinkedIn. Such a social network permits to have more people from different countries and industries than using only the personal network. The conditions applied to select the interviewees were:

- People active in the purchasing department or who deal or search suppliers
- People who work or want to work with China

All the people but Philippe Druot were interviewed in English (to not alter the information, the interview of Philippe Druot is in French in the appendix, nevertheless the analysis is in English)

SELF ANALYSIS OF SUPPLIERS

Suppliers were analyzed for the creation and the validation of the process. These analysis permits to test the availability of the information and their relevance. Indeed the asked information for the first step of the process has to be available easily for the buyer. Numerous suppliers were therefore analyzed through their official website or pages on B2B website such as Alibaba.com, madeinchina.com or globalsources.com to develop the process.

INTERVIEW GUIDE

The interviewees were asked about:

- Supply risk: their definition of supply risk, how can their company improve its risks management, the main difficulties about China and its risks associated, they were also asked if they had particular issues when sourcing from China.

- Outsourcing decision: what do they outsource, if they want to outsource more, and why do they outsource or want to outsource in China.
- Selection of suppliers in China: how do they seek and evaluate their potential Chinese suppliers, if they assess upstream suppliers and how do they reduce the risk when selecting suppliers.
- Risk forecast: interviewees were asked if they are making risk forecast and “what if?” plan.

The confidentiality was guaranteed where needed by interviewees. The complete interview guide can be retrieved in the appendix (appendix 1 and 2).

CASE STUDIED AND SAMPLE

The case study was selected due to its willingness to have a new process and to start from a blank page. The willingness was in fact to develop a new solution for companies and not to adapt an existing system to another market or industry. The possibility to work directly with the management and to test the solution was also an important criterion. Indeed the participant observation is convenient to understand the process in place and therefore being able to develop a solution that can be used by the case company. However Kaneka management did not want to be involved directly in the resolution of the question research, the researcher was then able to work to find the best solution without having to follow a specific path. The developed process is therefore adapted to the case company and validated by it without being exclusive to Kaneka’s operation.

The other companies analyzed were selected for different reasons specific for each of them, but they all work in or with China and have a purchasing process developed enough to be analyzed and discussed:

- Packard Bell: This company decided to outsource its production in china in the 2000’s, the purchasers working in Packard Bell at this time had therefore to find new suppliers in China. The purchaser interviewed was hire due to her knowledge of the Chinese market and culture. This experience is close to the problem of Apical Division.
- Found: It is a company that helps others to source in China; the general manager of this company has therefore a deep knowledge of the Chinese market and of the risk associated

and specific in China. Moreover as an adviser for small and medium companies, he knows the mistake frequently done by novices in China.

- Company active in the automotive industry: This company worked a long time with Chinese suppliers to import car's part and has a complex and highly developed process to assess the sourcing risks.
- PHSD consulting and trading: this trading company imports chemical products from China. The owner and founder of this company was interviewed due to his knowledge in the chemical industry in China and the importation difficulties. The fact that this company is active in the same industry than Kaneka and that the founder has a long experience in this industry was valuable to develop a process adapted to the case company.
- DCI strategic: This company offers advice services for global supply chain, the managing director of this company uses, among others, his experience at Kodak. Indeed Kodak worked with China and had an office in Shanghai. His experience and knowledge of global supply chain in multinational was really interesting and adapted to the size of Kaneka group.

Figure 2: Table of analyzed companies

Company name	Size	Industry	Interviewee	Country of activity
Kaneka	Multinational	Chemical	/	Global
Packard Bell	Multinational	IT	Purchaser	Global
Found	Small company	Purchasing advise	General Manager	China
/	Multinational	Automotive	Vice president and general manager	Global
PHSD	Small company	Chemical industry	Founder	Global
DCI strategic	Multinational	Consulting services	Managing director	Global

Self-made table

VALIDATION OF THE RESEARCH

The solution was developed using scientific literature and analysis of real companies active in China. Moreover the process was created in a real environment of a company looking for new Chinese suppliers. The conception used scientific theoretical data and practical data coming from

the case company and others. The process was therefore validated theoretically and practically by the case company, as the first objective of this research was to find a solution for this company.

The theoretical validation was made before the practical one, to validate the process before using it in a real environment. The solution was presented to the top management of Kaneka Apical Division; those managers asked questions and comment the process. Their remarks were used to make some modifications on the process to improve it and the presentation was adapted to be able to make it more easily understandable. After the presentation the process was accepted by the managers. We were therefore allowed to use the solution in a real situation.

After the theoretical validation by professionals, the process was tested practically. To make this test reliable, an actual search was made with real objectives and limitations. The process was then tested to find new suppliers in China; those suppliers had to be cheaper and with acceptable risks for the quality of Kaneka. As the test was made in a real situation, we had time and financial means limitations. Due to these limitations the visit of the suppliers was not made during the study; however two suppliers were selected to be potentially chosen. The risks of those suppliers were deeply evaluated and the “what if?” plan and risk management needed highlighted. A risk analysis of the current suppliers was also made to be able to compare the risk augmentation with the potentials costs savings.

The process has to be tested in a long term basis to be completely validated. But the approval already done, allows us to validate the usefulness of the process to assess the risks of potential suppliers in China. The developed solution is usable from the beginning of the search to the actual selection of Chinese suppliers. As the focus of this research is risks, the process enables to select the ones with the lowest risks according to the limitations and needs of the buying company.

4) KANEKA NORTH AMERICA APICAL DIVISION

COMPANY DESCRIPTION

The process was developed and tested with Kaneka North America Apical Division, with the participation of its employees and top management, especially Manish Maheshwari and Frederik Van De Velde. The method used to analyze this company was the participant observation. Indeed three months were spent at Apical Division for an internship; one of the missions was to find a way to provide new suppliers for Apical Division. These suppliers have to be cheaper than the previous local one without increasing the risk or harming the quality of the products. Due to the particularity of the Chinese market and the experience of the researcher, the decision was taken to focus on China.

“Kaneka Corporation of Osaka, Japan is a \$5 billion [consolidate base] producer of chemical products including resins, pharmaceutical intermediaries, food supplements, synthetic fibers, and fine chemicals” (kaneka Americas Holding, found on the homepage of the official website). Kaneka North America LLC is a subsidiary of Kaneka Americas Holding and was created by the merge of Kaneka Texas Corporation and Kaneka Nutrients in 2012.

The Apical Division is the part of Kaneka that produces polyimide films. This film is a highly technologic film used by several industries, among others: aircraft and aerospace, motors and generators or mining and drilling. The product of Apical Division is a highly technological products, every department of the company has therefore to focus on the quality. The customers of Kaneka insist on the quality and the traceability during the entire supply chain from the raw materials to the final product which is several steps downstream Kaneka.

Kaneka has a matrix organization; it is divided in a dimension by function (purchasing, marketing, sales, new product development...) and geographically in the other. The purchasing function has a centralized and a decentralized organization. That means that some products are managed by the headquarter in Japan for Kaneka around the world, the contract, searches for suppliers and purchasing decisions are therefore taken by Kaneka Japan. The used suppliers are then the same for every department of Kaneka. The other products are managed more locally, by geographic area or plant.

The centralized organization is for products that are used by several departments in Kaneka. Apical Division has no influence on the price of those products, and has just to manage its ordered quantities and stocks. This organization has been chosen to be able to benefit from economies of scale and negotiate better contracts due to the large quantities ordered.

The decentralized organization is applied for more specific product, for example products only used by a specific plant or division. This is the case for the raw materials of the polyimide film produced in the plant of Pasadena in Texas. Indeed these films are only produced in this plant, the manager based there, are therefore more able to manage the sourcing and select suppliers according to the direct needs of the plant.

SOURCING AND RISK MANAGEMENT IN CHINA

The gap found in the literature, was confirmed by the study of Kaneka. Indeed several companies have a lack of knowledge considering sourcing in China and Apical Division does not have a purchasing department to develop a specific process for China. In fact Apical Division has a purchasing department, but this department is not involved in the strategic purchasing.

The Apical Division does not manage its suppliers by itself it is done either by Kaneka Japan or Kaneka North America. Some products were managed at Apical Division but they were transferred to North America. However Apical Division wants to search for new suppliers by itself and take back this responsibility to be able to have the control on the price and the risks. Currently the suppliers located in Asia are managed by Kaneka Japan, no specific risk assessment or selection processes exist at North America or Apical Division for this market.

The purpose of this research was therefore to start from a blank page to have a solution perfectly adapted to the Apical Division. The Chinese experience of the researcher, his academic purchasing knowledge and the practical point of view of Apical management were the base to solve this challenge.

Kaneka Apical Division is situated in Pasadena, which is at the south east of Houston in Texas. The port of Houston is the first in the United States in foreign import (Port of Houston authority, 2016), Houston and Pasadena have a lot of chemical companies and factories. The port is therefore equipped to manage importation of chemical products and local companies exist to manage and transport those products even the hazardous ones.

NEEDS OF KANEKA

The willingness of apical division is to find a way to manage its sourcing. China for numerous chemical products has competitive price and good quality suppliers; its market is therefore attractive but can raise questions about the risk involved. Moreover the way to enter into the Chinese market is particular as the Chinese market has some specificities; the selection process has then to be adapted.

The need for a process with tools and templates was therefore felt. The decision was taken to not take a lot of information from Kaneka but to focus on the needs and willingness of Apical Division to be able to provide a completely new process applicable in this company. Through discussions with employees and managers several criteria were highlight for the process:

- Being usable by someone that does not know all the specificities of the Chinese market and Chinese culture.
- Being easy to use, and that not require strong mathematical skills.
- Being feasible in a reasonable time, indeed purchaser and manager time are also a firm's resource to spare.
- The process has also to be flexible and let enough room for the purchaser or manager's experience.
- Reduce sourcing risks.

The process was presented and discussed with some managers of apical division to be improved during its development. Once the process was finished, it was presented to the top managers of Kaneka Apical Division to be accepted and their comments collected. As the process was approved, it was used to search suppliers in China for several chemical products. The purpose of this test was to verify the practicality of the process and to modify it if needed.

The results of this test regarding the process are described later in this paper in the Kaneka validation part.

All the prices, suppliers name and specific data have to stay confidential to the demand of Kaneka management.

5) ANALYSIS

A. ANALYSED PURCHASING PROCESS

PACKARD BELL

The interview of Yen Yen Brinon-Wang can be found in the Appendix (Appendix 3)

Yen Yen Brinon-Wang was interviewed for her work at Packard Bell between 2003 and 2007. Although this period is not really recent, it is not less interesting. Indeed, during this period Packard Bell decided to move its production sites to China. Therefore Packard Bell had to find new suppliers and developed its way to find Chinese suppliers.

At the beginning the people from the factory in France tried to word with Chinese suppliers, but the communication was really difficult between them. The problem was that people in France are not always good in English and in China it is the same. Yen Yen Brinon-Wang as a Taiwanese did not have this issue as she can speak fluently Chinese. Even if the Chinese from Taiwan and the one in China is not exactly the same, the culture and language differences was much smaller than with French people.

