KNOWLEDGE ASYMMETRY IN INTER-FIRM RELATIONSHIPS

A SUGGESTION FOR A KNOWLEDGE SOURCING STRATEGY FOR THE MINISTRY OF OIL OF IRAQ

WRITTEN BY: R.N.J.C. DELLEMIJN

AUTHOR: R.N.J.C. DELLEMIJN

STUDENT NUMBER: 0041602

PRINCIPAL: dr. ir. U.F.A. KARIM

SUPERVISORS: dr. A.H. VAN REEKUM, dr. P. DE VRIES

COURSE: MASTER THESIS

DATE: 16 AUGUST 2012

STATUS: FINAL

MANAGEMENT SUMMARY

This thesis introduces a new knowledge sourcing strategy model. Four strategies were developed a grow, transfer, buy and hire strategy. Based on the analyses of the organisational and knowledge characteristics it is possible for an organisation to create the most optimal strategy to source new knowledge. To demonstrate the working of this model it was applied to a real-life case study for the Ministry of Oil of Iraq (MoO). The most optimal (combination) of knowledge sourcing strategies to acquire knowledge in the contract management and control domain is presented as a suggestion for the Ministry of Oil of Iraq for the development of their knowledge base.

This is however the end-result of this thesis. In the preceding chapters it is explained why knowledge is important in an inter-firm relationship. The most important findings will be described in the upcoming sections after which the advice for the knowledge sourcing strategy for the Ministry of Oil of Iraq will be explained in more detail.

Since the world is becoming increasingly complex and knowledge is increasingly dispersed, organisations ever increasingly have to rely on external organisations to help them develop and sell their products or services. They develop many inter-firm relationships. Managing these relationships is a challenge, since an external organisation may not always have the same goals as your organisation. They may show unwanted behaviour or represent themselves in an untruthful manner. In both situations the agent may act on his own interest, that is referred to as agency problems in the agency theory. These agency problems can have large financial and/or other consequences for the principal.

The concept of knowledge asymmetry is introduced in the first chapter as evolution of the already known concept of information asymmetry in the agency theory. Information asymmetry creates the opportunity for the agency problems to occur, since the principal won't have information on the behaviour, actions or results of the agent. Having information however is not a guarantee for understanding the behaviour, actions or results of the agent. It is the interpretation of the information, understanding the information that is critical to understand the behaviour, actions, and results of the agent and curb the possible agency problems.
It is knowledge that allows the interpretation and understanding of information. Knowledge is a transformation of information using experience, skills and attitude, all within the individual mind. It has to be learned, which is difficult, time consuming, uncertain, and often accompanied with great costs. Information, in comparison to knowledge, can be purchased, although not always available, at a certain price.
Understanding that reducing information asymmetry is more easily than resolving the knowledge asymmetry is valid, based on the previous statements.

Knowledge is in contrast to information a more difficult construct. It is more difficult to absorb, it can't be transferred, it is bound to an individual. That makes knowledge also explicitly more costly.

The difference between information and knowledge will require a completely different approach for the principal when engaging in an inter-firm relationship. The principal will need to carefully consider the available and necessary knowledge in the organisation to effectively manage and control the inter-firm relationship, since sourcing knowledge takes more time, is uncertain, bound to individuals and sometime unavailable and certainly more costly than sourcing information.

How knowledge asymmetry affects the performance of the inter-firm relationship is described in the second chapter. Risk directly influences the performance of the inter-firm relationship, which can be 'managed' by control or trust. Reducing the knowledge asymmetry between the principal and the agent positively affects the performance of the relationship, is argued and formulated in propositions. Reducing the knowledge asymmetry allows the principal to more accurately assess the risk, reducing the uncertainty that negatively affects the performance of the inter-firm relationship. A smaller knowledge asymmetry also allows the principal to more accurately assess the trustworthiness of the agent as well as the processes and behaviour of the agent. This positively affects the effectiveness of both the control and trust mechanism, which in turn have a positive effect on the perceived risk.

The last chapter provides an answer to a topic that was introduced in the first section of this management summary. "*If I am in need of knowledge, how can I source it?*" Four strategies are developed, grow, transfer, buy, and hire, which cover all possible sourcing possibilities. Based on four organisational (absorptive capacity, financial capacity, HR capacity, and risk attitude) and four knowledge characteristics (core competence, knowledge availability, time to knowledge, and knowledge time-span). An organisation can identify knowledge gaps, and for each knowledge gap a knowledge sourcing strategy can be developed. In particular (in this thesis) for organisations that are in an inter-firm relationship, and find themselves in need for specific knowledge regarding the management and control of a relationship. The strategies can be combined in parallel or sequential order to reach the desired knowledge state, and provide the principal with flexibility regarding the sourcing of knowledge.
The knowledge sourcing strategy model however is not limited to use in inter-firm relationships. The strength of the model is also in its wide possible appliance. Every organisation, business unit or individual that has identified a need for knowledge can use the knowledge sourcing strategy model to source knowledge.

The organisational and knowledge characteristics of the MoO were measured using an online questionnaire. Based on these results a suggestion for a knowledge sourcing strategy was formulated. The suggestion is to start with a grow and hire strategy at the same time. Since the MoO regards the knowledge in the management and control of inter-firm relationships as core competence, it is suggested to internally grow that knowledge. The financial means to accommodate that strategy are deemed available by the respondents. The knowledge is however needed at a short time-span, the MoO is already engaged in the inter-firm relationships. That why it is suggested to also immediately execute a hire strategy as knowledge will be almost immediately available (respondents have indicated that they expect that the knowledge is available at external sources). Since the grow strategy will take time to provide results, a hire strategy can fill this gap. The hire strategy can, in time, be replaced

with a buy strategy. This can support the grow strategy, the knowledge will be at close proximity, and provides more certainty at a lower cost than the hire strategy. A buy strategy provides a more solid base for the MoO. A buy strategy will take more time to execute, which is the reason to first execute the hire strategy, given the immediate knowledge need. After the grow strategy has shown sufficient results, the buy strategy can be phased out, from which time on the Ministry of Oil is self-sufficient regarding the knowledge in this domain.

In the first chapter the significance of the concept of knowledge asymmetry as evolution from information asymmetry is reasoned. Consequently the importance to reduce the knowledge asymmetry in an inter-firm relationship is formulated in propositions. The last section of this thesis provides a practical model, the knowledge sourcing strategy framework, for any organisation that wants to source knowledge, and more specifically for those in an inter-firm relationship that want to reduce the knowledge asymmetry to increase the performance of the relationship.

TABLE OF CONTENTS

1 EXPLORING KNOWLEDGE AND CONTROL IN INTER-FIRM RELATIONSHIPS

Our current society has seen enormous changes in the last decades. The world is globalising at an incomprehensive speed and local economies are trying to adapt to the changing environment. Where in a far past families (or villages) were self-supporting in their needs, since the 16th century the division of labour is seen in the society. Division of labour in production facilities was described by Smith (1776) in which the example of a large-scale pin factory was presented. Labour is since then increasingly diversified and knowledge is subsequently increasingly dispersed over people (Hayek, 1945; Sharma, 1997). The large conglomerates have been focusing on core activities in the past quarter century and have been outsourcing non-core activities (Grant and Baden-fuller, 204). Organisations are refocusing on a set of their core competences and skills (Grant and Baden-fuller, 2004; Tiwana and Keil, 2007). Organisations therefore focus on the areas in which they have competences and knowledge. They rely on external organisations to provide needed products and service that are beyond the scope of their own competences (Grant and Baden-Fuller, 2004). Professional service agencies for example, are therefore of increasing importance for organisations (Sharma, 1997).

Shareholders expect organisations to focus at their core competences to be more successful and profitable (Prahalad and Hamel, 1990; Dobbin and Jung, 2010). The consequence of this strategy is that organisations focus at a limited number of knowledge domains that support and match their organisation strategy and core competences. They rely on other organisations to supply the knowledge in the form of products or services that are outside their core competence, but are necessary for the operations of their organisation (Grant and Baden-fuller, 2004).

This focus on core competences causes an increasing amount of interaction between organisations where they acquire and supply products and services to each other. It causes a necessity for organisation to cooperate and engage in inter-firm relationships. This creates an interface between both organisations, since the relationship between the organisations has to be managed. Insufficient information and or knowledge leaves the principal vulnerable to opportunistic agents. Especially since controlling and monitoring these inter-firm relationships requires specific knowledge to achieve a successful outcome (Brown, Potoski, and Van Slyke, 2006).
There is a realistic chance that as a principal, you won't receive the product or service that you had in mind at the time of the contract arrangements. The principal may not be able to effectively put his requirements on the product or service into a contract (or specification), or the agent may not deliver what was contractually arranged. Although both situations are relevant, the post contractual phase is the context in this thesis, the management and control of a contractual inter-firm relationship from the perspective of the principal.

The agency theory models the complex contractual relationship between individuals or organisations and the elements that may cause deviation from the optimal performance of that

relationship. It is therefore the starting point in a search to the connection between knowledge and the performance of contractual inter-firm relationships.

1.1 AGENCY PROBLEMS BETWEEN THE PRINCIPAL AND AGENT

"*An agency relationship exists when one or more individuals (called principals) hire others (called agents) in order to delegate responsibilities to them*" (Baiman, 1990, p. 342).
According to Baiman (1990) the relationship in the agency theory can be applied either applied to an employer-employee or inter-firm relationship[1].
The agency theory focuses in this relationship on the most optimal contract that governs the relationship between the principal and the agent, where agents are assumed to act in self-interest (opportunistic behaviour) (Eisenhardt, 1989; Baiman, 1982).
This causes an *agency problem* when the goals of the principal and the agent are misaligned (Eisenhardt, 1989), and leads to a loss of efficiency and influence the performance of the relationship. It is information asymmetry between the principal and the agent that is at the root cause of the agency problems when goals are incongruent. Due to the information asymmetry, *agency problems* may arise according to Baiman (1982) for either of two reasons, *moral hazard* or *adverse selection*.
Pauly (1968) refers to moral hazard as a deviation from the behaviour of the agent as contracted with the principal, or when the behaviour of the agent deviates from ethically and moral acceptable (Pauly, 1968). Moral hazard is behaviour that negatively influences the performance of the relationship (Baiman, 1982). It occurs in situations of post-contract information asymmetry, when the behaviour of the agent deviates from the contractual arrangements (ibid.).
Adverse selection constitutes a misrepresentation of the current abilities, competences or state of the agent towards the principal (Akerlof, 1970; Eisenhardt, 1989). The information asymmetry between the principal and the agent won't allow the principal to discover the true abilities, competences or state of the agent[2] in the pre-contract phase (Akerlof, 1970). During the inter-firm relationship, the principal can gather information on the abilities, competences or state of the agent and gain insight in the truthfulness of the original representation of the agent.

Moral hazard and adverse selection are both agency problems that threaten the performance of an agency relationship. According to Baiman (1982) information can prohibit *moral hazard* and *adverse selection*, since information can reveal the behaviour of the agent, so that the principal can (preventively) monitor whether the agent shows adverse selection or moral hazard behaviour (Jager, 1994).

[1] Although the principal-agent branch specifically assumes an employment relationship, the transaction cost economics branch is aimed at inter-firm relationships (Baiman, 1982; Eisenhardt, 1989; Baiman, 1990). Baiman (1990) also relaxes this strict distinction since he argues that there would be no significant difference between both in the analysis. This view is shared as according to Baiman (1982) and Fama (1980) the agency theory views the firm as a set of individuals that act on self-interest and are bound by contracts. This description of a firm in the agency theory matches that of a market better instead of a hierarchy.
[2] For example, when the principal has no information to verify the competences presented by a potential agent, the agent may misrepresent or hide his true competences towards the principal for his individual benefit.

Agency problems negatively affect the performance of the contractual relationship between the principal and the agent. Information is already frequently mentioned in the context of the agency problems as a crucial element. Information asymmetry can have *agency problems* as an effect, while information can curb *agency problems*. How can information curb the *agency problems*? That question will be however attended two in section 1.1.2. First the contract that has such a prominent place in the agency theory will be explored.

1.1.1 TWO BRANCHES OF THE AGENCY THEORY

There are mainly two different branches in the agency theory that have opposite views on contracts, the Principal-Agent model and the Transaction Cost Economics model (TCE) (Baiman, 1990). These opposite views can be explained by their different assumptions on the rationality of the individual.

The principal-agent theory assumes that an individual has unbounded rationality and unlimited computational abilities. The individual can "*anticipate and assess the probability of all possible future contingencies*" (Baiman, 1990, p. 342). Transition cost economics however assumes that the individual has bounded rationality and have limited capacity to acquire and process information. Individuals consequently "*cannot foresee all possible future contingencies*" (Baiman, 1990, p. 346).

These assumptions lead to a critical difference between the principal-agent and transaction cost economics branches on contracts. The principal-agent branch assumes that (also given the unbounded rationality), contracts will be comprehensive and complete. Contracts can be accurately and costlessly enforced by the courts (Baiman, 1990).
The transaction cost economics branch of the agency theory however assumes that contracts are incomplete and courts are imperfect enforcers of contracts (Baiman, 1990).

The assumption of the TCE branch is supported by Tirole (1999) according to whom contracts are by definition incomplete due to the complexity of products or service at every detail as well as the contingencies that may occur (Dyer and Singh, 1998). The more complex the product or service is, the more complex the contract becomes, and unavoidably the incompleteness increases (Williamson, 2002). This view on contracts matches with the assumption of bounded rationality of the TCE model. Individuals are not able to foresee all future contingencies and contracts are therefore by definition incomplete since they are made by those individuals with bounded rationality.
The accurate and costless enforcement of contracts by courts are also unrealistic. Often is seen that these court procedures are costly, take considerable time and the result is not satisfying for each of the involved parties. Consequently have court procedures a drawback due to a lack of competences in the legal system to understand whether there is a breach of the contract and which party caused that breach (Tirole, 1986; Lewis and Sappington, 1991; Williamson, 2002).