Packard Bell opened an office in Taipei to improve the communication with Chinese suppliers and have skillful employees. Taipei was the perfect location due to its language and the fact that Taiwan is an advanced environment for IT companies thanks to its history of subcontracting them. Yen Yen Brinon-Wang has then to find suppliers in China and take care of their risks. Packard Bell did not explain their previous risk assessments. Yen Yen Brinon-Wang used then her own experience and background to define risks. For her, the major sourcing risks in China includes

- The legal perspective: At this time, the Chinese government tried to attract foreign companies and offer advantages and incentives for them. However they are not granted forever and the government can withdraw these advantages whenever they want. Those changes have obviously an impact on the cost structure of the firm. Another legal issue that can happen is the bribery problem, but it is the buyer responsibility to react in accordance to its laws and standards.

- The economic situation: Chinese economy is not always stable and suppliers can suffer from the fluctuation. As they will not always prevent in case of trouble, they can disappear before the buyer realized the difficulties of its supplier.
- Cultural issue: Communication issues and the different ways to do business can be an issue for people that are not used to Chinese culture. The Chinese suppliers are also afraid of not being paid by their customers; this fear has to be understood by western firms. For Yen Yen Brinon-Wang relationship is important in every culture, but in China people are first looking for trust and then business, in the western world it is the other way around.
- Quality: China can have good and bad quality, Chinese companies are evolving and their qualities are improving. However it is still an important part of the supplier management of the buyer to assess the quality of their Chinese suppliers to have a beneficial relationship in both ways.

As IT industry was already mature at this time, internet was a useful tool to find supplier. Indeed Google provides ready to use list of best suppliers. Information about those suppliers was usually easy to find. Another way is the trick given by Yen Yen Brinon-Wang which is to ask potential suppliers for their competitors and look after for them. The available information is analyzed by the buyer to reduce the list of potential suppliers to around three different ones. The lasting suppliers will be contacted and analyzed with other criteria such as their management, organizational structure, their innovation and their efficiency. For IT industries, such as Packard Bell, efficiency and innovation are important matters. Then Yen Yen Brinon-Wang will visit them, to meet different people from different departments and to see production sites with the quality staff of Packard Bell. During the supplier assessment and the visit, she will use home-made templates made with people from different departments of Packard Bell to have diverse opinions. The mitigation of external risks will also be assessed during this process through for example the number of available production sites.

The last step is the negotiation process, during it the buyer will know the willingness of the suppliers to work with Packard Bell. This willingness and their efficiency will also be assessed, when Packard Bell asks questions or technical support to their supplier, through their answers and the speed of response. As Packard Bell did not outsource important components at this time, upstream suppliers were not assessed; this is also due to the confidentiality culture in IT industry.

FOUND

The interview of John O'Grady can be found in the Appendix (Appendix 4)

Found is a Hong Kong company active in China, they offering purchasing advice and services for overseas companies in China. John O' Grady was interviewed for this company; he is the general manager and works with advanced clients. John O' Grady lives and works in China for 12 years and work at found since 6 years. He has then a long experience as a purchaser in China. Found is specialized for procurement in China, this company is then really interesting for this paper.

Due to his experience, John O' Grady uses mostly his personal network to find new suppliers. For him the main risks in China are related to the quality, these issues can be from a human factor or be related to the used machine. They may not be well calibrated or maintained; the product can therefore have little defects or being not well finished. The buyer has then to manage the quality and verify it as often as possible.

Other risks are the financial stability of the suppliers and the potential presence of legal issues, with for example a local government. This kind of legal issue are barely impossible to find out for an individual outside China, but procurement companies such as Found can help buyer to find out about them. Nevertheless the most common problem Found have is for their client to do not know enough about their product. This issue is not related to the Chinese case, but sourcing in China can exacerbate it. Indeed most buyers are used to buy from the same suppliers for many years using a routine protocol. Those buyers did not have to really understand their product and know the specification in details. But when they want to buy the product in China, the suppliers understand the specification and can produce products with different specifications or materials for a variety of prices.

John O'Grady highlighted the importance of the company visit. He said "I never finally advise on purchasing a product until I have visited the factory at least once. It's my absolute rule". First, for a relationship perspective, to meet the people with whom you will do business, the manager, the production manager... it is also important to see the facilities, the working conditions, the products they working on, the safety, the satisfaction of the workers, the storage conditions... For him the company visit will add a new perspective to the knowledge of the supplier. This is why, this visit has to be prepared and not done in a hurry. The buyer has to take his time to not miss any elements of the visit.

Found has plan B and even plan C to be able to continue sourcing in case of a risk occurrence, however John O' Grady insist on the fact that some kinds of events are impossible to predict

Found works mostly with private own companies in China, however John O' Grady do not think that the relationship at the manager level would be so different with a public one. China has evolved considerably this last decade and these relations would have been different several years ago, moreover public company are essentially working on huge project and are therefore too big for numerous buying firms.

Found as a purchasing company with experience and skilled agents, does not use computation to evaluate risks but mostly experience according to the key points they choose. But John O' Grady concedes that they maybe should use some mathematical formulas. Found does not choose the supplier for the client, but gives advice and shows opportunities, the final choice is made through a discussion between Found's staff and the client.

COMPANY ACTIVE IN THE AUTOMOTIVE INDUSTRY

Ian Hinke who was vice president and sourcing and vendor manager was interview for his work in a company active in the automotive industry. To his demand the given information stays confidential.

PHSD CONSULTING AND TRADING

The interview of Philippe Druot (in French) can be found in the Appendix (Appendix 5)

PHSD consulting and trading is a trading company focused on additives raw materials and polymers, this company has been created in 2014 by Philippe Druot. He has been interviewed about his experience of the Chinese and Asian market. This company was really interesting, because it has given another point of view than the one of Kaneka in the chemical industry.

The first problem highlighted by Philippe Druot is the amount of intermediates in China, which leads to difficulties to find the producer or manufacturer of a product. A lot of Chinese firms provide catalog with a broad panel of products (especially in the chemical sector). However for most of the firms it is impossible that they produce themselves that amount of different products. Those firms produce therefore some of them and trade the others, those are bought to friend's companies. An assessment of a supplier can then be difficult because the assessed factory do not produce the wanted product; if the supplier is not honest it is even more difficult. In this last case

it is better to stop the relation. A dishonest supplier will most likely create difficulties in the future.

During the factory visit, the machines and the process have to be carefully looked at, but the raw materials are also an important factor. Indeed the plant can be equipped with the last machinery and have a process at the hedge of the technology, if the raw materials do not have a good quality and are not used in the right quantity, the product will be disappointing. Those visits will happen most of the times after few meetings with purpose to establish the relationship. Relationship in China is more important than in the western world and business is barely impossible without being “friends” before.

A well done visit and the right payment agreement should permit to avoid wrong delivery from suppliers. In China the samples and first order are most of the time good, but when the quantity is increased dishonest suppliers may send bad quality product impossible to use. It is always better to find a way to see the product before shipment or to entirely pay it after having seen or tested it.

The regulations in China are often subject to changes, the supplier’s factory may close for environmental reasons and the Chinese Yuan Renminbi is not always stable. Therefore long term relations with suppliers are hard to maintain, moreover Chinese suppliers rather sell locally where they can have the money quickly. They may also change their business to earn more money. Having a 15-20 years relationship with a Chinese supplier is barely impossible. Philippe Druot says that it is important to never sole source in China and always have a backup supplier. This supplier should be in Europe or in the USA, depending where the buying firm is located.

DCI STRATEGIC AND KODAK

The interview of Russ Doak and his document can be found in the Appendix (Appendix 6)

DCI's management consulting services support global supply chains for internal and domestic business development activities and projects, assisting clients on proposals, studies, and undertake projects on infrastructure development. For this company Russ Doak was interviewed he is managing director and has an experience of 15 years in international supply chain.

Russ Doak highlighted the supply risks due to the non-recognition of American or European laws and the use of different standards. One way to mitigate risks associated to the culture, the distance and the standards is to have an office inside China. This office will be able to search

suppliers and manage them. They can go to business fairs and therefore find suppliers that are not on internet. Indeed in China, even big and efficient suppliers are sometimes not on internet. Moreover this office will manage more efficiently the Chinese suppliers, due the drop of language barriers and time and cultural differences.

When Russ Doak was working at Kodak, they used to monetarize the risks; it was then easier to compare suppliers. Indeed every element part of the decision was translate into a price, the cheaper suppliers was therefore the one offering the best compromise.

Russ Doak shared a document that gives some advice to purchaser in China and explains common mistakes that are done in China.

These mistakes are

- Lack of a well-defined strategy
- No well-defined standards for suppliers
- Inadequate due diligence performed on suppliers
- Lack of protection for payment and quality issues
- No written contracts
- Written contracts not reviewed by attorneys
- Ignorance of the U.S. foreign corrupt practices act (FCPA)
- No mandarin speaker in the team

Solutions to this mistake are explained in this document. This document is in the appendix after the interview of Russ Doak.

PURCHASERS INTERVIEW

All the responses to the questionnaire can be found in the Appendix (Appendix 7)

Five companies have been studied, to gather more practical information on how firms actually behave in China and how firms look for new suppliers in this country. Six people active in the purchasing responded to a questionnaire to expand the range of industries and purchaser profiles. Those people are or were working with China, two type of questionnaire have been sent, one at the beginning with more general question and another with more specific ones.

According to the questionnaire the main difficulties in China are the language and the communication issues. This problem is exacerbated with the time differences. These cultural issues can lead to other issues such as relationship or quality.

The second main risk associated with China enunciated by the respondents was the quality issues. They express way to try to solve it, for example having a trading company in Europe or America or implement systematic quality check before shipping the product. Another problem raised was the government implication in firms, especially in small and medium cities. Such implication can bring communication issues or even legal ones.

The respondents look for suppliers with different tools, from internet (Alibaba, Google or Baidu) to local services or professional associations. The method used is linked to where the company or where the buyer is from and where he is working. It makes sense, as a buyer who works in China will be able to easily go to business fair and not a buyer working elsewhere. The later will have to first use internet or his network if he is an experienced buyer.

Only one of the respondent to the questionnaire assess more than the first tier suppliers. It can be because the buyer completely trusts his supplier or if this one does not want to share information about its own suppliers. Such a policy will hide a part of the risk related to the supply chain which can harm the buying's firm.

The purchasers use different tools to assess risks such as templates, visits or interviews. Only one of them uses mathematical formula. For some of them the risk assessment looks not clearly defined, therefore they are using their experience and feeling without having a proper process.

Surprisingly not all of them specify that they are doing company and factory visit, it is surprising because the visit is part of the basic when sourcing in China. However, even if it was not specified, they are maybe visiting suppliers. Two of them mention references, this is an easy way to have information about suppliers from a trustable source, or at least companies that use more or less the same standards and are subject to the same laws. The references are especially used when looking for new suppliers; indeed after working with it you do not really need an external point of view anymore.

Some are not trying to forecast risks and therefore can be surprised by an occurrence. Even the ones, who forecast they do not seem having a process to properly forecast the risks where it is

needed. Most of them have back-up suppliers without really thinking when to use them and the usefulness of having back-up suppliers for this or this product.

B. RESULTS

The needed practical view for the process was found during this analysis and some ideas from the literature review were confirmed or invalidated. Moreover this analysis permits to understand the difficulties and worries found on the Chinese ground, which are not explained in the literature. Several criteria have been highlighted during the interviews, and will be used to find a better solution for the case company.

The first idea is the need to have a process divided into steps; it confirms the study made by Tummala and Schoenherr (2011). Indeed most firms do not have the time to analyze deeply every supplier. Moreover for firms based outside china this analysis takes more time due to the time differences and includes travel cost. Those steps allow firms to eliminate progressively suppliers, and then focus their attention on the best suppliers.

The problem highlighted during this practical analysis is mainly the cultural and communication issues. These issues have different interpretations according to the nationality of the practitioner and its working place. Indeed several issues such as the times differences or the language depend only on the buyer. However the difference in the way to do business between China and Europe or America was, with quality, the most important risks. As those risks can add complications between buyers and sellers (Jia & Zsidisin, 2014), the process has therefore to allow the buyer to understand and manage the Chinese characteristics that can be not well known and that a standard process may not consider. Thereby the process has to consider the relationship between the buyer and the seller. In China this criterion cannot be forgot, as it is barely impossible to have a profitable business with a suppliers without having a true relationship. If a buyer selects his suppliers without taking into account this criterion, he may choose a supplier with who the relationship can be difficult. The business with this supplier will be more complicated and exacerbate the possible communication issues. Moreover communications and relationship can reduce supply risk efficiently (Ganguly, 2013) and (Olso, & Wu, 2011) those problems will lead to unacceptable risks and times wasted to solve and mitigate them.

The first step of the process should be a way to avoid the not trustable suppliers, as the first filter of Millington Eberhardt and Wilkinson (2006). This problem does not really exist in the western area, but in China the lack of knowledge of the buyer is sometimes used by dishonest people to earn money. Therefore the buyer has to have a way to quickly check the suppliers to secure the existence of the selling company and that the sold products really exist or can be produced.

The practitioners underlined the issue that can come from the intermediaries in China. Indeed most of the Chinese companies selling abroad are trading companies and do not produce what they are selling. Such companies can be perfectly safe but add a layer to the supply chain and can be unable to solve a specific quality issue due to their lack of knowledge. Moreover, these intermediaries may not share the name of their suppliers and therefore hide some risks. In this situation the buyer is unable to properly assess the production and depends on the performance on a company that he sometimes does not even know the name.

The importance of the visit of the office and the factory of the buyer was also emphasized. Several practitioners never consider buying from a firm without having previously visited both their office and their production site. The selection process has therefore to include this visit to reduce the risks by improving the knowledge about the potential supplier and strengthen the relationship. The buyer has to be guided for this visit to help him to focus on critical points; however freedom has to be let to the buyer to add criteria and adapt his visit to its industry and to the supplier.

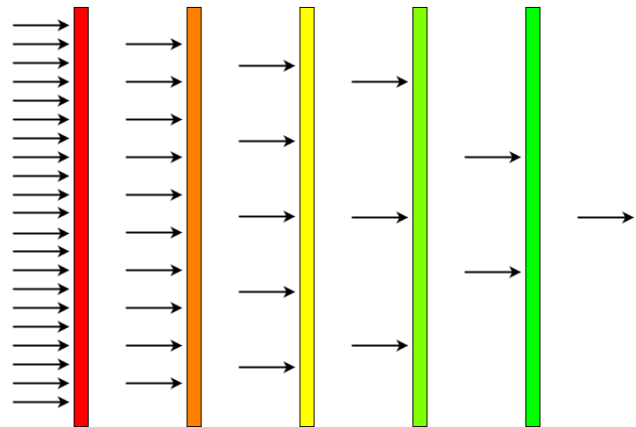
The standards and rules are different in China, their way of production are most of the time different than from a supplier in Europe or another country and may not be adapted to international or other countries regulations. The supplier has to be able to produce according to the standards of the buyer (Levary, 2007). The practitioner insisted on the importance of the accuracy of the product's specification and the knowledge of the buyer. Furthermore the supplier has to have the needed certifications for his product according to the rules in China and where the product will be used and sold. The buyer has then to verify the certification and to assess the knowledge of the supplier during the selection process.

6) SOLUTION FOR CASE COMPANY

A process has been created to facilitate the supplier's selection in China, reduce risks during the process and risks associated to the selected suppliers. This process is composed of five steps, at each step the list of potential suppliers is supposed to be reduced of the ones that do not meet the buying firm's requirements or the less suitable. By reducing this list at each step, the buyer will lose less time, as he will have to make the difficult and time consuming analyzes only for suppliers who worth it. During these five steps, nine tools or templates will be used, one tool is a proven formula from previous studies and the others are self-made. One metric and two indicators have been created to be able to deeply categorize risks and then better manage and mitigate them.

The developed process permits to start from the decision to search for new suppliers to the selection of them. Moreover the risks will be analyzed into details to allow the buying company to make plan and manage risks in case of occurrence, according to the selected suppliers and to their risks specifications.

Figure 3: The five steps process



Self-made drawing

A. PROCESS EXPLANATION

STEP ONE: FINDING NEW SUPPLIERS

After having decided what to outsource with the outsourcing matrix or other tools, the buyer will define clear objectives and its limitations in term of budget, time, quality... to be able to find suitable suppliers. The first step consists in finding suppliers; the easiest tool to find them is internet (Google.com, Alibaba.com...). However internet is not always reliable and the amount of information can be complicated to manage; another good way to find suppliers is the use of the personal network, the found suppliers should be more reliable and the communication can be easier to implement.

When a list of suppliers is created, they have to be assessed with the “Check list”. This check list will remove the untrustworthy suppliers. This list is adapted to the Chinese market and is necessary due to the number of improper suppliers or scams in China.

STEP TWO: CONTACTING SUPPLIERS

The remaining suppliers will be contacted by email and phone to have a first contact. The buying company should register trademark before contacting suppliers to avoid any legal issues. Specifications of the product have to be crystal clear; indeed China has different manufacture standards than the European or American companies. Any missing information will be complete by the supplier according to the Chinese norms. The buyer will then ask for quoted prices, if this price is comprised in the buyer’s budget he will start to assess the supplier. He will be asked to fill in the “Supplier Self-assessment”. In this assessment the seller will give information about his company and his production to the buyer, this information includes:

- Company general information
- Quality management system
- Certifications, environment and safety
- Value chain management
- Risks management
- Measurement, analysis and improvement
- New product development

The buyer will judge this self-assessment, summarize and evaluate it in the first part of the “Supplier Assessment”.

STEPS THREE AND FOUR: ASSESSING SUPPLIERS

STEP THREE: GATHER INFORMATION

The five points of the “Supplier Assessment” will be analyzed at this step.

1) Quality

The quality of the sold products or services has to be assessed in a long term basis. The supplier has to be able to deliver satisfying quality products or services and be able to at least continue at the same quality or improve it. It is the buyer responsibility to verify if the product imported from China respects the safety rules, the labelling rules, and every law that can apply to the product in the firm’s home country. Sometimes suppliers send special samples for quality test; therefore the buyer will have to pay attention that the delivered product is at the same quality than the samples. The quality of the suppliers itself, such as the flexibility and the capacity will also be assessed at this stage. The quality department of the buying company has to be involved in this quality assessment, and works with the buyer to do it properly.

2) Relationship

The possibility of relationships will be analyzed according to the buying firm needs and willingness. In China the ownership influences the possible relationship, even if most of Chinese suppliers are looking for long lasting one. The financial health of the suppliers is an important criterion for the relationship, as a not healthy supplier will maybe not last or have time or money to invest in a long lasting relation.

3) Delivery

The accuracy of the delivery, the payment policy and the used packaging, have to be evaluate. If the buying firm wants to shorten its lead time or stocks, this criterion will have a greater impact.

4) Costs

The buyer has to calculate the total cost with the quoted cost; indeed the real paid price can be much bigger than the quoted price. The reputation price that can occur when having suppliers in

China is important to take into account even if it is difficult to calculate. The “Cost Mapping” permits to the buyer to increase its visibility of the costs influence and importance, and evaluate the stable and not stable costs. Those factors can affect the relevance of the cost decision or even the decision itself.

5) Risks

A complete analyze of risks has to be done to protect the company. With the “Supplier Risks Assessment” the buyer will be able to calculate indicators to understand, evaluate and assess the risks linked to the supplier. The “Supplier Risk Analysis” permits to the buyer to evaluate each risk according to its influencing factors. This template will help the risk assessment and help buyers to not forget any influencing factors when doing it. The “Supply chain mapping” is another tool to help the buyer; it will give a visual analysis of the supply chain and highlight potential big connection nodes that may increase risks.

The indicators that will be calculated in the “Supplier Risks Assessment” are:

- Probability of occurrence * Potential impact = “Risk indicator”: this well-known formula gives an easy to use indicator of risk and will be used further in the process.
- Potential impact * Speed of risks = “Severity”: a risk with a high severity can have a huge and quick negative impact on the company. The buyer will have to make forecast and “what if?” plans for these risks. Even if the probability is low the company has to be able to manage quickly the occurrence of such risk to mitigate the negative consequences.
- Probability of occurrence * Potential impact * Speed of risks = “Criticality”: risks with high criticality have to be managed to be reduced. A company cannot have strategic suppliers with high criticality risks.

A risks analysis of suppliers is better to be done by a team formed with people from different departments. To be able to have a single indicator that summarize the entire risks assessment the “AHP process” can be used, this process will allow the different team member to assess each risk’s importance between each other. The risk indicator of each risk will then be multiply by its weight and all the risks indicators summed to have a single supplier’s risk indicator.

The last part of the third step is to prepare the next one, indeed the buyer or the visiting team has to prepare the visit and highlight the points that will have to be checked during the company and

factory visit. Usual points are common to every supplier but depending to suppliers some specific points may require particular attention, those points will have to be added in the “specific point from the assessment” table.

STEP FOUR: COMPANY VISIT

The buyer alone or preferably a multi-disciplinary team will visit the company and the production sites. This visit will give a lot of information for the five point of the “Supplier Assessment”. The points highlighted during the previous step will be assessed and analyze, however new concerns may be raised during this visit. Due to the new information, several points of the “Supplier Assessment” and the “Risk Analysis” will have to be reassessed. Therefore the step three will have to be partially done again after the visit.

The five points of the “Supplier Assessment” in the “Supplier Summary” will be completed after this step. The risk’s score can be calculated thanks to the “AHP process”, however if for another point the team has difficulty to agree on a score the “AHP process” can also be used or another tool.

STEP FIVE: SUPPLIER SELECTION

To take the final decision the “AHP process” has to be used to highlight the objective of the buying company. Such an important decision has to be taken by a multi-disciplinary team and should be discussed. This process will permit to give the final score of the supplier. The several suppliers that have been analyzed until the final steps will be compared with this final score. The team has then to choice one of few suppliers to start a profitable business relationship with.

B. USED TOOLS

SUPPLIER CHECK LIST

The template of the “supplier check list” can be found in the appendix (Appendix 8)

The “supplier check list” is the first tool used in the process to find new suppliers in China. The objective of this check list is simple; avoid scams and loosing time contacting untrustworthy suppliers. Indeed when looking for suppliers in China, everything can be found, from the high

technology company leader in quality and technology, to a swindler who wants to earn money illegally. This issue is mostly present on internet and on buying website. The best companies will worth the time spending to find and analyze them, but the bad or fake ones will just make the buyer loose his time and money. The sole existence of a website as <http://alibabascam.com> is a proof that scams are numerous in those websites and are a concern for buyers.

The purpose of this template is then to remove the last kind of suppliers quickly; to have a list of, at least, trustable suppliers. To verify the suppliers check list's criteria, the buyer will use information available online to not loose time contacting them.