Contracts are often incomplete, difficult to comprehend and enforcement by courts is challenging. A contract, even an optimal contract is therefore not a promise for the performance of a relationship (Dawson et al., 2010). Das (2004) even suggests that a strong relationship between the principal and the agent is more effective than a contract. The TCE

view on contracts shows that a contract on itself cannot curb the *agency problems*. Not every possible behaviour and outcome of the agent can be described in a contract, due to the bounded rationality of individuals and the consequently incomplete contracts. Contracts are therefore de facto a faulty mechanism that is difficult to enforce by court. Information seems to be the key element between the *agency problems* and the performance of the contractual relationship. It can be stated that there is no real substitute for information in an inter-firm relationship. It is therefore important to focus more closely at information in the agency theory to attend to the *agency problems* to answer the question "*How can the principal achieve an optimal performance of the contractual inter-firm relationship?*" Ouchi (1980, p. 130) describes this question as the "*fundamental problem of co-operation*".

1.1.2 INFORMATION AND INFORMATION ASYMMETRY IN THE AGENCY THEORY

It is already stated that information can reveal *agency problems* to the principal and thereby curb the *agency problems* (Williamson, 1973; Fama, 1980; Baiman, 1982; Kosnik, 1987; Eisenhardt, 1989; Conlon and Parks, 1990). It should be regarded as the only effective instrument in the agency theory to curb *agency problems*, since there is no true substitute to information. These problems can occur when the agent has private information that is not available to the principal, but is relevant to the contractual arrangements between the principal and the agent. Both the principal-agent and TCE branch acknowledge this description as information asymmetry in their models (Eisenhardt, 1989; Baiman, 1982; Williamson, 1973). Although the term information asymmetry is frequently used in articles on the agency theory, a clear definition cannot be found. It is therefore important to define information asymmetry at first.

Information asymmetry can be defined as "*A situation where the agent has private information that is relevant to the contractual arrangements with, and is not revealed or available to the principal."* The principal can be subjected to *agency problems* when information asymmetry occurs.

The principal-agent model assumes that the private information of the agent cannot be costlessly obtained by the principal (Baiman, 1990). It is however a commodity that can be acquired (Eisenhardt, 1985). Williamson (1973) acknowledges both points of view of Eisenhardt as he regards the cost for the principal to achieve information parity. The assumption behind both models is that information can be acquired, it is a commodity, and it has a certain cost.

Information asymmetry is regarded as a one-sided construct in this paper. Only the information asymmetry observed by the principal is relevant in this paper. Although it is also possible from the point of view of the agent, this is not regarded in this paper.

Since information asymmetry can have *agency problems* as a consequence, and information can reveal these problems, the question arises, *"Is information effective to reveal the behaviour, actions and outcomes of the agent?"*

1.1.3 SHORTCOMING OF INFORMATION ASYMMETRY IN AGENCY THEORY

The answer to the question in the previous section is shortly "no". This statement can be proven by sketching a fictive principal-agent relationship, where the available information is the sole variable.

Two individuals *A* (the agent) and *P* (the principal) are in a principal-agent relationship. In this situation P experiences information asymmetry opposed to A. This asymmetry can be undone by presenting P with all necessary information to which A has access. Due to this action, the information asymmetry ceases to exist. A situation of complete information is created. In such a situation are *agency* problems unlikely according to the agency theory (Eisenhardt, 1989). However, there is one limitation, the fact that the principal has complete information, does not imply that the principal understands all the information[3]. This is not a newly gained insight. Greenwald for example referred to *"asymmetrically distributed knowledge about worker abilities."* (1986, p. 326) in a section where he describes the information asymmetry between buyers and sellers. Williamson (1973) also refers to Arrow (1969) who states that "one of the agents to a contract has deeper knowledge than does the other". The importance of knowledge was acknowledged, however not embedded, or to be found in the agency theory.

The concept of knowledge asymmetry is relevant as the principal may be confronted with a situation where he either has little knowledge to interpret the information supplied by the agent or gathered by the principal (Sharma, 1997), or when the principal is not knowledgeable to determine which information should be gathered, is missing or is invalid. Judging the performance of the agent is therefore difficult for the principal, especially when the agent is an expert or professional in his profession[4] (Sharma, 1997). In these situations, the principal is susceptible to agency problems, even when no information asymmetry occurs.

To summarise, reducing information asymmetry won't be able to prohibit agency problems. The construct of information asymmetry in the agency theory is therefore of limited practical use organisations in a contractual inter-firm relationship. The principal will remain susceptible to *agency problems* even when the information asymmetry is resolved. However, knowledge seems to be a more appropriate concept. Can it prevent and curb agency problems?

[3] For example, a board of directors can receive an annual report of the executive committee. However, as long as the board of directors has no knowledge on the content of the report, it won't be able to judge whether is satisfies the 'contract' between the board of directors and the executive committee.

[4] Sharma (1997) described knowledge asymmetry in a principal-professional context. Experts in medicine, law, advertising and strategy consultancy firms are defined as professional. In this research the agent in the inter-firm relationship is much broader

1.2 EXPLORING THE CONCEPT OF KNOWLEDGE ASYMMETRY

To answer the question posed in the previous section it is necessary to firstly explore what knowledge is. Are there elements of knowledge that can be distinguished to describe the concept? The major difference between knowledge and information will be described and knowledge asymmetry will be defined. These steps are necessary to provide a solid base to argue why knowledge asymmetry is an improved concept.

1.2.1 WHAT IS KNOWLEDGE?

A begin for the search of the definition of knowledge can be started at the work of the Greek philosopher Aristotle. He stated that "Knowledge consists in thoughts which agree with reality; it is the reproduction in the mind of the object." (Smith, 1895, p. 32) Knowledge can be true when it represents reality, but the process to determine the truth of knowledge must come through human thought (e.g. human perception). The human element is deemed essential in Aristotle's definition of the creation and acknowledgement of knowledge. This differentiates knowledge from information in the sense that information is transformed by humans, creating knowledge as a personal interpretation of the information.
Information is thus not the only element that comprises knowledge (uit Bijerse, 1999). A distinction is therefore made between "know what" and "know how" (Polanyi, 1966), (Shapiro, 2005). As Polanyi (1966, p. 4) states, "*..we know more than we can tell.*". This statement has two implications in combination with the distinction between *know what* and *know how*. At first there is knowledge that can be easily explained to others (*know what*) and secondly there is knowledge that can't be easily explained to others (*know how)*. The difference is between telling someone how to ride a bike, and actually knowing how to ride a bike. Both are different types of knowledge, according to Polanyi (1966).
That individual capacity to know more than we can tell is a critical element of knowledge, which enables individuals to use information from the world around us and transform it into individual knowledge that is bound to ourselves. In the next chapter we will have a closer look at this individual bounded capacity that makes knowledge unique.

1.2.2 KNOWLEDGE SEPERATED INTO TANGIBLE ELEMENTS

The transformation capacity described in the previous section is the essence of the human element that Aristotle's already described. Weggeman (1997) researched that transformation capacity and states that knowledge is comprised of several human competences that transform information into knowledge. Weggeman therefore defined knowledge in the form of a formula, as a function of information and experience, the skills and attitude (ESA) at a given point in time.

$$Knowledge\ (t) = Information * (Experience + Skills + Attitude)^{5}$$

By combining these elements an individual should be able to create knowledge from the reality around him. Knowledge is in these words a combination of external and internal (human) factors. The information is gathered or presented from external sources and processed internally with the use of experience, skills and attitude.

[5] *Attitude* is according to Weggeman (1997) a collection of *values*, which are based on *beliefs*. *Attitude* determines our view on the world and acts as a filter or a lens through which we look upon it.

The formula instantly indicates why an earlier statement, that information asymmetry is at a 'lower level' than knowledge asymmetry is understandable, since information is an element of knowledge.

Weggeman (1997) his view on knowledge and its elements is congruent with earlier explorations of knowledge by authors. They distinguished *explicit* and *tacit* knowledge (Polanyi, 1966; Nonaka and Takeuchi, 1995; van Daal et al., 1998) . *Explicit* knowledge can be expressed in words and numbers. It can be codified so that it is easily communicated and transferable. It is *information* (Lueg, 2001). To refer to *explicit* knowledge as information is also consistent with Lueg (2001) argument that *information* is context specific and its interpretation is dependent on the knowledge of the receiver of that knowledge. The latter is referred to as *tacit* knowledge or *knowing how* (Polanyi, 1966). *Knowing how* (as well as *tacit* knowledge) is what Weggeman (1997) refers to as experience, skills and attitude in his formula. These elements are used interpreted and transform the information.
Explicit knowledge will be referred to and threated as information, while *tacit* knowledge will be the knowledge that is referred to in this thesis.

1.2.3 THE DIFFERENCES BETWEEN KNOWLEDGE AND INFORMATION

The difference between *information* and *knowledge* can be made tangible with example of the learning of mathematics. In a mathematics educational book many examples and assignments are given. When only reading the chapters, the examples (or even copying them in your workbook) and listening to the lectures of the teacher won't create any true understanding of mathematics (Jensen and Meckling, 1992) [6]. It does not create any knowledge, you will only store information on the subject, it will be not be absorbed (Polanyi, 1966). However, when making the assignments, an insight into the workings of the mathematics will be gained. *Skills* on mathematics are learned, being able to solve a quadratic equation. When a deeper understanding of mathematics is gained, after longer studying, *experience* on the subject is created. One will not be able to solve the quadratic equation, but also to instantly 'know how' which routine will solve the equation in the fastest way (Polanyi, 1966). At the end an individual knows how to solve a mathematical equation, but won't be able to share this gained knowledge. The *knowledge* is bound to an individual, this is congruent with the definition of knowledge given by (Weggeman, 1997, p. 64): "*Knowledge is (through learning acquired) personal capability that allows an individual to execute a certain action."* The transformation process of information into knowledge resides in the mind of individuals (Jensen and Meckling, 1992; Nonaka and Takeuchi, 1995; Grant, 1996). It is a human action (Blackler, 1995; Nonaka and Takeuchi, 1995).

The example learns us several characteristics of knowledge and clearifies the differences between information and knowledge, which are presented in table 1. Knowledge is *bound* to an *individual,* and in contrast to information not an commodity (Grant, 1996; Sharma, 1997). The learning process of tacit knowledge is often *difficult*, *time* consuming, and *uncertain* (Jensen and Meckling, 1992; Grant, 1996). This is accompanied with *costs* for knowledge that are greater than the costs related to information (Sharma, 1997).

[6] It is similar to watching sports on television. It looks much easier than it is in reality.

At last and most importantly, knowledge is not *transferable* in contrast to information (Grant, 1996). In contrast to Jensen and Meckling (1992) who state that knowledge is transferable only at which cost? However, knowledge is bound to an individual, given the elements of experience, skills and attitude. This limits the transferability of knowledge as it can't be turned into information (Cook and Brown, 1999) [7]. Learning mathematics is something that has to be accomplished by an individual, he may be helped by a teacher (information), but when an individual's transformation capacity (knowledge) is insufficient the information will never be absorbed and transformed into new knowledge. Therefore knowledge is not deemed transferable.

Differences between Information and Knowledge

	Information	Knowledge
Boundary	unbound	Bound to individual
Learning	No learning needed	Needs to be learned
Result of learning		Result uncertain
Time to learn		Long time span
Transferable	Transferable	Not transferable
Cost	Low cost	High cost

Table 1: Differences between information and knowledge

1.2.4 DEFINING KNOWLEDGE ASYMMETRY

The definition of knowledge and the elements that construct knowledge were given in the previous section. A definition of asymmetry can be found in the Oxford Dictionary:

"lack of equality or equivalence between parts or aspects of something"

(Oxford Dictionaries, 2011)

The 'something' from the citation can be substituted with knowledge, the parts or aspects are information, experience, skills and attitude. A complete definition of knowledge asymmetry, based on the definition of asymmetry given in the Oxford dictionary would become:

Lack of equality or equivalence of a combination of information, experience, skills, and attitude between a principal and agent in a relationship.

Knowledge asymmetry consists of the already known construct information asymmetry, as well as experience, skills and attitude asymmetry. All four of these mentioned elements

[7] According to Nonake and Takeuchi (1995) *knowledge* can be transferred to *information*. However, when *knowledge* knowledge can be made *information*, it won't be considered *knowledge* any longer, it has become *information*. Hence the argument of Cook and Brown (1999) is followed. *Knowledge* can't be transformed into *information*.

should be considered in the concept of knowledge asymmetry and when considering solutions that should balance the inequality of knowledge.

The knowledge asymmetry between the principal and the agent can be decreased by either one or both of the two elements of knowledge asymmetry, information or ESA. When only decreasing the *information* element of knowledge, the overall knowledge asymmetry will be theoretically decreased, however as long as the *ESA* component knowledge asymmetry won't be decreased, the overall knowledge asymmetry won't be practically decreased. Without a well-developed *ESA* element, there is no transformation capacity to transform the increased amount of *information*. Hence, the decrease of a single independent element of knowledge, being *information* or *ESA* element won't lead effectively to a decrease in knowledge asymmetry.

1.2.5 WHY KNOWLEDGE ASYMMETRY IS AN IMPROVED CONCEPT FROM INFORMATION ASYMMETRY

The agency theory stipulates that the principal cannot observe the behaviour of the agent, when information asymmetry exists in the inter-firm relationship, due to a lack of information (Eisenhardt, 1989). This asymmetry allows the agency problems (*moral hazard*, *adverse selection*) to occur. Reducing the asymmetry will reveal the actual behaviour of the agent and reduce the possibility of agency problems.

However, reducing the information asymmetry won't reduce the risk of agency problems. The previous sections have shown that information is an element of knowledge. Without the experience, skills and attitude elements of knowledge, the information cannot be interpreted. If you don't know, how can you tell? The concept of knowledge asymmetry is therefore a realistic and useful evolution of the concept of information asymmetry[8]. The concept of knowledge asymmetry should therefore be preferred over information asymmetry. Using it will, in contrast to information asymmetry, provide better opportunities to increase the performance of the inter-firm relationship. Well-monitored contractual partners increase the chance that the product or service will be delivered according to the contract specifications (Brown, Potoski, and Van Slyke, 2006) and financial specifications (Hefetz and Warner, 2004). It is the evolution of information asymmetry into knowledge asymmetry that will present principals with an opportunity to improve the effectiveness of their monitoring.