Several points that have to be verified are specific to China:

- Business license: Every mainland Chinese company has to possess a business license from the Company Registration Authority, according to the article 7 of the company law of the People's Republic of China (PRC). This registration can be verified on local website of the administration for industry and commerce (AIC) or on Alibaba.com for gold suppliers and in other B2B websites.
- Foreign trade registration: The Chinese companies that want to export goods or technologies to another country have to obtain a foreign trade registration according to the article 9 of the foreign trade law of PRC. If a supplier does not have it, but wants to sell products abroad he will have to use an intermediate. This can lead to problems as it adds a layer and the intermediate can be unable to solve technical issues. This information can be found on local administrative website or on B2B websites.
- Gold supplier: suppliers have to pay a fee to be considered as gold suppliers on Alibaba.com and to be verified by the website's staff. If the buyer uses this website he should stick to those kinds of companies.
- Company name: in China company names have to be composed of four elements (the administrative region, the trade name, the type of business and the legal ending indicating the type of the company)
- Legal address: it is important to verify that this address is possible according to the industry. For example if it is supposed to be a factory it is easy to verify it on map.baidu.com if it is really one. (Baidu maps works better than google maps in China).

This legal address allows also corroborating the names and the phone numbers of the company.

- Phone number: A real and trustable company will always provide a fix number.
The country calling code of China is +86, the mobile phone format is 1xx-xxxx-xxxx and the fix format is two or three digits (area code) + 8 digits (the only area code starting with a 1 is 10 for Beijing 北京).
- Contacts: A company that can provide more than one contact has more chance to be a real than a fake one.
- Location: the transportation network in China is sometimes really unsatisfactory. Therefore a factory located in a small town in central China without proper transportation means can raise logistic and delivery issues for the buying company.
- Certification: it is the buyer responsibility to be sure that the imported product respects the rules and standards of his home country. Some companies provide their certifications of international or western organization on their website. The buyer will have to be sure of the authenticity of those certifications.

A supplier that does not fulfill all the previous criteria does not worth to be contacted. For the certifications it is perfectly understandable that a company can produce with the needed quality and according to European or American standards without having the needed certifications available on their websites.

Other criteria not specific to the Chinese market are included in this check list, such as (consistency of the business scope, financial statement and company background). Those criteria will also reduce the number of potential suppliers to keep only the best one. The template gives advice if a criterion is not fulfilled when others at let to the buyer appreciation.

SUPPLIERS SELF-ASSESSMENT

The template of the “supplier self-assessment” can be found in the appendix (Appendix 9)

After the first contact with the supplier, at the second step of the process, the buyer will ask the supplier to fill in a self-assessment. It will provide information to the buyer, moreover the only fact that the seller agrees to fill in this template shows a certain willingness to work with the buying company. The asked information can be divided into eight different sections:

- Basics: company address, contact information, date of creation and production sites address are asked in this section. This information will be used later in the analysis, such as the different addresses of the production sites and their numbers. The address is also asked in Chinese character, it will be useful if a member of the buying firm had to visit this supplier and does not speak Chinese (Taxi men in China barely never speak or read English).
- Company information: this sections will precise what was found on the company website or used search engines. The recommendation by a customer, especially if it is a customer in the home country of the buying firm, is a gain that can lower potential concern of the buyer. The competitor of the selling firm can become suppliers for the buyer; therefore this information can be useful. However most of suppliers will not give any company names. The type of ownership of Chinese suppliers and their size are important criteria, as they behavior can depend on it. Moreover certain firms or customers will refuse to work with certain suppliers or company that works with them (for example if a supplier belongs to the army).
- Quality management system: it is the buying firm responsibility to be sure that the imported product complies with rules and laws of its home country and its standards. Moreover the Chinese standards can be far away of European or American one, the buyer will then have to manage its supplier's quality. The questions if the supplier accepts factory visit is important, this visit is part of this process and it is too dangerous for a firm to import product, especially strategic one, without having seen the production sites first. More explanations will be given about factory visit later in the tools description.
- Certifications, environment and safety: this section aim is to have information on the internal standards and rules of the suppliers.
- Value Chain management: this section aim is to have information on external supply chain management of the suppliers, their capacity, their demand forecasting tools and their shipment method and route.
- Risk management: This section will be useful when doing the risk analysis of the suppliers, indeed how the supplier manage his risks greatly influences the risk assessment that the buying firm will make.

- Measurement, analysis, and improvement: how a supplier manages its performance is important for the quality, the cost and the future relationship.
- New product development and confidentiality: this section is important for future relationship. The buying firm may need suppliers to develop new product with and will need confidentiality and a process to do so. Moreover a good protection of confidential information will permit to avoid useless and expensive legal issue.

The speed of response to this self-assessment and the quality and explanation of the answer given will also give crucial information on the willingness of the supplier to work with the buying company and the skills of its employees.

SUPPLIER ASSESSMENT

The template of the “supplier assessment” can be found in the appendix (Appendix 10)

This tool is the core of the assessment; it will be use at the end of the step two and during the steps three and four. This template will gather all the information and analysis before the supplier summary and the decision. To be able to fill in this assessment other tools will be useful (cost mapping, supplier risk analysis, supply chain mapping and supplier risk assessment). As the focus of this research paper is on the supply risks, the tools to assess risks and the risk part of the assessment will be explain longer than the other ones.

The supplier assessment can be divided into three main parts: supplier self-assessment, supplier internal assessment and company visit.

SUPPLIER SELF-ASSESSMENT

In this part, the buyer will analyze the supplier’s answer to the self-assessment and comment each section (except the “basics” one, however if comments have to be made on it, the row “other” is available). The positive points and concerns that matter to the buyers and the buying company will be written in accordance to their section. Thanks to this table the buyer or people from other departments will not have to go through the self-assessment to continue the analysis and will have all the information available easily. It can be convenient when the supplier is not clear or precise enough. In that case the person in contact will ask questions to fill in the table and the suppliers will not receive plenty of emails from all the departments of the buying firm. Indeed

several departments will help to continue the analysis, such as quality, finance or operation, therefore having information available, according to the buying firm metrics and language will ease their works.

SUPPLIERS INTERNAL ASSESSMENT

This important part will be used during the step three and four and will finalize the analysis of the five important criteria of a supplier; quality, relationship, delivery, costs and risks. To do so the buying firm's staff will use the first part of the supplier assessment, the samples, other analysis or tools, or ask to the supplier if relevant information is missing. The buyer and the department in charge of the different criteria will give a score to the suppliers at each sub-criteria of this assessment. If, due to a special project, supplier or industry, a relevant sub-criteria has to be analyzed the sub-criteria "other" is available. The scale of supplier's performance is a scale 1 to 10. Where, 1 stands for very low performance and 10 for almost perfect. The same criteria or sub-criteria have to be assessed by the same person or team for each potential supplier to avoid score differences among suppliers due to personal interpretation.

Quality

The first criterion is quality, a team formed with people from the quality, the legal department and the buyer will have to assess the quality of products proposed by the suppliers and their fulfilment of the needed rules and laws. To do so the quality team will need samples to test and analyze the products, the buyers will have to make sure that the delivered product will have the same quality than the sample. The legal department has to verify that every rules applying to exportation from China, importation in their home country and selling where the customer are will be respected. Those rules can be related to raw materials, labelling, working conditions, and production ways ... The possibility of innovations will also be assessed depending on the need of the buying firm, the willingness of the suppliers and their technology.

Relationship

The willingness of relationship of the suppliers will mostly be analyzed by the buyer, indeed it will be probably him that will stay in contact with the suppliers. In China where the "guanxi" is really important, this criterion cannot be forgotten and should be assessed in the long term. The ownership of the suppliers, its size, its growth type, will deeply influence the future relationship.

In China the business relationship may be more important than the business in itself, therefore if the buyer and the supplier have opposite conception of this future rapport the business will probably not go smooth. The potential communication problems than can occur in international business can be exacerbated by a bad relationship. These rapports will affect the trust between the supplier and the buyer. The potential partnership, the common innovation, the technical help or the risk forecast, may be hampered, and the business between those companies can finish earlier than previously expected.

The financial stability is also an important sub-criterion in the relationship. Indeed if the supplier has financial issues, he will have less time, money and willingness for the buying firm, even worst these issues can lead to the bankruptcy of the supplier, and therefore the end of the relation and the loss of the time and money invested in this supplier.

Delivery

The delivery capacity of a supplier can be really important especially for a buyer that wants to reduce its inventories, lead times or increase its reactivity. However it can be difficult to evaluate for a potential supplier. Indeed the buyer will mostly rely on what the supplier will tell him and his own observations. Another source of information is the customers of this supplier, but not every supplier agrees to give name of customers. Shipment time from China is around a month, firms have to be sure that they can afford such a long shipment time, before spending time looking for suppliers in China. This shipment time depends also of the transportation firm; this later depends on climatic conditions, efficiency of their homeport and other used port. A risk assessment will therefore have to be done to assess and secure or have backup plan for the different transportation routes used by important products of the supply chain.

In China, the buyer has to take care of the packaging as he has to take care of the quality. Chinese standards are once again not the same than European and American one, and products can be damaged during the transportation. To avoid this kind of issues, the buyer will have to supervise this step and explain to the supplier how exactly he wants his product to be sent.

Costs

Lower costs is most of the time the reason to source in China, however expected savings are rarely those achieved. Buyers and decision makers have therefore to carefully evaluate the costs

before taking a decision and take into consideration all the costs. The quoted price is only a part of the costs of the firm; other costs can be divided into seven categories:

- Price: quoted price, cost of payment, tax and duty, administrative cost
- Logistic: transportation, insurance
- Quality: cost of inspection, cost of return, customers complain, loss of sales
- Inventories: materials losses, opportunity cost, personnel and equipment
- On time delivery: management, safety stock
- Management: company and production site visit, support to supplier, staff's time
- Other

All these costs will have to be added to the quoted price of the suppliers to be able to make a true comparison between potentials suppliers. Another cost has to be taken into account when thinking about having suppliers in China. It is the potential cost of reputation. Indeed for some customer, China may be seen as unsafe or unreliable, therefore they will see the product of the buying firm as less qualitative, or consider the firm as more risky.

An easy to create and useful tool is the “cost mapping”, thanks to this chart the buyer and the decision maker will have a visual understanding of the influencing costs and their stability. It can be used to choose a supplier according to the firm needs. This tool will be explained into details later.

Risks

This criteria is the core of this research, several tools will be used to assess it. The “supplier risk analysis” and the “supply chain mapping” will help the buyer to complete the “supplier risk assessment”. The final result of this last tool will be integrated in the “supplier assessment” and used as final result for this criterion.

The tools used for the risk assessment will be explained later.

FACTORY VISIT

The company and factory visit in China is really important, professionals advise to never order a product from suppliers without having previously done a visit of this company and its production sites. The company visit is divided into three sections in the “supplier assessment”, usual point,

specific point from the assessment and news concerns. For more convenience the explanation of the visit will be explained following a three step process, before the visit, during the visit and after the visit.

Before the visit

The buyer has to prepare the visit, and highlight the criteria that will need more attention. Some criteria require always attention during a company visit, those criteria are written in the first table “usual point” they include management, safety, product labelling, product packaging, production chain, materials used, inventory and relationship. However due to the previously done supplier assessment, the buyer can have several concerns and therefore having to add criteria to its visit. Those criteria can be added in the table “specific point from the assessment”.