The agency theory and its models will benefit of the more realistic and accurate concept of knowledge asymmetry. It will allow for more accurate modelling and analysis of contractual relationship and agency problems. The agency theory regarded information as a commodity that is available at a cost (Eisenhardt, 1989). Knowledge is not considered a commodity like information. It is difficult to transfer (when possible at all) and only at great cost (or even not at all) (Jensen and Meckling, 1992; Grant, 1996; Sharma, 1997). Learning knowledge is often difficult, tie consuming and uncertain (Jensen and Meckling, 1992; Grant, 1992). Knowledge is a 'specialty' that more closely matches the bounded rationality perspective of the TCE instead of the unlimited computational capabilities of individuals and the information asymmetry, since it describes "*the human actors in more realistic terms*" (Williamson, 2002,

[8] Information is not rendered useless. It is still a significant and important element of knowledge.

p. 5). It is knowledge that is closely bound to individuals and emphasises the shortcomings of individuals and their limited abilities in a world where there are almost unrealistic expectations of an individual.
Knowledge asymmetry is an evolution and improvement from information asymmetry to a more accurate and realistic concept of knowledge asymmetry. Although the concept of knowledge asymmetry is more complex, and will provide challenges to principals (engaging) in an inter-firm relationship, principals in inter-firm relationships should embrace it, since it provides a more effective instrument to prevent and curb agency problems.

1.2.6 THE PRACTICAL RELEVANCE OF KNOWLEDGE ASYMMETRY FOR THE PRINCIPAL

The principal has a simple goal in the contractual inter-firm relationship as stated previously, and that is to make sure that the product or service is delivered that was arranged for with the agent. This thesis is aimed at the management and control of the contractual relationship with the agent. Knowledge asymmetry in the post contractual state is therefore relevant given the context of this thesis[9].
Reducing information asymmetry as principal in the post contractual state is less of a challenge than reducing knowledge asymmetry, can be imagined. The principal has to anticipate these differences between information and knowledge in advance since reducing knowledge asymmetry is a more time consuming and costly, and most importantly uncertain process than reducing information asymmetry. The availability, time and price is not a certainty when it concerns information either, but compared to knowledge (and given its characteristics) reducing information asymmetry will be much easier in general.

That's why the evolution of information asymmetry to knowledge asymmetry is important for the principal that is (engaging) in a contractual inter-firm relationship. It will require a completely different approach for the management and control of a contractual inter-firm relationship, since the characteristics of knowledge are much more complex than those of information.

This question was stated in section 1.1.1 "*How can the principal achieve an optimal performance of the contractual inter-firm relationship?*"[10] Ouchi (1980, p. 130). In this chapter is argued that knowledge is a critical element in the management and control of a contractual inter-firm relationship. This did not answer the question however, in the next chapter this question will be attended to in more detail. The relation between knowledge asymmetry and the performance of the contractual inter-firm relationship will be the topic of that chapter.

[9] This statement does not undermine the value of knowledge, and the importance of knowledge asymmetry in the pre-contractual state.
[10] This question is posed in the context knowledge asymmetry and the management and control of an inter-firm relationship. Not how the management and control function exactly should be designed.

1.3 THE STRUCTURE OF THE THESIS

1.3.1 OBJECTIVE OF THE THESIS

The thesis has one single objective, to improve the effective monitoring and control of an inter-firm relationship, when regarding the agency theory. More specifically, in this thesis the concept of *knowledge asymmetry* will be explored, argued and practiced in order to prove this concept can reduce the *agency problems* and how it can reduce the *agency problems*.

It is therefore the objective of this thesis to add the concept of knowledge asymmetry in the agency theory to the current literature base and also to present a framework that will allow organisations themselves to develop a knowledge sourcing strategy that reduces the knowledge asymmetry with their inter-firm partners. At last it is the objective to inform and educate people about the necessity of the concept of knowledge asymmetry, its practical implications in an inter-firm relationship, and provide a test case to show the working of the framework.

1.3.2 RESEARCH QUESTION

The research question is a direct derivative of the objectives formulated in the previous sections. Based on those objectives the following research question is presented

"*How affects knowledge asymmetry the performance of a contractual inter-firm relationship, and how this newly gained knowledge can be put into organisational practice?*"

This question can be divided in several sub-questions, which will be answered during the course of this research. At first it is important to establish a ground base for the justification of the concept of knowledge asymmetry, which leads to the following question: "*Is knowledge asymmetry, in contrast to information asymmetry, a more effective concept in the agency theory to curb the agency problems?*" This question has already been answered positively in a previous paragraph. Consequently the success and the performance of the inter-firm relationship are of relevance, which relates to the following question: "*How is the concept of knowledge asymmetry related to the performance of an inter-firm relationship?*" The answer to this question shapes the theoretical base ground of the concept of knowledge asymmetry in an inter-firm relationship. It describes the relation and effect between knowledge asymmetry and inter-firm relationship performance. However, the practical implications for organisations in inter-firm relationships are not yet attended to, which will be with the following question: "*How can a principal in an inter-firm relationship reduce the knowledge asymmetry?*" To validate the practical use of the framework and demonstrate its attractiveness for organisations in inter-firm relationships, the framework will be applied in a test case. *"What is the most optimal knowledge sourcing strategy for the Ministry of Oil of Iraq?"*
The research strategy that is used to come to the answers on the presented questions will be described in the next section.

1.3.3 RESEARCH STRATEGY

Two separate approaches are applied for the first and second 'half' of the research. Considering the first two research questions, an inductive approach is applied. Specific elements of theories from authors will be taken in order to build on a more general theory of

knowledge asymmetry. In the second half of the thesis however, a deductive approach will be applied. How an organisation can reduce the knowledge asymmetry is operationalized in a framework, which is tested using a case study order to answer the last question. The strategies follow the shape of a diamond (from top to bottom). An inductive approach from specific theories (small) to a general theory is applied (wide), which is specified (small) using a deductive approach.

1.3.4 DELAMINATION

As described shortly in a previous paragraph, the agency theory is a complex concept that consists of a wide variety of definitions and is applied in many diverse situations. In order to assure the applicability of the thesis as general theory and specific framework, several decisions have been made to keep the thesis compact and to the point.
The unit of analysis is the (organisation of the) principal that experiences agency problems due to a knowledge asymmetry. This is placed in the context of a dyadic inter-firm relationship, however the characteristics of this relationship (such as cultural factors, contract type or form of relationship[11]) on the existence or reduction of knowledge asymmetry are not considered in this research. The context that is assumed however is a principal that is engaged in a contractual inter-firm relationship for a long term, complex and expensive product or service delivery. Such as service contracts that governments arrange with large international oil corporations.

[11] For example, joint venture or equity-based.

2 THE RELATION BETWEEN INTER-FIRM RELATIONSHIP PERFORMANCE AND KNOWLEDGE ASYMMETRY

2.1 A THREAT TO THE SUCCES AND PERFORMANCE OF AN INTER-FIRM RELATIONSHIP?

The concept of knowledge asymmetry was introduced in the previous chapter. What is the relevancy of that new insight for organisations that are in a contractual inter-firm relationship? The question of this chapter is therefore: "*How is the concept of knowledge asymmetry related to the performance of an inter-firm relationship?*" The search for this problem starts once again with the *agency problems*. Eisenhardt (1989) described that agency problems have a negative effect on the inter-firm relationship performance. Any behaviour of the agent that is not in the interest of the inter-firm relationship (or principal) will have a negative influence on the performance of the relationship as it does not attend to the agency goals. The *agency problems* can also be referred to as risk. According to Das and Teng (2001) risk can be defined as a variation (a distribution) in outcomes that is outside the scope of the contractual arrangement between the principal and the agent. A different perspective of risk is when it creates a danger or hazard (March and Shapira). This negative view on risk can be typed as downside risk[12]. These risks are related to unfavourable outcomes in the relationship (Das and Teng, 1996). Risks that pose a danger or hazard to the intern-firm relationship, a threat of very poor outcome (March and Shapira, 1987). This representation of risk is a comparable to the consequence of agency problems. Risk is critical in answering the question from the beginning of this section, as it is an element that influences the performance of an inter-firm relationship.

2.1.1 UNTANGLING RISK IN AN INTER-FIRM RELATIONSHIP CONTEXT

Two types of risk can be distinguished in strategic alliances (Das and Teng, 2001). 1) relational risk, the risk that that the agent won't be cooperating in good faith. The characteristics of relational risk are comparable to *moral hazard* and *adverse selection* of the agency theory, the *agency problems* (Eisenhardt, 1989). 2) Performance risk, the risk that despite satisfying cooperation among firms, the initial goals are not achieved. This is mainly due to external factors such as the economic climate, government politics or fluctuating customer demand. Das and Teng (2001) described both types of risk in the context of a strategic alliance, a specific type of an inter-firm relationship. According to Das and Teng (2001), relational risk is unique to inter-firm relationships, which is applicable to the contractual inter-firm relationships that this article researches. Performance risk is a fact for every business operation whether engaged in inter-firm relationship or not. This risk is therefore outside the scope of this research.

[12]Shapira researched the perception of managers on risk and revealed that managers are primarily concerned with downside risk. "Do you think of risk in terms of a distribution of all possible outcomes? Just the negative ones? Or just the positive ones?" Eighty percent of the executives said they considered the negative ones only. (as cited in March and Shapira, 1987, p. 1407)

2.1.2 RELATIONAL RISK, AGENCY PROBLEMS AND THE INTER-FIRM RELATIONSHIP

The risks that are limited to the (future) behaviour of either the principal or the agent in the inter-firm relationships are typed relational risk (Das and Teng, 1996). In a relationship, the agent may show opportunistic behaviour where the self-interest of the agent is pursued instead of the joint goals of the relationship (agency problems) (Das and Teng, 1996). Besides relational risk, an inter-firm relationship can also experience uncertainty between the parties (Van de Vrande et al., 2006).

The existence of risk creates uncertainty of the outcome, which threatens the performance of the inter-firm relationship. This thought is congruent with the *agency problems* from the agency theory. When the agent will show the expected and anticipated behaviour, the outcome becomes certain and therefore the performance of the inter-firm relationship. An accurate assessment of risk will increase the chance that the actual risks that the principal is exposed to will be revealed (Bostrom, 1997). Consequently it reduces the uncertainty of the outcomes as the risk is more accurately assessed. Hence a more accurate assessment of the relational risk will increase the performance of an inter-firm relationship. Relational risk is thus a critical component in the search for an answer on the question posed at the beginning of this chapter.

Proposition 1: *A more accurate assessment of relational risk decreases outcome uncertainties and therefore increases the performance of the inter-firm relationship.*

2.2 A FRAMEWORK TO MANAGE RELATIONAL RISK

Both trust and control can be used to manage risk in inter-firm contractual relationships (Schoorman et al., 2007). As Das and Teng (2001, p. 251) phrase these dependencies: "*..for effective alliance performance, partner firms need to manage this risk adequately by understanding the conjoint roles of trust and control.*" The combination of trust and control should manage the perceived relational risk of the principal. Since trust and control jointly have the ability to reduce the perceived probability of undesirable outcomes (Das & Teng, 2001). Of both instruments, trust is a passive instrument that is not invasive in the operations of the agent, no action of the principal is required to 'trust'. Control however is an active instrument that is invasive at the operations of the agent, directly influencing the actions and behaviour of the agent (Das and Teng, 2001)[13].

Both instruments can reduce the relational risk and therefore have an effect on the performance of an inter-firm relationship (figure 1). In the upcoming two sections, the effect of each of the instruments on risk is described in greater detail.

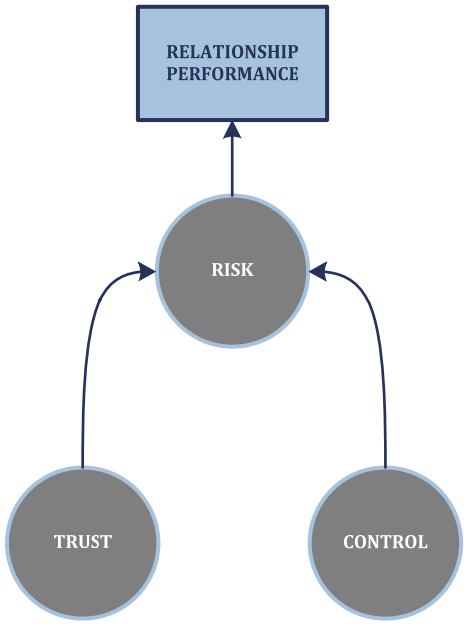

Figure 1: The connection between the trust and control to the performance of an inter-firm relationship through risk

2.2.1 THE EFFECT OF TRUST IN AN INTER-FIRM RELATIONSHIP

Trust is a natural counterpart of the *agency problems*. It encompasses a belief in the agent on the intention to perform his part of the contractual agreement, making the behaviour of the agent somewhat predictable (Lane and Bachman, 1996)[14]. A definition of trust is given by Mayer et al. (1995, p. 712) *"the willingness of a party to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party."* Mayer et al. (1995) interpreted the willingness to be vulnerable to the perceived actions of the

[13] Control can work counterproductive as mechanism as people, especially professionals do not appreciate it when they are continuously controlled by, for example their manager (Vermaak and Weggeman, 1999).
[14] Trust between two organisations instead of two individuals is referred to as inter-firm trust. Trust is perceived by the individual principal in the organisation of the agent (Zaheer et al., 1998).

agent can be explained as a willingness to take risk. Risk is thus an inherent element of trust, which is knowingly taken by the principal. The principal has a choice to trust the agent or refuse to do so (Nooteboom, 1996). The amount of risk taken is directly related to the amount of trust the principal has in the agent, the more trust a principal has in the agent, the more willing the principal is to take risk with that agent and vice versa (Mayer et al., 1995). In situations where the principal has a high level of trust in the agent, the principal has confidence in the performance of the relationship, despite any uncertainties. There is confidence that the agent has the ability to take care of any perceived and future risks willingly and with integrity.
Will the principal presumptively trust any agent in which the principal potentially engages in an inter-firm relationship? No, knowledge on the trustworthiness of an agent is a critical resource in this deliberation (Kramer, 1999).

Several authors have defined trust in a similar, though slightly different manner. Zaheer et al. (1998) define trust as 1) predictability, 2) reliability, and 3) fairness. Knowing what an agent will do, the consistency in doing it and how he will do it. Mayer et al. (1995) distinguish 1) integrity, 2) ability, and 3) Benevolence. Believing in the good intention of the actions of the agent, knowing what an agent can do and the fact that the agent is willing to do so. A smaller definition of trust is given by (Nooteboom, 1996) which distinguishes competence and goodwill trust. Competence trust reflects on the abilities of the agent, while goodwill trust reflects on the intentions of the agent.

The definition of Nooteboom (1996) is the best fit with the agency theory and more in specific the *agency problems* which are the main factor in this thesis. *Goodwill* and *competence trust* are the natural counterparts of moral hazard and adverse selection. According to Nooteboom (1996) *goodwill trust* encompasses the intention of the agent to perform according to the agreement, while moral hazard assumes moral or ethically unaccepted behaviour of the agent that is in conflict with the contractual agreement. *Competence trust* concerns the ability of the agent to perform the agreement, where adverse selection is concerned with the misrepresentation of the abilities of the agent.

Zaheer et al. (1998) distinguish between personal and inter-organisational trust, the latter relevant given the inter-firm focus of this article. They revealed that inter-firm trust has a positive effect on the performance of a relationship. Similar findings have been reported by Gulati and Nickerson (2008). Kramer's (1999) review on trust in organisational context supports the positive effect of trust on the relationship performance, they assign this positive influence to the presumptive characteristic of trust, this view is also supported by Das and Teng (2001). According to Zaheer et al. (1998) trust should be seen as a 'leap of faith'.

This section has revealed three aspects of trust that are relevant for this chapter. At first it is a natural counterpart of the agency problems and secondly it has a positive effect on the performance of an inter-firm relationship. Thirdly, it not only takes 'a leap of faith' to trust an agent, but also knowledge.

2.2.2 CONTROLLING THE BEHAVIOUR OF AN AGENT

Control mechanisms are used to manage an organisation towards its objectives Ouchi (1979). To influence the behaviour of people in such a way that it will lead to the achievement of the objectives (Flamholtz et al., 1985). A process that stipulates rules and directions, measures performance, and accordingly to the performance, rewards and punishes (Jensen and Meckling, 1992). The types of control mechanisms can be subdivided by distinguishing the source and the type of control.

The source of control can be either internal organisational or external market control (Walsh and Seward, 1990). Control that is originated from the principal is internal control, while external control is originated from an external source, such as the market.

A large number of articles on internal control mechanisms have been written and the authors distinguish mainly three types of control, commonly referred to by the following terms: 1) behaviour, 2) outcome, and 3) Clan (Ouchi, 1977; Eisenhardt, 1985; Das and Teng, 2001; Turner and Makhija, 2006).

- Behaviour control: *".. mechanisms that clearly specify the appropriate behaviors and processes in which employees must engage."* (Turner and Makhija, 2006, p. 207). This control is related to the programmability of a task. A simple task (e.g. work on an assembly line) is easily to prescribe, measure and evaluate. The behaviour of the agent can thus be easily directed, measured and evaluated (Eisenhardt, 1989). By describing the behaviour specifically, the outcome should be as desired. To prescribe the specific behaviour of the agent, knowledge on those behaviours and processes is necessary (Turner and Makhija, 2006).
- Outcome: *"Outcome controls are those mechanisms that focus on the outcomes of tasks or the specific outputs desired by the organization."* (Turner and Makhija, 2006, p. 203) When a task is more complex (e.g. managing an organisation) it is difficult to prescribe, measure and evaluate that behaviour. In that situation, the desired outcome is specified (e.g. increase the profit margin by 10% in a year), measured and evaluated after a year. Outcome control is most often used in conjunction with incentives which should align the goals of the agent with that of the principal and motivate the agent to achieve the targets as specified (Turner and Makhija, 2006).
- Clan: *"The informal socialization mechanism that take place in an organisation and that facilitate shared values, beliefs, and understandings among organizational members."* (Turner and Makhija, 2006, p. 210). When it is challenging to describe the desired behaviour or processes and the outcome is to complex or uncertain to specify, clan control can be used (Turner and Makhija, 2006). The social mechanisms in clan control should result in goal congruence and commitment, a social instrument to reach the specified goals.

There are two types of external control to distinguish: Market and third-party control such as a supervisor.

- Market: There are several points of view on market control. According to Ouchi (1980), the market acts as a transparent information system to determine the fair price for products and services. However, Klein and Leffler (1981) refer to market control as an information system on the performance of agent and their image in the market. The potential loss of future business is a critical element of market control in their view. Walsh and Seward (1990) regard market control as place of competition for (potentially) more efficient suppliers. Providing constant pressure for agent to deliver their product or service as efficient as possible.
  Market control however has limitations on its applicability. When the environment is uncertain or complex and there are a small amount of competitors, market control is not an effective mechanism (Williamson, 1973; Ouchi, 1980). Asset specificity is also a factor that limits effective market control (Williamson, 2002).
- Third-party: Ouchi (1980) refers to a third party to estimate a fair price for a product of service. Delegating the monitoring of an agent to a supervisor is a form of third-party control (Strausz, 1997). The third-party agent can deliver information that the principal needs to control his agent, or the principal can delegate the complete monitor and control function to a third-party agent.

Besides internal- and external control, a distinction between measure-based and value-based control can be made (Das and Teng, 2001). Measure-based control is aimed at establishing rules and regulations and procedures that have to be followed (Das and Teng, 2001). These can be evaluated and rewarded. Value-based control is aimed at creating common values, traditions and norms (ibid.).
Measure-based control can be viewed as a form of explicit control where the principal directly intervenes in the actions of the agent. Value-based control however is more a form of implicit control, where the principal controls the agent from a distant.
The dimensions of control, internal and external as well as value- and measure based can be mapped in a matrix. The types of control mentioned in the first part of this section can be placed according to their characteristics in two dimensions (see figure 2).

Figure 2: Types of control and the incurred risk based on (Jensen & Meckling, 1976; Ouchi, 1977; Eisenhardt, 1985; Das and Teng, 2001; Turner and Makhija, 2006)

These control mechanisms can be used in curbing the *agency problems* (relational risk). Each type of control is susceptible to a certain risk, relational, performance or a combination of both (Das and Teng, 2001). Figure 2 shows that both clan- and third party control incur relational risk. Clan control is more comparable to trust given the value-based characteristics Ouchi (1980). When third-party control is applied, an additional principal-agent relationship is created which should be monitored and can incur additional agency problems (Strausz, 1997). Both types of control are there for presumed ineffective in curbing *agency problems*. Control types that can be effective in curbing *agency problems* are process/outcome control and market control. Market control is not exposed to relational risk as there is not relationship. However, there are conditions where market control fails and as it is a form of value-based control, the effectiveness of the control is not guaranteed. The control is out of the 'hands' of the principal. The principal has to trust the operation of the market. As the business transactions underlying inter-firm relationships are often complex and uncertain, characteristics to which market control is not always applicable, the focus in this thesis will be at the process and outcome control, which the principal can directly influence.

As the objective is to reduce *relational risk* (and preferably performance risk) process or outcome control is the most effective control type. However, market control is effective given specific market characteristics, which should be carefully considered.

2.2.3 THE INTERDEPENDENCE BETWEEN TRUST AND CONTROL: YIN AND YANG IN AN INTER-FIRM RELATIONSHIP

For the satisfactory performance of a relationship, trust and control should be in balance and not conflict with each other (Das and Teng, 2001). When there is trust in a relationship, there is reduced need for control systems and vice versa (Hosmer, 1995; Poppo and Zenger, 2002; Gulati and Nickerson, 2008). The balance between control and trust can be represented by a

weighing scale. Increasing the control would decrease the trust and vice versa. A combination of trust and control that challenges the balance of the weighing scale would challenge the performance of the relationship. For example, a high level of control and high level of trust will create a contradicting signal to the agent (Poppo and Zenger, 2002). A high level of control suggests a low level of trust of the principal in the agent. In that situation the question would arise whether the principal trusts the agent, and at such a moment, the trust between the principal and the agent would already decrease.

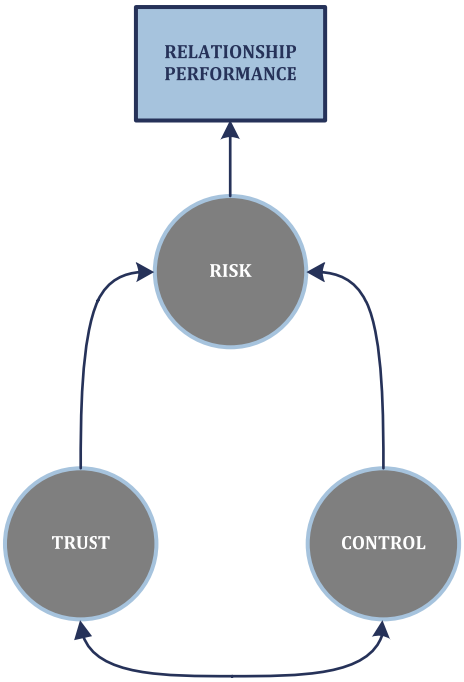

Figure 3: Control and trust to manage relational risk and inter-firm relationship performance, based on Das and Teng (2001)

Figure 3 shows a visual representation of chapter 2.2. It describes the relations between the inter-firm relationship performance, the risk that is induced in the inter-firm relationship and control and trust to manage the risk. It shows that trust and control are not two independent mechanisms, but are interdependent in their existence.

There is a critical distinction between trust and control however. Trust is an *ex ante* mechanism to manage risk, given the expectation of agent behaviour that is presumed (Hosmer, 1995). Control has *ex ante* and *ex post* mechanisms. The clan and market and behaviour mechanisms are *ex ante*, while the process and supervisor mechanisms is *ex post*. However, the existence of performance measurement can function as *ex-ante* control (Flamholtz et al., 1985). It is important to realise this distinction, as using only one of each control types (ex ante or ex post) exposes the principal to an increased amount of relational risk.

2.3 INCORPORATING KNOWLEDGE ASYMMETRY IN THE FRAMEWORK

The question was "*How is the concept of knowledge asymmetry related to the performance of an inter-firm relationship?*" Thus far is concluded that risk (and specifically relational risk or *agency problems*) affect the success and performance of the relationship. In the previous section is proven that both trust and control can *curb the agency problems*. One part of the initial question remains, which will be answered in the upcoming section. "*How is knowledge asymmetry connected to risk, trust, control and the performance of an inter-firm relationship?*"

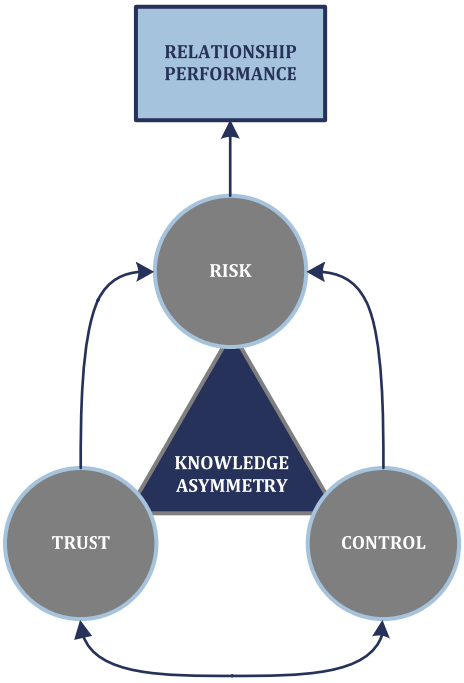

Figure 4: Knowledge asymmetry incorporated in the original model of Das and Teng (2001)

Figure 4 shows that knowledge asymmetry is connected to each of the elements of the original model. In the upcoming three sections will be argued how knowledge asymmetry directly affects risk, and how it affects risk through trust and control. It will result in an overview how knowledge asymmetry influences the performance of the contractual inter-firm relationship.

2.3.1 KNOWLEDGE ASYMMETRY AND RELATIONAL RISK

In the academic literature, sparse attention is given to the effect of knowledge on the perception of risk, it is more directed at the effect of knowledge at risk taking. However, at least three authors have published on the relation between knowledge and risk.

Leisch et al. (2011) reviewed the effect of knowledge on the perceived risk of organisations with international expansion aspirations. They argue that a lack of knowledge accentuates the perceptions of risk and uncertainty. Knowledge enables an organisation to assess risk more accurately and lowers the uncertainty (Leisch et al., 2011).

According to Wilson and Crouch (1987) knowledge is critical in illuminating and minimising risk more specifically, the experience element of knowledge. Application of the past experiences can be used in future assessments of risk. As knowledge improves, the

uncertainty as expression of the perceived risk will change (Wilson and Crouch, 1987). An increase in knowledge will allow for a more accurate assessment of the risk.

According to Wang (2011) people may overestimate risks due to a lack of knowledge. A lack of knowledge causes an inaccurate assessment of risk. In the article, Wang (2011) argues that self-perceived knowledge can cause overconfidence and an underestimation of risk. It is critical to consider the importance of factual knowledge in this context. Non-factual knowledge can lead to unexpected and unwanted outcomes as stated by Wang (2011).

Agency problems were defined as relational risk and it is assumed that the statements of the previous mentioned authors on risk are appropriate for relational risk. Knowledge will enable the principal to more accurately assess the potential *agency problems* that the principal is exposed to, according to the authors that are referred to. A decrease in knowledge asymmetry will allow the principal to more accurately assess the abilities of the agent and will give the principal a better insight in the operations of the agent. This will reduce the perceived uncertainty of the principal and will have a positive effect on the performance of the inter-firm relationship.

Proposition 2*: A decrease in knowledge asymmetry will allow the principal to more accurately assess the relational risk, reducing the uncertainties of the inter-firm relationship, and increasing the performance of the inter-firm relationship*

2.3.2 KNOWLEDGE ASYMMETRY AND CONTROL

Knowledge is a critical element of control mechanisms. As control mechanisms have "*inherent information processing properties*" according to Turner and Makhija (2006, p. 197) processing information is infeasible without knowledge, which in turn complements control (Jensen and Meckling, 1990). Knowledge can be related to both control mechanisms: process and behaviour (figure 5). The type of risk that the principal is exposed to is also incorporated in the figure. This creates a simple overview of the relation between knowledge, control mechanisms and risk.