The suppliers had also to know where the factory is and prepare its transportation ways. Being lost in China is not the purpose of those visits. Moreover company and production sites visits take time and cannot be done in a hurry. It is therefore important for the buyer to allow himself enough time to do these visits properly and consciously.

During the visit

The visit should be done by a multi-disciplinary team, however due to the cost the buyer can have to do it alone. If it is the case he will have to understand deeply the specificity of the product and the best way to produce it, to be able to analyze properly the supply chain.

The usual and specific criteria will have to be assessed carefully during the company visit. However new concern can appear during the visit according to what the team sees. These worries will be added in the table “new concerns”. All of those criteria will be assess during the visit and scores and comments will be given to each of them. The relationship part and the feeling during the visit are really important as the relationship is impossible to really assess before these direct meetings and an awkward feeling can hide issues of the suppliers.

After the visit

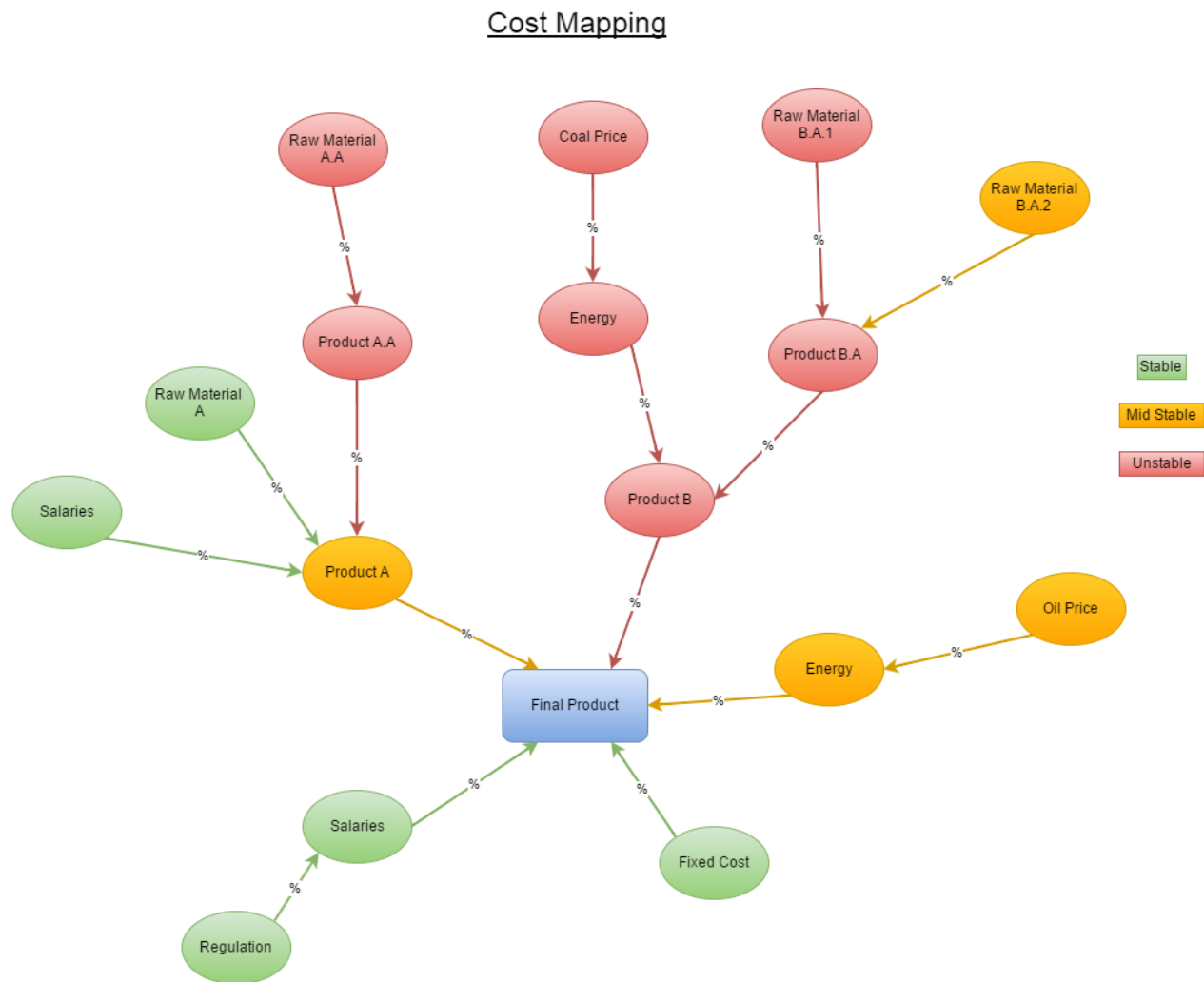
When the visit is done and every criterion assessed, the visiting team or the buyer will have to analyze which criteria will influence the assessment previously done. Two tables are available for that, “point to integrate into the assessment” and “point to integrate into the risk analysis”. Scores

and comments will be given to these points to be integrated in their categories and the buyer or the team will reassess criteria and risks accordingly.

COST MAPPING

This tool has for objectives to give a visual costs' overview of the buying firm's final product. The buyer's objective is to map all influencing costs and assess their stability.

Figure 4: The Cost mapping



Self-made chart

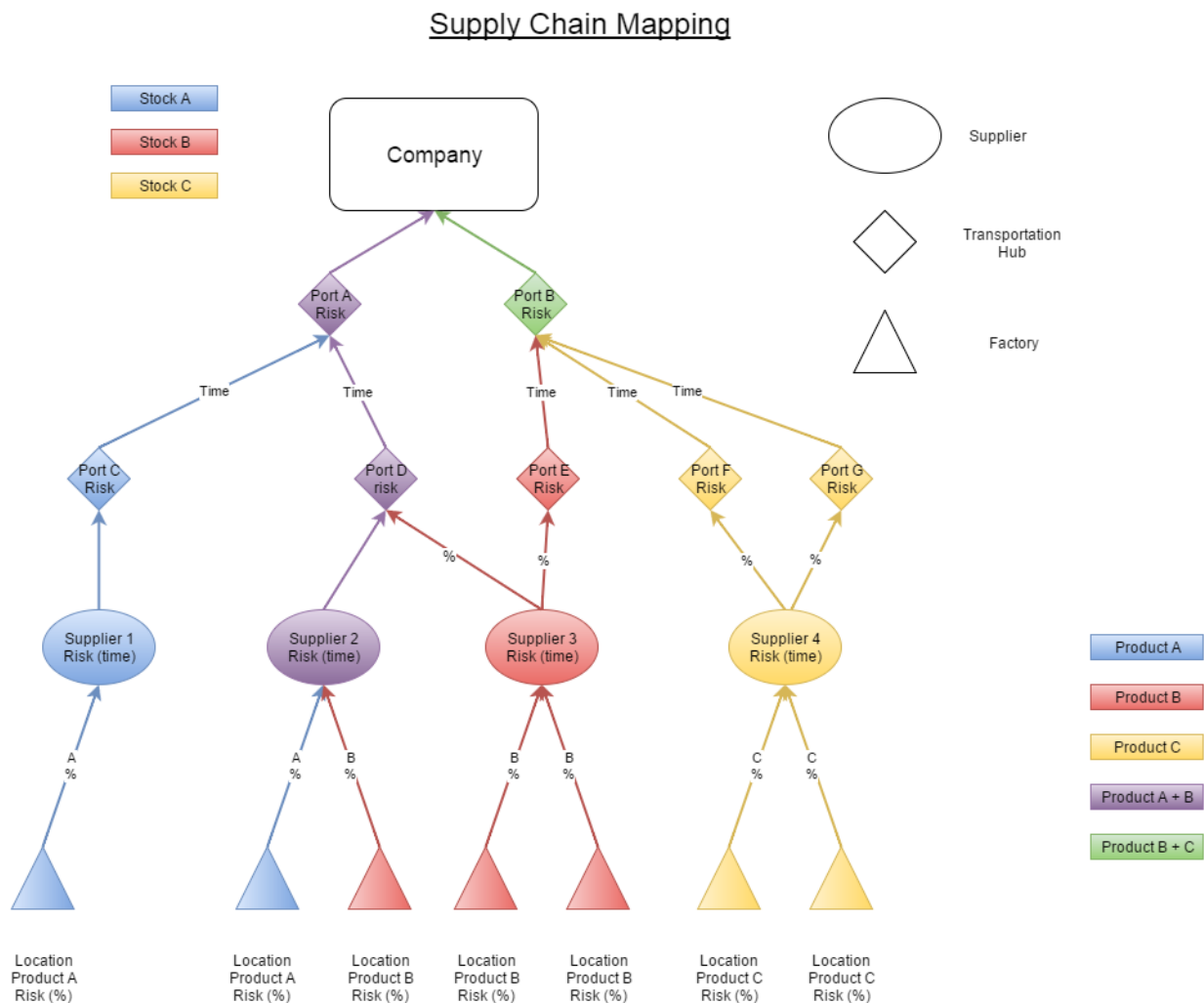
The final product is in the center, around are the main costs to produce it. Those costs can be a price to a suppliers or an internal cost, they have also to be analyze and their influencing factors mapped. This analysis has to be done until costs are insignificant for the final product. The

percentage on the arrow represents the share of the cost at the beginning of the arrow in the cost at the end. The color represents the stability of the factor. This tool permits the buyer and the decisions makers to directly spot from where an increase in the cost may arrive and influences the final product price.

SUPPLY CHAIN MAPPING

This tool has basically the same objective than the “cost mapping” but for risks. The “supply chain mapping” is really informative and gives a supply chain overview to the buyer. He will be able to assess the lead time, risks, and stocks and spot the nodes where numerous flow of material come through and then may increase risks.

Figure 5: The supply chain mapping



Self-made chart

This example of a supply chain mapping shows the different elements that help to make the risk assessment and visualize risks.

- Products: the mapping can be done for a single final product or for the entire company, all the strategic product and products that can harm the production in case of shortage, will have to be assessed.
- Suppliers: all the suppliers of previous products will be mapped. To increase the quality of the information their lead time and risk associated will be written. The risk assessment will therefore have to be done to complete this mapping.
- Transportation hub: products can be trapped along their transportation flow in every hub they go through. Those transportation hubs can be harbors, railway station, bus station, airport, warehouse... the buyer will make a small risks assessment of those hubs using the “transportation hub risk assessment”. The numbers written on the mapping are an average of risks indicators. The severity and Criticality are just here as indicators, their usability will be explain later with the “supplier risk assessment”

Figure 6: The risk-assessment of transportation hub

Risks	Probability of occurrence	Potential Impact	Speed of consequences	Risk indicator	Severity	Criticality
Natural disaster	4	4	10	16	40	160
Strike	6	2	1	12	2	12
Legal issue	1	5	4	5	20	20
Regulation change	2	8	3	16	24	48
Terrorism and war	1	4	1	4	4	4
Unpredictable event	1	6	1	6	6	6
Risk indicator of transportation hub				9,833333333		

Print screen of a self-made Excel sheet

- Factory: for an input the number of suppliers is important, but the number of factory is important too. Indeed, if a natural disaster happens a supplier can continue to deliver if he has several plants that make this product. The risk of the factory (linked to the risk of the supplier), the percentage of the product made in this factory by the supplier and the location of it are useful information that will be used to make the risk assessment.