The principal exposed to relational or performance risk according to Das and Teng (2001), when knowledge related to either the outcome or the behaviour is imperfect. There is no exposure to risk for the principal, only when knowledge on the outcomes and behaviour of the agent is perfect (Das and Teng, 2001).

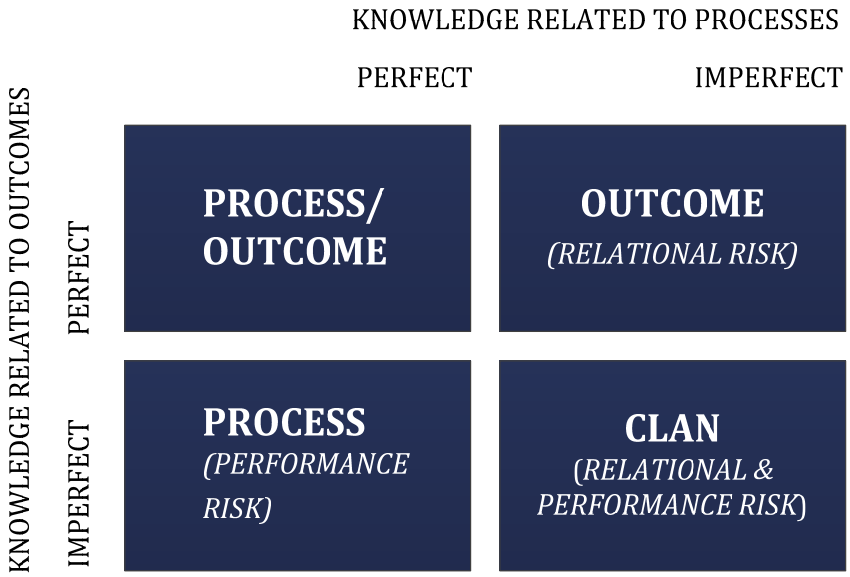

Figure 5: The relation between Knowledge, Control and Risk (Das & Teng, 2001; Turner & Makhija, 2006)

When the knowledge of the agent regarding his own behaviour and outcome is presumed perfect, approaching that knowledge level as principal reduces the perceived risk of the principal towards the behaviour of the agent. Reducing the knowledge asymmetry causes a reduction in perceived risk.

Proposition 3*: A decrease of knowledge asymmetry on either the process or outcomes reduces the related relational or performance risk.*

Proposition 4*: A decrease in knowledge asymmetry on both process and outcome reduces both relational and performance risk.*

2.3.3 KNOWLEDGE ASYMMETRY AND TRUST

A principal assesses the trustworthiness of an agent to determine whether the principal can trust the agent. Trust is after all essential for a stable relationship (Hosmer, 1995). Knowledge is a critical element in determining the trustworthiness of an agent (Sheppard and Tuchinsky, 1996). According to Schoorman (2007) information is processed, referred to as 'thinking' to determine the trustworthiness. This statement is supported by Hardin (2002, p. 13), *"knowledge to allow the trustor to trust"*. Hardin (2002) additionally argues that knowledge is developed in the light of everyday experiences. The trustworthiness of an agent can be determined in the light of relevant evidence (information) (Hardin, 2002; de Clerq and Dimov, 2008). That trustworthiness is assessed by using a set of complex attitudes is complemented by Hovland et al. (1952).
The elements of information, experience and attitude that are acknowledged in the assessment of the trustworthiness of an agent by the different authors confirm the importance of knowledge in the assessment of the trustworthiness of the agent by the principal.
Based on the arguments presented by the authors can be concluded that an increase in knowledge will allow for a more accurate assessment of the trustworthiness of the agent. In chapter 2.2.1 two types of trust were distinguished, goodwill and competence trust. It is

assumed that the effect of knowledge on trust as described previously will have a similar effect on the both types of trust (goodwill and competence).
The definition of trust by Mayer et al. (1995) referred to the expectation that the agent will perform a particular action that is important to the principal. The principal expects that the behaviour of the agent will be according to the contractual agreement. When the principal has knowledge on the actual behaviour of the agent, that expectation has become certain. This allows for an accurate assessment of the trustworthiness of the agent by the principal. This argument is graphically presented in figure 6. The smaller the knowledge asymmetry between the principal and the agent, the more accurate the principal can assess the trustworthiness (competence and goodwill) of the agent. This accurate assessment allows the principal to create an effective balance[15] between trust and control for an optimal performance of the inter-firm relationship from the principal's perspective.
A more accurate assessment of the trustworthiness of an agent has a more accurate assessment of the relational risk that the principal is exposed to as a consequence.

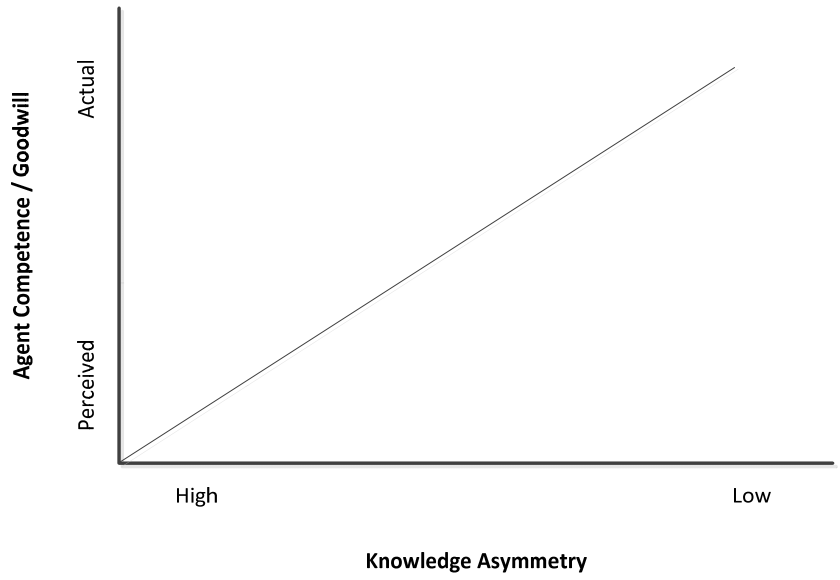

Figure 6: The effect of knowledge Asymmetry on the trustworthiness of an agent.

Based on the presented arguments the following propositions on the effect of knowledge asymmetry on trust can be created.

Proposition 5: *The smaller the knowledge asymmetry is between the principal and the agent, the more accurate the principal can assess the trustworthiness (goodwill and competence) of the agent.*

Proposition 6: *The more accurate the principal can assess the trustworthiness of the agent, the smaller is the relational risk that the principal is exposed to.*

[15] When the assessed trustworthiness of the agent is low, a choice for mainly control mechanisms can be made. However, when the trustworthiness of the agent is high, a choice to trust the agent can be made, if necessary with appropriate control mechanisms.

2.4 WHAT IS SUFFICIENT KNOWLEDGE IN AN INTER-FIRM RELATIONSHIP?

In this chapter, propositions describe that reducing the knowledge asymmetry between the principal and the agent has a positive effect on the performance of the inter-firm relationship. However, when is the asymmetry reduced to an effective level?

The principal needs a certain amount of knowledge to prevent and or curb agency problems in the contractual relationship with the agent. Most importantly knowledge on the product or service that is sourced from the agent. Tiwana and Keil (2007) describe organisations that maintain knowledge of their outsourced activities. Those organisations know more than they make. They refer to this phenomenon as peripheral knowledge (Tiwana and Keil, 2007). Peripheral knowledge is knowledge maintained within the organisation on outsourced activities. This is the type of knowledge that is referred to in this research in every occasion where knowledge is mentioned. Peripheral knowledge is important for parties that outsource activities. Peripheral knowledge enables the principal to design effective monitor and control systems (Tate et al., 2010). According to Jager (1994) as well as Milward and Provan (2000), are competent employees that monitor the contract critical to assure contract compliance and prevent *agency problems*. However, when an organisation increasingly outsources non-critical competences, less knowledge is likely to retain within the organisation (Milward and Provan, 2000). Organisations that outsource activities face this critical contradiction.

It is peripheral knowledge that is important in curbing *agency problems*. The amount of knowledge that would be effective to curb *agency problems* is however still unspecified. The principal needs sufficient knowledge to be able to take accurate decisions and appropriate actions according to the information gathered with the monitor and control systems, to curb the agency problems and 'guarantee' the performance of the contractual inter-firm relationship.
When does a principal have enough knowledge to be able to take appropriate actions? Hayek mentioned this problem already in an article in 1945. He accepts the fact that principal cannot have all relevant knowledge for the decision that is worldwide available (Jensen and Meckling, 1992; Hayek, 1945). Hayek (1945) saw the market mechanism and price system as solution to this problem. Mechanisms that reflect much knowledge in such a 'simple' construct as a price, without the necessity to have all knowledge that is reflected in the price. However, not all knowledge that is needed to take a decision can be expressed in prices. Not all situations that a principal can encounter could be solved by using price system to take decisions.

Knowledge has a price however, as well as the risk that the principal is exposed to by having too little knowledge. When the cost of the risk is lower than the cost of reducing the knowledge asymmetry between the buyer and the supplier it may be financially interesting to stay at current knowledge levels. An accurate assessment of risk is critical in such decisions, which is difficult and prone to mistakes. It is doubtful whether a trade-off between the cost of knowledge and the cost of risk is effective.

There is however one guideline that could be introduced in order for the principal to make progress in this quest. A principal should have enough (peripheral) knowledge to interpret the

information he acquires and gathers in such a way that he knows when some elements of the information need the attention of a more knowledgeable person on that subject before taking the decision. He must know for example that certain information is probably incorrect, but it not necessarily why it is incorrect. A more knowledgeable person can reveal that. This will ask for some knowledge (experience, skills and attitude) on the subject (peripheral knowledge).

2.5 KNOWLEDGE ASYMMETRY AND THE PERFORMANCE OF AN INTER-FIRM RELATIONSHIP

This chapter was started with the question: "*How does the concept of knowledge asymmetry influence the success and performance of an inter-firm relationship?*", which was answered in this chapter. It can be proposed that, based on the arguments in this chapter, that a reduction of the knowledge asymmetry between the principal and the agent has a positive influence on the performance of the inter-firm relationship.

In the first section the consequence of relational risk (agency problems) on the performance of an inter-firm relationship is argued. The existence of risk creates uncertainty for the principal and threatens the performance of the inter-firm relationship. Hence, curbing the risk is critical for the performance of an inter-firm relationship. This can be achieved with the use of trust and control. In the third paragraph of this chapter, the effect of knowledge asymmetry on trust and control, as well as risk is explored.

Reducing the knowledge asymmetry allows the principal to more accurately assess the *relational risk*. This reduces the uncertainty of the outcomes within the inter-firm relationship. Both trust and control can curb the relational risk that the principal is exposed to.
A principal is the least exposed to risk when a combination of process and behaviour *control* mechanisms is applied in the inter-firm relationship. A reduction in knowledge asymmetry on the processes and behaviour of the agent is necessary to apply these *control* mechanisms.
Trust is the other 'mechanism' that can be used to curb the relational risk. The principal can more accurately assess the trustworthiness of the agent, when the knowledge asymmetry between the principal and the agent is reduced. An accurate assessment of the trustworthiness of the agent decreases the relational risk that the principal is exposed to.

Concluding, risk creates uncertainty, which affects the performance of the inter-firm relationship. The concept of knowledge asymmetry allows for a more accurate assessment of risk. This risk can be curbed using control and trust as mechanisms, which has a positive influence on the performance of the inter-firm relationship. The concept of knowledge asymmetry increases the effectiveness of both mechanisms. It allows for a more accurate assessment of the trustworthiness of an agent and it enables the use of the control mechanisms that curb the relational risk. As according to Grant (1996, p. 119) "*the quality of a decision depends upon their being based on upon relevant knowledge.*"[16]
All of the given factors have a positive influence on the performance of the inter-firm relationship. To answer the question of this chapter, the concept of knowledge asymmetry has a positive influence on the performance of an inter-firm relationship. This is important assumption based on the propositions given the significantly increased rate of failure of inter-firm relationships (Das and Teng, 1999). These propositions are therefore a valuable addition to the current literature on inter-firm relationship performance.

[16] Inherently assuming that the assessment of trustworthiness of the agent and the execution of control mechanisms as a principal is a matter of taking decisions.

3 A KNOWLEDGE SOURCING STRATEGY

In the previous chapter, the effect of a decrease in knowledge asymmetry in an inter-firm relationship is argued. The question of this chapter is "*How can the principal in an inter-firm relationship reduce the knowledge asymmetry?*" In order to decrease the knowledge asymmetry, the principal has to increase his knowledge. In this chapter the possibilities for an organisation to acquire knowledge are researched. A framework that can be used to analyse the characteristics of the organisation is presented. Using this framework an organisation can formulate a knowledge sourcing strategy. This should lead to acquiring the necessary knowledge when executed.

3.1 DISTINGUISHING POSSIBLE KNOWLEDGE STRATEGIES

When creating a knowledge sourcing strategy, the first question should be "*What knowledge sourcing strategies can be distinguished?*" This question will be answered in the upcoming section.

Knowledge can be acquired using four strategies, depending on the source and the process of the knowledge acquisition. The source of knowledge can be inter-firm or intra-firm (Chen & Lin, 2004; de Clerq and Dimov, 2008), creating knowledge within your organisation using current resources or acquiring knowledge from outside the organisation. The process of knowledge acquisition is the second distinction. This distinction can be made on basis of the transaction theory. Williamson (2002) argues that every organisation can make a decision between 'make' or 'buy' for acquiring necessary resources, it can be internalised within the own organisation, or accessed from outside the organisation. Both of the described dimensions, the source and the process can be placed in a matrix. In the upcoming two sections each dimension will be introduced in more detail. Firstly the source dimension, and secondly the process dimension.

3.1.1 THE SOURCE OF KNOWLEDGE: INTRA-FIRM AND INTER-FIRM

The dimension 'source' states the origin of the knowledge, from within or outside the boundaries of the organisation. The distinction is the (legal) origin of the original knowledge that is tapped into by the organisation (principal). When the origin of the source of knowledge is found within the boundaries of the organisation, it is an intra-firm source. In situations where the origin of the knowledge is outside the boundaries of the organisation, it is an inter-firm knowledge source and acquired at a certain cost by the principal from the agent.

The internal accumulation of knowledge is an important driver for organisations to exploit external knowledge sources as well as new opportunities (de Clerq and Dimov, 2008). According to Casselman and Samson (2007) all required knowledge for an organisation is not necessarily found within the organisation, methods to transfer knowledge from external sources should therefore be developed. Inter-firm relationships can play an important role to 'access' and subsequently transfer this knowledge and are a determinant in the firm performance (de Clerq and Dimov, 2008). The mutual interaction between internal and external knowledge enhance each other (Clerq and Dimov, 2008).

3.1.2 THE PROCESS OF KNOWLEDGE ACQUISITION: ACCESS AND ABSORB

The second dimension 'process' describes how the knowledge is sourced, an access or absorb strategy (make or buy). March (1991) described the origin of both terms as *exploration* and *exploitation* in his article. The first referred to search, risk taking, innovation and the unknown, the latter referred to efficiency, refinement, execution and the known. *Exploration* in inter-firm relationships is a strategy to *internalise* the knowledge of the partner in the own organisation (Hamel, 1991). Merely using a partners current knowledge as a consumption good is referred to as *exploitation* (Hamel, 1991). Later authors have formulated these concepts as *accessing* knowledge from a partner and *learning* and mentioned *absorbing* in the same context (Grant & Baden-Fuller, 2004). *Absorbing* is the organisational capacity "*..to recognise the value of new, external information, assimilate it, and apply it to commercial ends..*" (Cohen & Levinthal, 1990, p. 128). *Accessing* is obtaining knowledge in cooperation with an organisation or a person to gain access to knowledge relevant to non-core capabilities (Grant & Baden-Fuller, 2004). As stated previously, *accessing* knowledge can be compared to using a consumable, after use it is thrown away and it can't be accessed for future use, except when it is purchased again. When *absorbing* knowledge however, it is internalised in the organisation, quickly available for repetitive use.

Defining the knowledge acquisition process in terms of *absorbing* and *accessing* are a better fit than exploitation, exploration, learning or internalisation. The term *absorbing* knowledge perfectly resembles the need to create knowledge on your own and that it cannot be explored or found easily somewhere. *Accessing* knowledge also exactly covers the purpose for this article, the need to acquire knowledge without the necessity to integrate it in the organisation.

3.1.3 DEVELOPING FOUR KNOWLEDGE SOURCING STRATEGIES

There are four possible answers to the question: *"What knowledge sourcing strategies can be distinguished?"*

When both dimensions from the previous section, are inserted in a matrix, four sourcing strategies can be distinguished: *grow, transfer, buy and hire* (figure 7). These four strategies are the answer to the posed question and will be introduced this section. As an introduction into this subject the strategies will be introduced using the synonym of a tree.

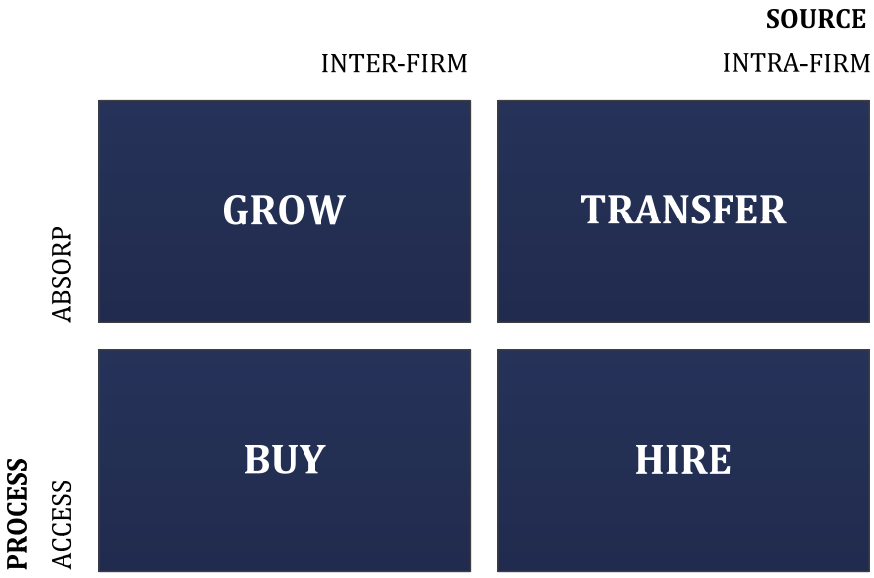

Figure 7: Knowledge Sourcing Strategies

grow: The *grow* strategy can be compared to the planting the seeds of an apple tree for the first time, carefully threating the growing three in the hope that once, the apples can be harvested (the knowledge). Once the tree is full-grown, the fruit can be harvested indefinitely until the tree is neglected and apples won't grow anymore. It is time consuming and the outcome is uncertain. Absorbing knowledge by education is also considered a growth strategy. It takes practice and trial and error to learn how to perfectly grow a tree.

transfer: Using this strategy a tree is grown with the help of an external party that is specialised in growing trees. Chances are that the tree will grow substantially faster and that the apples will be larger and more succulent. The most difficult of this strategy is to make the knowledge of the external party your own such that in the (near) future you will be able to grow and take care of your own tree. When the strategy is successful, for indefinite years the fruits of the tree will be reaped.

buy: When applying the buy strategy, an apple tree is bought from a nursery on the bases of an indefinite contract. The tree won't be owned, but the apples will be. As long as is paid for the tree, the apples may be reaped for organisational use. The knowledge for growing or taking care of a tree is not mastered. As soon as the 'contract' with the nursery is terminated, the organisation won't have access to new apples anymore.

hire: The *hire* strategy encompasses the rent of a certain amount of apples from a tree. Once the 'contract' ends, the supply of new apples is stopped.

The knowledge can be sourced from many ‘identities’. It can be sourced from individual employees or organisations, they can be hired or bought or they are a result of co-operating organisations. Which ‘identity’ actually is chosen in the end is not important during the strategy formulation, it is more a question for in the execution phase, and therefore not a topic in this paper.

It is important to notice that there is no best strategy. Each of the four presented strategies has its advantages and disadvantages in specific circumstances. However, according to Casselman and Samson (2007, p. 70) "*A firm's ability to identify, absorp and utilize knowledge is critical to its strategic success*". This quotation indicates why there is no best strategy and that a combination of strategies, can be the most optimal strategy.
In the upcoming chapters, at first the different strategies will be explained in more detail and their specific characteristics will be described. A framework with criteria will be developed that describes the most optimal organisational circumstances for each of the four strategies. Also a description how a knowledge sourcing strategy can be developed will be presented, which also will go into how sourcing strategies can complement each other.

3.1.4 THE GROW, TRANSFER, BUY, AND HIRE STRAGEGIES IN DETAIL

In the previous section, the four strategies are presented using a comparison with a tree. In this section the four strategies will be described in a serious matter, especially the differences between each of the strategies will be explained. At first the two absorption strategies will be attended to, after which the two access strategies will be described.

The *growth* strategy focuses at the internal creation or learning of knowledge. The internal research and development within an organisation is a good example of a growth strategy. The *growth* strategy is based on the independent functioning of learning within the organisation and without any knowledge from external sources. An example could be a pharmaceutical organisation that develops a new medicine. This development is the core competence of such an organisation and they are highly dependent on the future commercialisation of that medicine as return on their investments and future turnover. As such, the knowledge that is created during the R&D process is sensitive and protected. Co-operations with other organisations to share knowledge are therefore less likely. The result of this process is uncertain and costly (von Krogh et al., 2001).

As products and services become more complex and the environment is increasing its pace, everything has to be done quicker and should be ready sooner, many organisations are not able to *grow* the necessary knowledge for their products on their own and keep with the industry pace. An example is Kodak that engaged in multiple alliances to realise the first digital camera (Grant & Baden-Fuller, 2004). They allied with Motorola for manufacturing expertise of CMOS sensors, and Intel for data storage knowledge. The *transfer* of knowledge is often seen in one of the many forms of alliances, where both organisations can reap the fruits of the knowledge that is created in the alliance. Opposed to the *growth* strategy, when applying the *transfer* strategy, the sourcing organisation also should be open to transfer knowledge to their partner in 'return'. Using the *transfer* strategy is however not without risk, as the failure rate is high (Lam, 1997). Transferring tacit knowledge a challenge, for example due to societal barriers between firms (Lam, 1997).

The application of the *buy* strategy comprehends directly accessing or acquiring the knowledge source. An organisation can contractually bind an employee that possesses the necessary knowledge (e.g. recruit an employee from a competitor). The knowledge will then be 'legally' bound to the organisation. Another possibility is buying a complete organisation

that has the necessary knowledge. The first situation is seen with American organisations that contract locals in foreign countries to acquire local knowledge (Almeida, 1996). A second example is Microsoft that acquired Skype in 2011. With this acquisition they not only accessed knowledge on communicating technologies, but also knowledge on their customers which that can integrate in their current operations (Financial Times, 2011). As soon as the knowledge becomes redundant the sourcing organisation can terminate the contractual arrangement (in the case of an employee) or divest its stake in acquired organisations. After this, none of the knowledge is left in organisation.

The *hire* strategy is comparable to the *buy* strategy. However, the contractual relation is only limited in duration and the sourcing organisation won't gain ownership of the knowledge. It is only temporarily sourced and occasionally needed. An example is International Power, an energy provider that *hired* McKinsey to advice on its strategy for a possible merger with GDF Suez (Financial Times, 2010). Mergers are for most organisations occasional events that are not in the domain of the core competence. Keeping up knowledge on such transactions is difficult, if only due to their irregular appearance that does not allow to built-up experience and skills. Temporarily hiring professionals is a solution to access the necessary knowledge for such occasional activities.

In this section the four possible knowledge sourcing strategies have been introduced. These can be applied in a variety of circumstances and situations as is partly introduced by the examples which are cited in the previous sections. It thereby answers the question: "*What knowledge sourcing strategies can be distinguished?*" The groundwork is in place for the next section, that analysis which strategy is the most optimal to source knowledge given a set of organisational characteristics.

3.3 SELECTING A KNOWLEDGE SOURCING STRATEGY

The possible strategies to source knowledge were introduced in the previous section. The question now remains: *"How to select an appropriate knowledge sourcing strategy for an organisation?"* This section will provide an answer to that question. It will show that it is possible to select the most appropriate knowledge sourcing strategy based on organisation and knowledge specific characteristics.
These characteristics are introduced at first in the next section (3.3.1). The second part (3.3.2) describes the most optimal values of each characteristic given each of the four strategies. Based on the analysis of the organisational and knowledge characteristics an optimal strategy can be developed, which will be described in the third part (3.4).

3.3.1 CHARACTERISTICS THAT EFFECT THE KNOWLEDGE SOURCING STRATEGY

In this section four organisational and four knowledge characteristics are distinguished that are relevant to select an appropriate knowledge sourcing strategy. Organisation specific characteristics are 1) *absorptive* capacity, 2) *human resource* capacity, 3) *financial* capacity, and 4) *risk attitude*. Knowledge specific characteristics are 1) *core competence*, 2) knowledge *availability*, 3) *time to* knowledge, and 4) knowledge *time-span*.

Each characteristic will be introduced and explained in two separate sections and an argumentation for the applicability of each characteristic will be given.

3.3.1.1 ORGANISATION SPECIFIC CHARACTERISTICS

Absorptive capacity describes an organisation capability to absorb and utilise new knowledge. Cohen and Levinthal (1990, p. 128) defined *absorptive capacity* as followed: *"An ability to recognise the value of new information, assimilate it, and apply it to commercial ends. These abilities collectively constitute what we call a firm's 'absorptive capacity."* Absorptive capacity can be defined as a core competence. It can't be bought or quickly be integrated into an organisation by hiring external employees, it's highly firm specific and developing and maintaining absorptive capacity is a lengthy and time consuming process (Cohen & Levinthal, 1990). The *absorptive capacity* of an organisation is a competence and defines the capabilities of an organisation. *Absorptive capacity* is crucial to transfer knowledge outside as well as within the organisation (Hamel, 1991; Bierly and Chakrabarti, 1996; Cassiman and Veugelers, 1999; Berends et al, 2003).
To be able to recognise and evaluate the *absorptive capacity,* an organisation ironically needs some level of *absorptive capacity* (Cohen and Levinthal, 1990). If you don't know it, you can't see it.
However, several organisational factors can be analysed, at first the current *knowledge base* of the organisation. Prior knowledge will increase the ability to absorb new knowledge (Cohen and Levinthal, 1990). Secondly, the *knowledge gap* between the current knowledge base and the expected future knowledge base. When the gap is too large, learning from external sources is less likely (Hamel, 1991). This is also true for internal learning, as stated previously, building absorptive capacity is a long term process and instantly moving to a higher level is unlikely. At last the *routines*, *direction*, *internal and external linkages*. These comprise the organisational structure that can have a positive or negative affect on the *absorptive capacity* of an organisation.

Routines are described as complex mechanisms of co-ordination that allows professionals to integrate their knowledge in a product or service (Grant and Baden-Fuller, 2004). *Direction* provides an efficient method of communications between professionals of different fields of expertise (Grant and Baden-Fuller, 2004). *Routines* and *direction* combined determine the ability for knowledge to 'flow' throughout an organisation between different people and expertise.
The *internal and external linkages* are an indicator of the effectiveness of these *routines* and *directions*. Combining different streams of knowledge from inside and outside the organisation is crucial for the knowledge integration in an organisation (Bierly and Chakrabarti, 1996; de Clerq and Dimov, 2008). It is a key element of *absorptive capacity*.