- Shipment time: when considering the time to receive a product the lead time and the shipment time have to be considered, the later depend on the location of the plant and the way of transportation.
- Stock: a good way to mitigate the risk for the buying company is to have safety stock, on this mapping the stocks of the different products will be written in a time metrics. For example the company can have one month of product A and two weeks of product B.
- Percentage: On each arrow the percentage for the buying company will be written, for example if a product is sole sourced the percentage will be 100%. Such a situation increases the risk for the firm.

With this tool, the buyers and decision makers will see the potential sole sourced product in regards with the risk of the suppliers, plants, and transportation routes. New risks can be spotted thanks to this kind of mapping, for example if a company has two suppliers with several plants of a product, but their transportation routes have several risky common transportation hubs. A part of the advantages of having several suppliers are decreased due to these common nodes. This mapping can be extended to tier two suppliers or further if the buying firm needs it.

SUPPLIER RISK ANALYSIS

The template of the “supplier risk analysis” can be found in the appendix (Appendix 11)

The purpose of this tool is to decompose the risks and evaluate every factor that can influence risks. After having completed this analysis the buyer will more easily make the supplier risk assessment without forgetting to take a factor into consideration. This template is divided into seven different categories of risks, each of them are divided into sub-categories. For every sub-category several influencing factors have been identified and will have to be assessed by the buyer. For each of them, the buyer will have to evaluate the risks and influence of this factor according to the sub-category. The score will be expressed by a digit between 1 and 10, 1 referring to a factor with very low risk and influence and 10 to a factor with very high risk and influence. The different categories of risks are general information, delivery, quality, financial, supply chain management, reputation and security

General information

- No personal investment: A supplier that has no personal investment can be an issue. Indeed if the buying firm wants something outside the contract and ask the supplier, he will not respond positively or quickly. The risk of this sub category depends heavily on the relation between the seller and the buyer. In china this relation is really important, as said earlier in the paper.
- No flexibility: This risk is often link to the personal investment. However supplier can, not be flexible even with personal investment.
- No investment: The difference between this sub-category and the first one is the fact that this one takes only into account financial investment. If a supplier does not invest, he can ended with an old technology and therefore being not competitive or interesting for the buying firm.
- Capacity issues: These issues can happen if the buying firm wants to increases its quantity or for example if the supplier has financial issue and cannot pay his own suppliers.

Delivery

- Wrong delivery: It can happen if the suppliers did not understand the order or if he ships the wrong product or the wrong quantity to the buying firm. The product can also not have the needed specification. A good communication between both firms can reduce this kind of issues, an integrate IT system is also a good way to significantly reduce them.
- Late delivery: A late delivery can be a severe issue for a firm especially without safety stock. The extent of the supply chain and the number of transportation nodes influence heavily the possibility of late delivery. For this kind of risk the supply chain mapping is an appropriate tool.
- Damaged delivery: A good packaging and a proper shipment method can reduce risks of damaged product.
- Expanded shipping time: This issue is linked to the late delivery except that the expanded shipping time can be permanent and therefore will need an adaptation of the buying firm.
- Return issue: Return policies are important; if they are clear enough the issue can be solved without arming the relation between the buyer and the seller.

Quality

- Below quality product: Even if the assessed quality is good; products can still be delivered with a quality problem. The quality management of the suppliers is the main influencing factors concerning this issue.

Financial

- Bankruptcy: The bankruptcy of a supplier can happen without being predicted by the buyer, such a bankruptcy can harm the buying firm. The share quantity bought by the firm influence the risk of bankruptcy; indeed if the share is big and remains unchanged the buyer knows an important part of the supplier's business.
- Currency exchange
- Increasing cost: An abrupt change in the price of a product or a component can surprise the buying firm. A tool such as the cost mapping can help to predict this kind of increase so that the buyer can find a solution before it happens.

Supply chain management

- Issue with tier two suppliers: Suppliers can also have issues with their suppliers and so forth. A problem in the supply chain can have consequences in every link downstream. Therefore more this chain has layers more likely it can have issue. If the supply chain mapping is extended, it is a convenient tool to assess tier two or more suppliers.
- Communication issue: A communication issue can lead to different kind of other issues and can add frustration and deteriorate the relationship between buyers and sellers. It has therefore to be as good as possible.
- Shortage of materials: If the supplier has a shortage, he will most likely be unable to deliver the buying firm on time and so forth; this issue can also affect the entire downstream supply chain. The supply chain mapping is a perfect tool to manage shortage; the stock obsolescence must also be taken into account.

Reputation:

- Bad impact on reputation: the reputation of a firm can have a lot of repercussion and sources. The sole fact that a firm has suppliers in China can badly affect it. Moreover in

China, suppliers will entertain their “guanxi” and therefore offer presents, meals, etc. to buyers, they have to behave accordingly to the buying firm standards and laws. Indeed a trial for corruption can be a disaster for a firm.

Security:

- Natural disaster: the geographical position is the only influencing factor; therefore the location is an important criterion when choosing a supplier. Thanks to the supply chain mapping the buyer can verify to not have suppliers in the same area.
- Strike: A strike can happen everywhere and affect every link of the supply chain. Even if it is forbidden in China, strikes happen especially when labor laws are not enforced.
- Legal issue: In international business, a huge amount of different laws apply to firms, every one of them has to be verified and respected. This can take long time in the administrative maze, but a trial can be even more harmful and unprofitable.
- Regulation change: Unfortunately regulation changes happen often in China especially when firms obtain preferential treatment for implanting their company in certain places. This kind of treatment can disappear quickly and harm the firm's profitability.
- Terrorism and war: In unsafe country the war threat can deflect numerous firms. However nowadays, terrorism can happen barely everywhere even if the firm is not directly targeted. The target can be a link of the supply chain such as a harbor or an airport, and affect employees directly or indirectly.
- Unpredictable event: those events rely heavily on the direct neighborhood of the suppliers and the supply chain. For example the blast in Tianjin 天津 affected companies around and the harbor, such incident cannot be predicted.

SUPPLIER RISK ASSESSMENT

The template of the “supplier risk assessment” can be found in the appendix (Appendix 12)

This risk assessment is the foundation of this process, indeed thanks to this template the buyer and the decisions makers will assess risks of the suppliers, evaluate them and try to mitigate them. To be able to make this assessment in a proper way, the buyer will use the supplier risk analysis and the supply chain mapping. The buyer will also take into consideration the objective

of the firm and its customer. This risk assessment is composed of three steps, the analysis, the specification and the weighted score.

ANALYSIS

During this phase the buyer will have to define each risk sub-criterion with three metrics, their probability of occurrence, their potential impact and their speed of risks. For each of them the buyer will have to grant a score between 1 and 10.

Probability of occurrence

For this section 1 will stand for very unlikely and 10 for very likely, most of the risks are not regular and cannot be predicted with precision. The buyer will therefore make estimation according to the influencing factors and its experience. It is obvious that a risk with very low probability of occurrence is less dangerous than a very common risk (other factors staying unchanged).

Potential impact

In this section 1 will stand for very low impact and 10 for very high impact. The buyer will have to estimate the potential impact of a risk occurrence. This impact includes the financial impact, loss of reputation, loss of market share, loss of production... The firm culture and way of producing will considerably change the potential impact of a risk. It is then important for the buyer to well-known his firm and its objectives.

Speed of risk

In this section the buyer will have to compare the time before being hit by the risk and the time before returning to a normal situation. The first element is influenced by several factor, such as stocks of input and final product, time before detection or stock obsolescence when the second one is influenced by the lead time, the shipment time, the number of suppliers, the times before finding new suppliers ... If you have a long time to find a solution after a risk occurrence the risk will be less serious than if the consequences hit the firm directly and last a long time. The scale for this section is a little more complex than for the previous ones.

Figure 7: The speed of risk

Score	Time before consequences	Time to return to normal
1	Long	Short
5		
10	Short	Long

Self-made table

1 stands for a situation where the firm has way more time than needed to solve the issue, 5 stands for a situation where the firm has exactly the time needed and 10 for a situation where the consequences will last a long time before the firm will be able to return to a normal point.

This indicator adds details on the specification of risks which helps the company to have a more specific management, adapted to each risks related to the suppliers. For example the risk of a wrong delivery will have a higher speed if the lead time or the shipment time of a supplier is longer, while the impact can be the same. The speed of this risk will also depend on the time needed to return the wrong product and the contract's return term. The usual time of response of a supplier will also greatly influence the speed of numerous risks.

SPECIFICATION

Three indicators are calculated with the three metrics from the analysis, the risk indicator, the severity and the criticality. The risk sub-criterion will be compared between each other with each indicator; a different reaction will be needed from the buyer for the too high score among the indicators.

Probability of occurrence * Potential impact = Risk indicator

This indicator is commonly used among firms around the world. It defines easily risks and his easily understandable, this factor will be the one used to select suppliers.

Potential impact * Speed of risk = Severity

This indicator is new and expresses the possible seriousness of a risk. If it has a high potential impact and a high speed of risk, the risk will be considered with high severity, even if its probability is very low. Such a risk will need from the buyer to make forecast or “what if?” plan. Indeed those risks have dangerous potential consequences for the firm, therefore the firm need to act quickly in case of occurrence. The best way to increase the speed of response is to have plan already done, ready to be activated with the necessary resources available. Thanks to the “supplier risk assessment” the buyer can easily spot those risks and make all the “what if?” plans needed according to the risk advertence of its firm and the available resources.

The severity allows differentiating risks with high impact and different speed. For example the disappearance of a supplier due to bankruptcy or natural disaster, in the first case the buying firm can see warning sign which is not the case for the second. A faster plan is therefore needed for natural disaster than bankruptcy in this case.

Probability of occurrence * Potential impact * Speed of risk = criticality

This new indicator uses the three metrics to specify risks. Risks with high criticality are really dangerous and can hit the firm often, quickly, with serious consequences. Those risks have to be mitigated to lower their criticality. If it is are not feasible, the buyer should consider other suppliers or be cautious and manage everything related to this risk.

For example we can have the same probability of occurrence and potential impact for “communication issues” and “capacity issues”. However for the last risk, the time to go back to a normal situation will probably be longer than for a communication issue. The importance of those risks is therefore different and they management has to be done accordingly.

WEIGHTED SCORE

The indicator used to summarize the risk of a supplier will be the risk indicator. This indicator has been chosen to avoid extreme high value that can eliminate the weight of other risks with low speed. However firms can decide to use the criticality as indicator, to continue the assessment. The severity cannot be used as the probability of occurrence of the risk has to be taken into account when choosing suppliers. The weight of each criterion will be assessed depending to their importance for the buyer or the decision maker, it is always better to have this step done by

people from different department to have several points of view. Each sub-criterion among a criterion can also be weighted according to their importance. This step, especially for the sub criteria, can seem useless. Indeed risks are already defined with three metrics and it can be meaningless to add a fourth one. This is why the default value, give the same importance for each sub-criteria and criteria, this step is therefore not mandatory. However freedom is let to the decision maker to add the “importance for the firm” criterion.

To add this criterion the analytical hierarchy process will be used with the risk indicator of every sub-criterion (This method is explained in the following section). After having (or not) weighted the risk indicator, a sum will be made to have a single score for the risk of the supplier. This score will be the one used to give a score in the supplier assessment and the supplier summary.