The *human resource capacity* is available employee resources that can be committed to knowledge absorption processes. A surplus in capacity will allow an organisation to commit resources to new knowledge absorption, while organisations that are understaffed in their human resources are less likely to be susceptible to absorb new knowledge (Hamel, 1991).

In addition to the human resource and absorptive capacity, the *financial capacity* of an organisation is a relevant characteristic in a knowledge sourcing strategy. The availability of financial means, or the lack of those means may create opportunities or limit them. For example, internal R&D is not only time consuming and lengthy process, it also has high costs (Bierly and Chakrabarti, 1996).

The *Risk attitude* of an organisation is important regarding the choice for a sourcing strategy. Some sources are more susceptible to risk than others. In the case of internal R&D, the outcome of the process is highly uncertain (Cassiman and Veugelers, 1999). For basic research, the future commercial use is even more uncertain. Buying mature knowledge from an external organisation (e.g. in the form of outsourcing) is less susceptible to risk. The choice for a sourcing strategy should therefore be congruent with the risk profile of the organisation.

3.3.1.2 KNOWLEDGE SPECIFIC CHARACTERISTCS

Prahalad and Hamel (1990, p. 4) describe the *core competence* of an organisation: *"Core competencies are the collective learning in the organisation, especially how to coordinate diverse production skills and integrate multiple streams of technologies."* This definition show great resemblance with that of *absorptive capacity.* However the factor of *core competence* in this article focuses at what the core competence of an organisation is, while *absorptive capacity* is focused as the capacity of an organisation to absorb new knowledge. Many organisations focus at core competences and outsource non-core activities (Grant and Baden-Fuller, 2004). Whether knowledge is sourced for a core competence of non-core competences will affect the strategy. It is likely that non-core competences are bought or hired, for example strategy consulting or M&A are often hired to provide the necessary knowledge.

The *availability of knowledge* has a critical role in the outsource decision. Deciding to source knowledge from an external source is pointless when the knowledge is not available to your organisation. Four factors determine the availability of knowledge, 1) *Protection*, 2) *Maturity*, 3) *Type*, and 4) *Specificity*.

When knowledge is *protected,* by for example patents or secrecy, the availability of knowledge is negatively influenced. Freely available knowledge, such as open-source projects however positively affect the availability of knowledge.
The *maturity* of knowledge positively influences the *availability* of knowledge. The more mature knowledge becomes, the higher the chance that the knowledge has spread outside of the boundaries of the organisation that created the knowledge. As most (tacit) knowledge resides within employees, over time all knowledge will leak (Kishore et al., 2004), and become available due to the reemployment of former employees or their engagement in professional networks.
The *type* of knowledge is an important factor in the availability of knowledge. In an earlier section a distinction between *tacit* and *explicit* knowledge is made. *Explicit* knowledge is due to the fact that it is highly codifiable, easily transferable between individuals (Turner and Makhija, 2006). *Tacit* knowledge however is marginally codifiable and consequently less easily transferable (Turner and Makhija, 2006). Grant and Baden-Fuller (2004) even doubt that *tacit* knowledge is transferable from an external partner. *Tacit* knowledge is therefore less likely available than *explicit* knowledge.

The last factor that determines the *availability* of knowledge is the *specificity* of knowledge. (Subramani and Venkatraman, 2003) describe domain knowledge specificity, which is knowledge that is difficult to transfer and limited useable in different contexts. They describe this in the context of inter-firm relationships, while this article is written from a single organisation perspective. However their description of (domain) *knowledge specificity* is appropriate in that context. When knowledge is context, organisation and competence specific, the chance that it can be absorbed or accessed from an external source is highly unlikely. The *knowledge specificity* factor determines the possibility for the organisation to find the necessary knowledge in an external organisation.

Time to knowledge describes the time-span in which the knowledge is needed by the organisation. A grow or transfer strategy are slow strategies that take time and effort to accomplish, as stated previously. Hiring experienced employees for example in contrast can be accomplished in a much smaller time-span than educating new and young employees (Mason et al., 2004).

It is not only important to determine in which time the knowledge needs to be sourced, also the amount of time the knowledge is needed by the organisation is important to determine the appropriate knowledge sourcing strategy. Howell et al. (2003) have connected different types of relationships to the long, medium or short term of a relationship. Differences in time-span that a knowledge domain is needed, requires a specific strategy.

Eight organisation characteristics have been introduced in this section. In the upcoming section, the values of the characteristics for each specific knowledge sourcing strategy will be defined. Based on the framework that will be created an answer to the initial question, *"How to select an appropriate knowledge sourcing strategy for an organisation?"* can be given.

3.3.2 MATCHING VALUES OF THE ORGANISATION CHARACTERISTICS TO EACH KNOWLEDGE SOURCING STRATEGY

The organisational characteristics that are presented in the previous section are placed in one framework against the four knowledge sourcing strategies. In this section the value for each organisational characteristic will be argued given each of the four knowledge sourcing strategies. This section will answer the question *"How to select an appropriate knowledge sourcing strategy for an organisation?"* as the most optimal knowledge sourcing strategy can be based on the organisational characteristics defined in this section. At first the table is presented that shows all values for the organisation characteristics and the knowledge sourcing strategies, which will be explained in more detail in the sections that follow after the table (table 2).

Knowledge Sourcing Strategy Framework					
		GROW	**TRANSFER**	**BUY**	**HIRE**
Organisational Characteristics	**Absorptive capacity**	Medium	High	Low	Low
	Human resource capacity	Overstaffed	Overstaffed	Understaffed	Understaffed
	Financial capacity	High	High	Medium	Low
	Risk attitude	Risk seeking	Risk seeking	Risk averse	Risk averse
Knowledge Characteristics	**Core competence**	Core	Core	Neutral	Non-core
	Knowledge availability	Low	Medium	High	High
	Time to knowledge	Long	Long	Medium	Short
	Knowledge time-span	Long-term	Long-term	Mid-term	Short-term

Table 2: Knowledge sourcing strategy analysis criteria

3.3.2.1 THE FRAMEWORK VALUES OF ORGANISATION SPECIFIC CHARACTERISTICS

There are three possible values of *absorptive capacity*, low, average or high. When the organisation has low absorptive capacity, an *access* strategy is the best fit. These are the only strategies that can be applied when the absorptive capacity is low as the organisation has no capacity to absorb knowledge. For a *transfer* strategy, high absorptive capacity is necessary. An organisation needs to excel at internal learning before knowledge of external sources can be successfully absorbed (Bierly and Chakrabarti, 1996). It will allow the organisation to profit more from the external sources (Cassiman and Veugelers, 1999; Hamel, 1991).
In case of the *growth* strategy, average absorptive capacity is required. A small amount of knowledge is always necessary when learning new knowledge (Cohen and Levinthal, 1990).

For an absorptive strategy, a surplus in *human resource* capacity is necessary to create time for learning. There are two possible values for the *human resource* capacity, overstaffed and understaffed. When an organisation is understaffed it will be too much occupied with operational activities. Learning, in such an organisation that has a lack of capacity, is not a priority (Hamel, 1991). In situations, where an organisation has little to none (surplus) human resources a *buy* or *hire* strategy is the best fit. The knowledge is acquired without the need for additional human resources and the organisation won't be further burdened with additional work load. Sufficient human resources create capacity for a *grow* or *transfer* strategy.

The *financial* capacity characteristic knows three values, high, medium and low.
A *growth* strategy has high costs (Bierly and Chakrabarti, 1996). Grant and Baden-Fuller (2004) state that the cost of replicating knowledge (*transfer* strategy) is lower than the cost of creating knowledge (*growth* strategy). However, to be able to replicate knowledge, an organisation has to invest in absorptive capacity, only after that the knowledge can be replicated. Organisations can profit from the knowledge of an external source (Cassiman and Veugelers, 1999) creating a financial advantage to reach a similar knowledge level in comparison to a pure *growth* strategy. A *growth* and *transfer* strategy are therefore rated high.

The distinction of the cost between *buying* or *hiring* knowledge is highly time dependent, since hiring has lower cost for a short time-span, where buying would have lower cost on a longer time-span. This distinction should be acknowledged in the analysis of the framework. However to determine a value, the following argumentation is followed. *Hiring* knowledge would allow for more flexibility (also legally) and is therefore deemed more appropriate in situations of low financial capacity. Since a *buy* strategy would commit an organisation to a contract, a larger financial capacity is deemed appropriate. A *buy* strategy is therefore valued medium.

The *risk attitude* characteristic has two values, risk seeking and risk averse.
When applying a *growth* and *transfer* strategy, the future outcomes are uncertain and there is a risk that the original goals will never be reached (Cassiman and Veugelers, 1999), especially regarding the sunk costs that are involved with this strategy. These strategies are therefore risk seeking. Organisations that are risk averse should consider a *buy* or *hire* strategy. The knowledge is in these situations developed and ready to be acquired. There are also less sunk costs and these strategies can be altered with less consequences than a grow or transfer strategy.

3.3.2.2 THE FRAMEWORK VALUES OF KNOWLEDGE SPECIFIC CHARACTERISTICS

The *core competence* characteristic has three values, core, neutral and non-core.
An *intra-firm* strategy will allow an organisation to develop its own core competences (Bierly and Chakrabarti, 1996). When these core competences are established, it will allow the organisation to better understand the *tacit* knowledge of external organisation, for example when using a *transfer* strategy. For the development of core competences, a *growth* strategy is the most suitable. Using this strategy, an in-depth understanding of the knowledge is created. The knowledge is internalised and can be more easily integrated within (other parts of) the organisation.

In case of non-core competences, a *hire* strategy is a fit. Using this approach, the organisation resources can be focused at the core competences, while at the same time creating flexibility for the organisation to access knowledge when necessary.
When an organisation wants to extend or renew its core competences or access a broader knowledge base, a *transfer* strategy is suitable (Bierly and Chakrabarti, 1996). New sources of knowledge can be found that enhance and broaden the knowledge base. The core competences, using this strategy, can be brought to a higher level which would not have been able without this external knowledge. Before this strategy can be applied, the organisation needs to have enough absorptive capacity to absorb the transferred knowledge, for the strategy to be effective.
In the situation where the organisations want to internalise its non-core competences or at least have them at a closer distance to the organisation, a *buy* strategy is the best fit. For competences that are close to core competences, this strategy creates more certainty compared to the *hire* strategy and is therefore mapped to the 'neutral' value.

The *knowledge availability* characteristic has three values, low, medium, and high.
The knowledge *type*, explicit or tacit determines the transferability of the knowledge. Tacit knowledge is difficult or even impossible to acquire from an external partner (Grant and Baden-Fuller, 2004). Even when an employee is acquired with the needed knowledge, internalising this knowledge is a lengthy and time consuming process (Cohen and Levinthal, 1990). Explicit knowledge however is due to its nature more easily to successfully transfer (Bierly and Chakrabarti, 1996). In case of explicit knowledge, a *buy*, *hire*, or *transfer* strategy is applicable. A grow strategy is most appropriate in case of tacit knowledge.

The *Maturity* of the knowledge determines the likeliness of the sharing of knowledge by external organisations (Cohen and Levinthal, 1990). The more advanced or innovative knowledge is, the less likely organisations are to share that knowledge, for competitive reasons. New knowledge is therefore more associated with a *grow* strategy, although *transfer* strategies are also used in new product development for example and therefore also applicable in this situation. Mature knowledge is associated with a *buy*, *hire*, or *transfer* strategy.

The *Protection* of knowledge is a barrier for the acquisition of knowledge. External organisations that have carefully protected their knowledge are less likely to share this knowledge (Cassiman and Veugelers, 1999). When knowledge is well protected a *grow* strategy is the only viable course of action. When knowledge is less protected a *transfer* strategy is suitable and knowledge that is not protected, a *buy* or *hire* strategy is a best fit.

The *Specificity* of knowledge significantly determines the availability of knowledge. When the needed knowledge for an organisation is very specific to their operations, it is possible not available from external organisations. The knowledge would need to be grown internally in such specific situations. When the knowledge is not specific to the organisation, a *buy*, *hire* or *transfer* strategy should be chosen.

These factors combined determine the absorptive capacity of an organisation. Evaluation of each of these factors is necessary and after carefully weighing each individual factor a conclusive indication of the organisations absorptive capacity should be presented. For an

organisation to be able to learn, absorptive capacity is necessary, and it is something that can't be bought from an external organisation (Bierly and Chakrabarti, 1996). To be able to transfer knowledge from external sources, an organisation should even excel in absorptive capacity (Bierly and Chakrabarti, 1996). For a *transfer* strategy, more absorptive capacity is necessary than a *growth* strategy. A transfer strategy is consequently valued high, and a grow strategy medium.
Considering both *buy* and *hire* strategies, no absorptive capacity is necessary as the intention is to only access the knowledge and not to absorb it. The value for both strategies is therefore low.

Time to knowledge has three values, slow, medium and fast.
Recruiting experienced employees minimises the time compared to training new, young and inexperienced employees, according to Mason et al. (2004). The recruitment and training of employees can be compared to the *buy* and *grow* strategy of the knowledge sourcing framework. Based on Mason et al. (2004) can be stated that a *buy* strategy will have a lower time to knowledge than a *grow* strategy. In addition can be stated that a *hire* strategy will have at least the same time to knowledge but it will probably be lower. Hiring a company is a decision take is taken faster than buying a company and therefor is result earlier expected. A *transfer* strategy will be have a slower time to knowledge than a *buy* strategy given the characteristics that were previously mentioned. However it is deemed fast than a *grow* strategy, although a *transfer* strategy can take much time and effort, it is expected that the time to knowledge is lower than a grow strategy as the knowledge is already available at an external source.

The *knowledge time-span* characteristic has three value, short-term, mid-term and long-term. Howells et al. (2003) have mapped several relationship types to the duration of a relationship. Their work can be used to assign values for this criterion to each strategy. Joint ventures and informal knowledge sharing are seen in long-term relationships (Howells et al., 2003). According to Lee et al. (2010) joint ventures are often seen in relationships where knowledge is transferred. The *transfer* strategy is there for linked to the long term knowledge time-span. An equity stake and relational contract is mapped by Howells et al. (2003) to mid-term relationships. An equity stake is in this paper linked seen as similar to the *buy* strategy since a part (or the whole) organisation is acquired. The *buy* strategy is there for linked to the mid-term knowledge time-span. A connection to the *growth* strategy can't be found in Howells et al. (2003) as they focus at relationships. However, a *growth* strategy can be linked to a long knowledge time-span similar to the transfer, as a *growth* strategy is strongly related to the organisational strategy and the core competences of the organisation. Both are aimed at the long term development of an organisation.