ANALYTICAL HIERARCHY PROCESS

The template of the “AHP process” can be found in the appendix (Appendix 13)

The analytical hierarchy process (AHP) developed by Saaty (1990) has been used by numerous scholars or managers to take decisions. It can be used in different fields and be adapted to various applications. Thanks to this process the decisions maker can weight every criterion according to their relative importance between each other. The operation and the proof of result will not be explained in this paper, indeed this process is used since a long times and does not have to be proved anymore. However the way to used AHP with the “supplier risk assessment” and the “supplier summary” templates will be explained in this section.

This explanation will be made with the process to evaluate the importance of the category in the risk assessment. First the green area in this table will have to be filled in by the decision maker.

Figure 8: The pair wise comparison of AHP

Step 1: Pair wise comparison									
Factor	General information	Delivery	Quality	Financial	Supply chain management	Reputation	Security		
General information	1	1	9	1	1	1	1		Ration = Row/Column
Delivery	1	1	1	1	1/5	1	1		
Quality	1/9	1	1	1	1	1	1		
Financial	1	1	1	1	1	1	1		
Supply chain management	1	5	1	1	1	1	1		
Reputation	1	1	1	1	1	1	1		
Security	1	1	1	1	1	1	1		
Total	6,11111111	11	15	7	6,2	7	7		

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The scale used will be the one of Saaty (1990), the following table explains it.

Figure 9: the fundamental scale of Saaty

The fundamental scale

Intensity of importance on an absolute scale	Definition	Explanation
1	Equal importance	Two activities contribute equally to the objective
3	Moderate importance of one over another	Experience and judgment strongly favor one activity over another
5	Essential or strong importance	Experience and judgement strongly favor one activity over another
7	Very strong importance	An activity is strongly favored and its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order of affirmation
2, 4, 6, 8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals	If activity i has one of the above numbers assigned to it when compared with activity j , then j has the reciprocal value when compared with i	
Rationals	Ratios arising from the scale	If consistency were to be forced by obtaining n numerical values to span the matrix

Chart retrieved from (Saaty, 1990, p.15)

For example in the table “step 1: pair wise comparison”, for the decision maker “general information” is a risk criteria extremely more important than “quality” and “supply chain management” is a risk criteria strongly more important than “delivery”.

In the following table, the step 2 “normalization” is presented. The green are, represent the weight of each criteria (in this example all the criteria are equivalent).

Figure10: The normalization of AHP

Step 2: Normalization									
Factor	General information	Delivery	Quality	Financial	Supply chain management	Reputation	Security	Total	Average
General information	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	1	0,142857143
Delivery	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	1	0,142857143
Quality	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	1	0,142857143
Financial	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	1	0,142857143
Supply chain management	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	1	0,142857143
Reputation	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	1	0,142857143
Security	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	0,142857143	1	0,142857143

Print screen of a self-made Excel sheet

Figure 11: The consistency analysis of AHP

Step 3: Consistency analysis				
Factor	Consistency Measure			
General information	7			
Delivery	7			
Quality	7			
Financial	7			
Supply chain management	7			
Reputation	7			
Security	7			
CI	1,4803E-16			
RI	1,32			
C.Ratio	1,12144E-16	The consistency ratio has to be smaller than 0,10, if it is not the case the step 1 has to be done again		

Print screen of a self-made Excel sheet

Before continuing the decision maker has to make sure that his analysis is consistent, to do so Saaty (1990) developed a formula. If the number in the green square is smaller than 0.10, the analysis is considered as consistent and the decisions maker can continue. If it is not the case, the first step has to be done again. For the final step the risk indicator of each category will be multiplied by its weight. The weight of each criterion has to be the same for every supplier.

In this research the AHP process is used to first weight the risk and then to weight the five criteria before the final decision. The last utilization of the AHP process is primordial, indeed the weight of a criteria depend heavily on the objectives of the research of new suppliers. Most of the time, a new supplier is searched for a new product or because the previous ones were disappointing. The

criteria have therefore rarely the same importance as it depends on the company, the industry, the project or the criteria where the previous suppliers were not good enough.

SUPPLIER SUMMARY

The template of the “supplier summary” can be found in the appendix (Appendix 14)

This is the last tool used in the process, it will give to each supplier a score, and this score will be comparable with the one of others suppliers. Therefore the decision of which supplier chooses will be easier and more consistent as it will rely on a true analysis.

To take the final decision each team who has worked on a criterion (quality, relationship, delivery, cost, and risks) will have to grant a score between 1 and 10. In this part 1 stands for very low performance and 10 for almost perfect performance. It is essential that the same team for a criterion makes the analysis for every potential supplier to not have any personal interpretation influencing the results. The score will be given according to the “supplier assessment”, the AHP method can be used to calculate final score of criterion. For the risks it is important to point out that the score will not be the one given by the “supplier risk assessment”. Indeed the scale is not the same and is reversed (bigger is the number, worst it is). The team responsible for the risks will have to evaluate the number given by the “supplier risk assessment” according to the average risks of its industry.

Once all the criteria have their summarized score, a multi-disciplinary team will have to be formed. This team has to be composed of at least people from every department involved earlier in the process. Each member of this team will individually weight the score of the five criteria with the AHP method. Indeed at this stage of the analysis the importance of each criterion are really primordial, and have to take into account the point of view of the different department of the firm and the objectives of the search of new suppliers. A criterion other has been added for the case where the firm has a really specific objective that is not taken into account in the five previous categories. However this criterion should not be used in most cases.

Each decision maker will sum the weighted criteria, and an average will be made to have a single weighted score for the suppliers. Of course as for the previous analysis the same team has to evaluate every potential supplier. The supplier with the highest (closest to 10) weighted average will be considered as the best possible suppliers. The team will then discuss how many

suppliers they want for the product or services and chooses them. The process gives a score for suppliers, but the decisions team should be sure that the supplier looks to be the best one and should not blindly follow this process.

C. VALIDATION BY KANEKA

The process was presented to the sale, the purchasing and the senior management teams of Kaneka Apical Division. Some comments raised on the process, the tools and templates used. Those managers found the process very useful to find new suppliers in China. The process is open and flexible and can therefore be adapted to different companies or products. In general, the process allows decision makers to build their opinion and does not block them in any circumstance. Even if the process has been developed for the Chinese market, it can be easily adapted to another one, and used to evaluate an existing supply chain. This is a major advantage.

Comments were made on each template:

- Check list: This template is specific to China; it will be useless or not adapted to other markets. In China, it will help the buyer to think about its particularity. Indeed buyers with no experience in China will not specially consider eventual scams that rarely happened in Europe or America.
- Supplier self-assessment: This assessment covers a large topic range and includes Chinese specificity. Supplier should be more encouraged to detail his answer and justify himself. A third possible answer should be available in case of Yes/No choice. This answer can be “Not applicable” or “In process”.
- Supplier assessment: The flexibility and the openness were very much appreciated in this tool. The relationship part has a major importance due to the specificity of the Chinese market. This detail needs to be further point out or explained to the decision makers.
- Cost mapping and supply chain mapping: those tools have a great utility for buyers and decision makers. The only fact to draw the chart will help the buyer to deeply look at costs and risks of the entire supply chain. This reflection in itself will be convenient and will indicate to buyers the cost structure or supply chain weaknesses. Moreover those tools can be used in every market and in an existing supply chain.

- Supplier risk analysis: this tool is specific to buyers with little experience in the Chinese market. It may also help experienced buyers to think deeply for the risks analysis.
- Supplier risk assessment: This tool goes into details and assesses every possible risk. The metrics and indicators define further the risks and help to take the decision. The speed of risk and the two indicators using it were found convenient and useful.
- Supplier summary: A formula should help the buyer to transpose the score given by the supplier risk assessment to the score used in the supplier summary. The possibility to weight the different criteria's score according to the priority with the AHP method is an added value of the process.

The process is quite universal, even if it will be used only for important product. The name of the different templates or tools should be more differentiated to avoid confusion. After the presentation and the comments, modifications were made to improve the process.

The sentences “comments can be added to specify or justify the answer” and “please add “Not applicable” if you cannot answer to a question” were added at the beginning of the supplier self-assessment in order to incite the suppliers to be precise or give an answer when it is not applicable. However the buyer should highlight the importance of the precision when sending the self-assessment to suppliers. The template should not be overcharged with indications, to be clear and add freedom to the buyer.

The names of templates were not changed, indeed the buyer is the one that will fill in this templates and he should be able to differentiate them. The self-assessment has to be filled in by suppliers; the buyer will work only on the assessment. Every company and buyer may obviously change the name of the templates and the templates itself to fit more with their metrics used and wording.

A formula was searched but the solution has not been found to transpose the final figure of the risk assessment to the supplier summary; indeed this computation is difficult to be done automatically due to the inversion and the scale's differences used in these templates. The scale used in the risk assessment goes indeed from one to infinite (one being the less risky) and the scale used in the supplier summary goes from one to ten (one standing for very low performance). Moreover every industry and buyer has its own specific risk advertence; a formula can hardly be developed.

The process was then approved and tested to find suppliers of dimethyl formamide (DMF) and other chemical products. The DMF is a relatively frequent solvent used in chemical industry, the number of suppliers producing it is important. These tests were a good way to challenge the process and further improve it. Due to time and costs limits, the process was not tested further than the preparation of the step four. The time requested, the advantages and the limitations were assessed during these tests.

The time needed up to step four is very much related to the time taken by suppliers to answer questions. The check list is a relatively quick step, especially when the buyer has contact in China and does not need to search very long for suppliers; it takes only five minutes to check the list. The assessment needs more time, but if the buyer has all the requested information ready and knows his industry and his company well enough, not more than 2 hours are needed to complete it. The self-assessment depends only on the supplier. The power of the buyer on the supplier influences heavily the time and the quality of the supplier's answer. This needed time is increased by the time zones, especially for buying companies in America (between 12 and 15 hours of difference). One or two weeks may be enough to go through the three first steps of the analysis, the fourth step, the visit, depend only on the availability of the visiting team, the financial means of the company and the willingness of the supplier.

During the test the check list was found useful, the template does not have to be filled in at each time. Indeed after having experienced a research for suppliers in China, the buyer knows the checked criteria and handles them without using the template. He takes contact only with the trustable suppliers after a quick check of the available information. This template is therefore only convenient for inexperienced buyer or can be used as a reminder.

The supplier self-assessment performed well and suppliers did not reject it. The buyer has to highlight the importance of the details and justification to be able to do his analysis. The assessment allows summarizing the information of suppliers on a unique template and therefore facilitates the comparison. The self-assessment template has to be adapted for each product to better match with the industry and specificity of potential suppliers of the product (country, regulation, technology).

The risk assessment and the risk analysis made the analysis easier and allow the buyer to use the same method to analyze each supplier. It is better to have a standard to be able to use the same

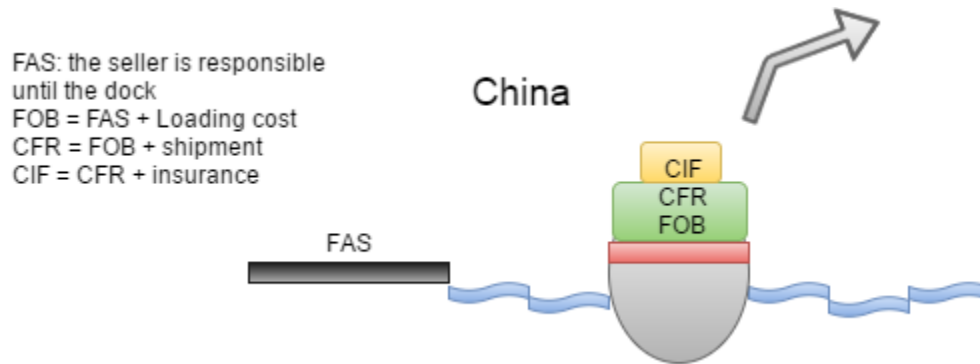
metric and therefore ensure consistency for the risk analysis, the probability of occurrence, the impact and for the speed of risks. This standard can be a potential or a current supplier, an industry average or the buying company itself, as soon as it is the same for every potential supplier. The number of sub-criteria to analyze is not too important and allows buyer to evaluate and consider a wide range of possible risks. The speed of risks can be difficult to determine for some risks but add information and details for other. This metric is therefore the same and not really used for several risks but can be decisive for others. The three indicators were found convenient and give an effective summary of the supplier's risk. The needed forecast (high severity) or management (high criticality) facilitates the risk side of the decision.

The cost and supply chain mapping were found useful to prepare the selection and to evaluate the different possibilities at the end of the process. Those tools were not used during the process. The AHP method were not used either as the process was tested only until the step three and this method is not convenient until having all the information into details.

The visit of suppliers was not done, but the process permit to go from the 27 found suppliers to 2 selected suppliers. The risk of those suppliers was described into details and compared to the one of the previous suppliers. For each supplier the necessity of “what if?” plan and risk management was highlight thanks to the risk assessment. The potential cost savings were also presented in relation with the risks increase. In general this process is easy to follow and fast enough to be used in a real company. However it has to be adapted to the company, industry and product before being totally functional.

Those tests brought another possible issue when going from a local supplier to a supplier abroad, especially from a country that have to import by sea freight. This issue is the logistic issue, indeed Kaneka Apical division was buying a chemical product from a local suppliers. This supplier sent his product by truck, and then the product was loaded into a tank in the factory. When such a product comes from china it has to come by drums or ISO tank, the second solution was chosen in the DMF case of Apical Division. Several questions are then raised, and depend on the contract with the supplier. The price agreed with the supplier can be FAS, FOB, CFR, or CIF. The buying company may therefore have to find a shipment company for its products.

Figure 12: The types of shipment



Self-made drawing

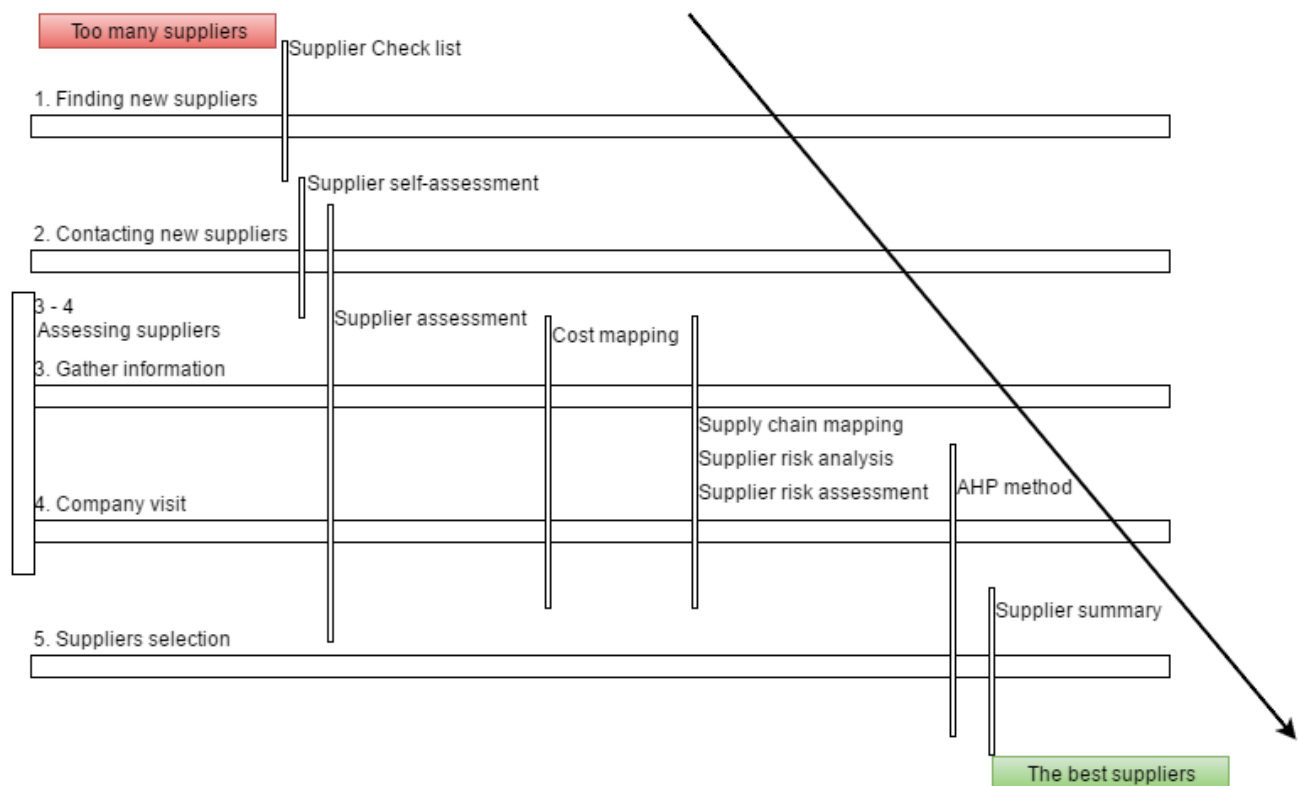
For each of those solutions the tank will come to a local port and will have to be managed. A transport company has therefore to be found to carry the tank to the factory, if this transport is too long an ISO tank needs to be rent locally. Moreover suppliers often offer better price for large orders, the buying company may be then unable to stock this command and have to find a storage company and rent ISO tanks for a longer times. This issue has to be taken into account by the suppliers. They raise the cost and the risk of sourcing in China. They are include in the process in the delivery criteria, the total cost, the risk assessment and the supply-chain mapping, but the buyer has to be aware of the time needed to find the cheapest and the safest solution.

7) CONCLUSION

This process through its five steps allows buying firms to find suitable supply partners in China. It was developed according to the literature review and the gaps found in it. The literature review gave ideas and knowledge about risks in global sourcing and Chinese market that were useful for the process's development. Other sources of information were the purchasing processes that were analyzed. Indeed the companies and professionals added a practical knowledge that the literature review was unable to properly give. The source of the idea of such a process was the analysis of Kaneka and the problem that had managers of Kaneka North America Apical Division.

This process is easy to follow and the templates and tools are easy to use. It is then not impossible for a company new in the Chinese market to employ it. However the process can also be used by a buyer or a company having experience on this market and in purchasing.

Figure 13: Process conclusion



Self-made chart

Several tools used in this process can help us to analyze a current supply chain:

- Cost mapping: This tool can analyze the cost structure of a value chain and eventually spot a risk of cost instability. The managers and buyers will be able to manage their costs and try to avoid costs increases.
- Supply chain mapping: Concentration of risks in a transportation node or a product sourced in an inadequate number of plants or suppliers can trigger a search for new suppliers or a program to reduce risks. Indeed managers may not be aware of such risks.
- Supplier risk assessment and supplier risk analysis: An analysis of a strategic or an important supplier can highlight important risks and force the company to take measure to mitigate them.

The new metric and indicators developed for the process (speed, severity and criticality) can also be used by managers to assess the risks of their own firms. The severity and criticality by including this new metrics “speed” can add details and accuracy to the risk assessment of their firms.

This process is specific to China; however it can be easily used in other countries. Several criteria will be useless and the utility of the “supplier check list” can be discussed. After some adaptations in the criteria used, especially for the first’s steps, the process can be run all over the world. Several tools such as the cost mapping, the supply chain mapping or the supplier summary will not need any adaptation to be workable in other countries. The supplier risk assessment may need adjustment for some criteria, but the calculation, the indicators and the AHP process linked to those criteria are ready for use outside China.

This process focuses on risks, indeed three tools are used to assess and calculate it (supply chain mapping, supplier risk analysis and supplier risk assessment) and the goal of the five steps is to reduce risks. However the other criteria are evaluated, quality, relationship, delivery and cost, but their analysis stays at a basic level. Except for the cost with the cost mapping, no additional tool has been created to analyze those criteria as it was not the purpose of this paper. Nevertheless the process can integrate new evaluating tools and the final stage will still work. However the risk analysis of the process needs a formula to transpose the figure at the end of the supplier risk assessment to the supplier summary. The development of such a formula can be an opportunity

for a future research; indeed it can be convenient for this process but also for other process developed in the literature.

The process has been validated by the top management of Kaneka North America Apical Division and then tested by the researcher in a real situation until the preparation of the step four. The list of potential suppliers was reduced of 92% thanks to the process. But the solution for Apical Division should be tested until the end of the process and evaluate after several years of working with the suppliers. Indeed the supplier's risks can occur after years of relation and is therefore difficult to be verified during this study. Due to time and financial implications no visits of suppliers has been done during the study. Visit is an important step of the process and should be done by the researcher to fully validate the solution to its end.

The process was created and validated by Apical Division, however as said before in this paper, the aim of the researcher was to create a solution also usable by other companies. The freedom of interpretation and working left in the solution should permit its utilization by other buyer in other firms. To be validated for an overall utilization the process has to be tested in other companies, in other industries and by other purchasers.

Later an international version of the process should be created and tested in the same condition to validate the solution for other companies. An international panel of suppliers should in this case be evaluated. After having been approved in real situations and with those conditions the process could be considerate as usable in different industries for global suppliers.

As the process focuses to evaluate the risk of potential suppliers, research can be done to develop tools in order to assess the quality, the relationship, the delivery and the cost of those suppliers. The relationship criteria is an important and specific criterion for Chinese suppliers, further evaluation of this criteria can therefore have a substantial added value to the current process.

The system also focuses on potential suppliers; a risk assessment cannot stop after the selection of the supplier. Risks of a company have to be assessed continuously due to changes in the management of the company, the technology and the environment. A suite of the developed process can therefore be developed to allow Apical Division or other companies to continue their risks evaluation after the selection.

Moreover when a buying company actually works with suppliers it is important to evaluate risks, but it is primordial to manage and mitigate those risks. The current process shows to the buyer

where the risks to mitigate are thanks to the criticality but does not help the buyer to manage those risks. As the supplier evaluation has to be adapted to the Chinese environment, the risk mitigation of Chinese suppliers needs also to follow a specific procedure to integrate the Chinese specificities. The severity shows to the buyers the risks that need to be forecasted. The buyer has to prepare plan in case of occurrence of those risks. A research can be done to help the buyers to create those plans and evaluate their efficiency. A cost analysis should be added to this research to assess the profitability of the plans.

The newly metrics developed “speed” was found useful and convenient by the management of Apical Division and during the test of the process. This metric may therefore be used in other research about supply risk to evaluate its efficiency in other situations with other objectives. The speed should also be validated by other research to be fully verified as a metric to define supply risks; it might also be useful to define risks in a more general idea.

This research was done in the changing Chinese environment; it may therefore be outdated quickly as companies in China adapt themselves to their new environment. The European and American environment may also change due to political situation; those changes could lead to a revision of importation regulations that can hamper China sourcing.

Tomorrow will tell us where and how to source ...

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