3.3.3 SELECTING A KNOWLEDGE SOURCING STRATEGY BASED ON THE OUTCOME OF THE FRAMEWORK

Once an organisation is analysed and a value for each characteristic is determined for a specific organisation, a conclusive strategy has to be chosen. There is however a probability that the values of the organisation specific characteristics do not match with the values of the knowledge specific characteristics. For example, an organisation values certain knowledge as

a future core competence. This would suggest a grow or transfer strategy. This is only not a match when the absorptive capacity value would be low, or when the organisation is understaffed.

There are two possible solutions to this mismatch. Either to organisation specific characteristics are adapted to match the knowledge specific characteristics or the knowledge specific characteristics are adapted to match the knowledge specific characteristics. Although both options are valid, in consideration of the subject of this thesis and the goal of this chapter, it is preferred to match the organisation specific characteristics to the knowledge specific characteristics.

In the next section will be described that both the organisation specific and the knowledge specific characteristics are dependent.

It should be explicitly stated that there are no exact guidelines that assist in the interpretation of the framework. Every characteristic is relevant and important and whether a characteristic should have a certain weight compared to the other characteristics can only be determined by an organisation itself. Common sense and a well-developed knowledge on the organisation are two elements that can assist in this decision, these elements however can't be described in this thesis. The knowledge sourcing framework is therefore not a decisive tool and answer to the initial question at the start of this section, it can only assist in the decision to be made.

3.3.4 CONCLUSION

At the beginning of this section, the question *"How to select an appropriate knowledge sourcing strategy for an organisation?"* was asked. The previous sections have answered this question. Eight organisational characteristics were introduced and values were defined that are matched to each of the four knowledge sourcing strategies. When the organisational characteristics, as presented in the framework, will be analysed a decision on the knowledge sourcing strategy can be made with the assistance of the framework.

When developing a knowledge sourcing strategy, analysing the organisation and knowledge specific characteristics, with the assistance of the framework is not the first step that should be taken. What the first step is in developing a knowledge sourcing strategy will be described in the next section.

3.4 DEVELOPING THE KNOWLEDGE SOURCING STRATEGY

The framework established in the previous section is a tool to support the selection of knowledge sourcing strategies. It is however not the first step in developing the knowledge sourcing strategy. This can be illustrated with a figure (8) of Zack (2006) that connects the strategy of an organisation to the knowledge of an organisation.

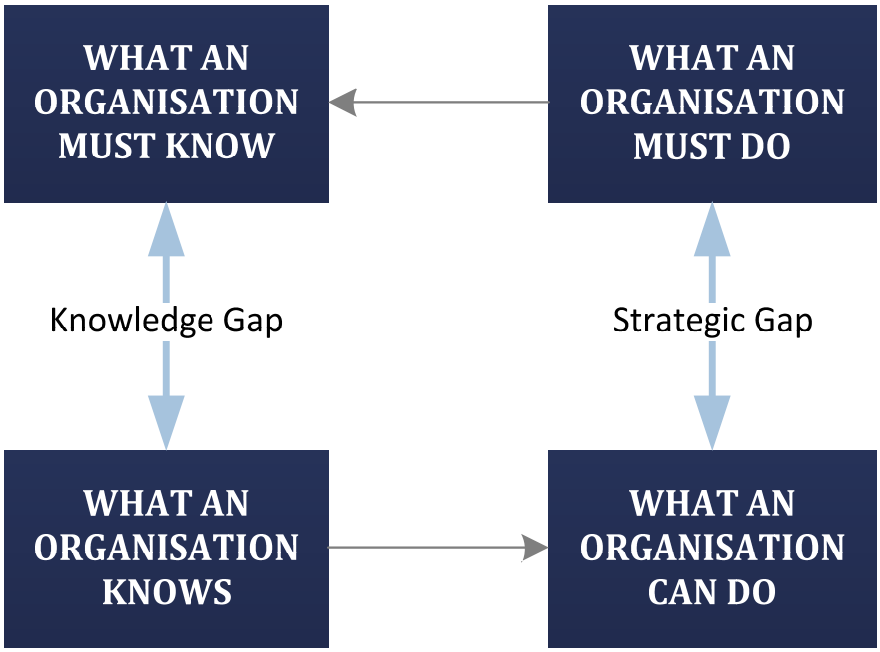

Figure 8: The relation between the strategy and knowledge (Zack, 2006)

The organisational strategy determines the future of an organisation, its goals and activities. As Zack (2006) formulates it, it states what an organisation must do in the (near) future. However, in order to execute that organisational strategy, knowledge is necessary. An organisation can only do what it knows. Since an organisation may not have all knowledge that it must know, there can exist a gap between what an organisation must know and currently knows. This is the knowledge gap as defined by Zack (2006). A knowledge gap will undoubtedly have a strategic gap as a consequence and vice versa, they are both interconnected.

The question in this section is "*How to develop an appropriate knowledge sourcing strategy for an organisation?*" It requires identifying the knowledge needs of an organisation based on its strategy, evaluating the knowledge gap's that exist and at last selecting an appropriate knowledge sourcing strategy that will reduce the evaluated knowledge gaps. This knowledge sourcing strategy will have an effect on the organisational strategy, since they are interconnected. As discussed in the previous section (3.3.3), the organisational specific characteristics should match the knowledge sourcing strategy, based on the knowledge specific characteristics. The organisational strategy will require an organisation to adapt its absorptive, financial and human resource capacity to match the knowledge sourcing strategy, and thereby adapting the organisational strategy to fit the knowledge sourcing strategy.

This section will not describe how to create an organisational strategy. It is a topic that is widely covered in the academic literature. It will be assumed however that an organisation has

formulated a strategy and consequently can indicate what the organisation should know in order to execute the strategy.
This section will describe the following three phases of the development of a knowledge sourcing strategy. At first the phase in which the knowledge domains will be derived from the organisational strategy. Secondly the knowledge gap will be evaluated, and thirdly how a knowledge sourcing strategy can be developed.

3.4.1 WHAT AN ORGANISATION MUST KNOW

Based on the strategy of an organisation, what it must do, it can be determined what an organisation must know (Zack, 2006). It would be however inefficient to determine what an organisation must know in every detail. A strategy is also not written in such detail. Knowledge domains are therefor used in this thesis. A knowledge domain comprises of knowledge that is closely related to each other and is therefore grouped in one domain (Anand et al., 1998; von Korgh et al., 2001; Casselman and Samson, 2007), for example knowledge on a specific activity or on a geographical location. Examples of a knowledge domain can be writing an academic article, or knowledge on the Asian culture.

There are three reasons why it is important to determine specific knowledge domains. Firstly, the criteria of the knowledge sourcing framework are knowledge domain bound. The values of knowledge specific characteristics will vary for each specific knowledge domain. For an accurate assessment of the framework, it is necessary to accurately define the knowledge domains.
Secondly, knowledge domains provide the link between the organisational strategy and a knowledge sourcing framework. A knowledge domain is directly bound to the strategy of an organisation (van Daal et al., 1999).
Thirdly, it is more efficient and realistic to use knowledge domains. Knowledge domains are more realistic as strategies are developed on a more general level of detail. Knowledge domains match this level of detail. Using knowledge domains is also more efficient. A domain can exist of a large amount of more specific knowledge. Determining a knowledge sourcing strategy for each specific and detailed part of knowledge will request too many resources.

Based on the organisational strategy, knowledge domains can be identified. They define what an organisation must know to successfully execute the organisational strategy. Without a strategy, it is not possible to effectively identify knowledge domains (van Daal et al., 1999). The results of the analysis will be weak and no, or the wrong knowledge domains may be identified.
The defined knowledge domains will be the input for the next phase of the knowledge sourcing strategy development, which will be described in the next section.

3.4.2 EVALUATING THE KNOWLEDGE GAP

The goal of this phase is to identify the knowledge gaps within the organisation. The gap identifies the discrepancy between what an organisation knows and what an organisation should know, in the terminology of Zack (2006). In the previous phase the knowledge domains that follow from the organisational strategy are defined. In this phase these domains

have to be evaluated within the organisation. Van Daal et al. (1999) describe a method to evaluate the knowledge gap, a knowledge matrix.
On one axe are the knowledge domains listed that were identified. On the other axe are the functional area's listed. A functional area is "… *a description of certain functions, tasks or activities for which an individual or a group is accountable.*" (van Daal et al., 1999, p. 259). The connection between a knowledge domain and an individual or group is crucial as knowledge resides the employees of an organisation (van Daal et al. 1999). It connects the 'virtual' and abstract knowledge domains to the actual human resource that have knowledge. The knowledge matrix is a participatory method. It involves the contribution of the employees of the organisation. In a combined effort the knowledge of each individual or group will be mapped to a knowledge domain and presented in the knowledge matrix. This can be executed on different levels of the organisation; strategic, tactical or operational (van Daal et al., 1999). I would like to refer to van Daal et al. (1999) for a more detailed description of the knowledge matrix tool.

Knowledge gaps are identified based on this evaluation. After completing this phase it should be clear which knowledge domains need to be acquired or further developed. This information is the input for the following phase. For each gap that is identified a knowledge sourcing strategy needs to be developed.

3.4.3 DEFINING A KNOWLEDGE SOURCING STRATEGY

In the previous phase the knowledge domains are identified for which a knowledge sourcing strategy needs to be developed. Based on the knowledge sourcing framework, the most optimal knowledge sourcing strategy can be determined. As stated previously, it is possible that the organisation specific characteristics do not match the knowledge specific characteristics. In order to execute the most optimal knowledge sourcing strategy given the knowledge specific characteristics, a multi stage strategy needs to be applied where the organisation specific characteristics gradually can be changed, as such they will match the knowledge specific characteristics. When the organisational specific characteristics match the knowledge specific characteristics, such a multi-stage approach is not necessary. In such a situation, the most optimal strategy can directly be executed.

However, in situations where both characteristics do not match a solution has to be sought. For example, a grow strategy is the most optimal outcome given the knowledge specific characteristics, but the absorptive and human resource capacity is insufficient in the current organisation. It is possible in this situation to steadily work towards the desired absorptive and human resource capacity given the knowledge specific characteristics. Assume that the knowledge is needed as soon as possible. At first a hire strategy can be applied, where knowledge and human resources are accessed in the organisation. This can be executed in a short time span. Consequently a buy strategy can be applied. New employees can be recruited that bring new knowledge, experience and create additional capacity to support a grow strategy. They will also relief the current organisation with the additional human resource capacity.
At the same time of executing the hire strategy, the growth strategy can be started. The hire strategy will create some slack in the human resource capacity and will allow this 'excess'

capacity to focus on growing the new knowledge. The absorptive capacity is also increased in this stage, step by step. The employees can profit of this new knowledge brought by the new employees.
At a certain moment in time, the organisation specific characteristics such as human resource capacity and absorptive capacity will be developed and match the level that is necessary for the chosen strategy. The end state will be reached and the buy and hire strategy that were used as accelerator to reach the end state of the grow strategy can be gradually phased out and terminated.
Although this process is 'quickly' written down and read, the process can take several years.

It can be concluded that the path to acquire specific knowledge is dependent on earlier learning stages (de Clerq and Dimov, 2008).The combination of these stages creates the opportunity to attain a specific knowledge level. How these stages are configured and which path to the end state is followed is entirely dependent on the outcome of the knowledge sourcing strategy framework.

3.4.4 CONCLUSION

The last question of this chapter and the main question of this section was "*How to develop an appropriate knowledge sourcing strategy for an organisation?*" It has been answered in the previous three sections. There are three phases to develop an appropriate knowledge sourcing strategy. At first the organisation strategy must be analysed and knowledge domains have to be identified. Secondly the gap between the knowledge in an organisation and what an organisation should know based on the organisational strategy needs to be evaluated. For the specific domains where a knowledge gap is identified, a knowledge sourcing strategy can be developed. The developed knowledge sourcing strategy framework can assist in developing this strategy. The organisation and knowledge specific characteristics of the organisation will be evaluated. Based on that evaluation, a multi stage path to reach the desired end state can be created, which completes the knowledge sourcing strategy.

3.5 A KNOWLEDGE SOURCING STRATEGY, THE FINAL ANSWERS

The initial question that was posed at the beginning of this chapter was "*How can the principal in an inter-firm relationship reduce the knowledge asymmetry?*" This question is answered in three stages, each accompanied with its own question.

At first four strategies are formulated that answer the question "*what knowledge sourcing strategies can be distinguished?*" A grow, transfer, buy, and hire strategy are the four strategies that can be distinguished. It allows an organisation to choose between a combination of the process of acquiring knowledge and the source of the knowledge and covers all possibilities to acquire new knowledge. It is the foundation of this chapter and for the subsequent knowledge sourcing strategy framework.

The second section describes "*how to select an appropriate knowledge sourcing strategy for an organization?*" A knowledge sourcing strategy framework is developed. In this framework, organization and knowledge specific characteristics are placed. Each characteristic has its specific value for each of the four knowledge sourcing strategies. This framework assists an organisation in selecting an appropriate strategy.

The last section answers the question "*how to develop an appropriate knowledge sourcing strategy for an organization?*" Three stages are introduced that allow an organization to develop their own knowledge sourcing strategy. Analysing the organizational strategy and identifying the knowledge domains. Evaluating the knowledge gaps in the identified domains and creating a knowledge sourcing strategy that will reduce the evaluated knowledge gaps.

This last section brings together everything that is described in the previous sections in this chapter. It combines the developed knowledge sourcing strategies and the knowledge sourcing strategy framework. The last section describes how a knowledge domain can be identified, for which a knowledge sourcing strategy needs to be developed.

This last chapter answers the initial question, posed at the beginning of this chapter "*How can the principal in an inter-firm relationship reduce the knowledge asymmetry?*" Engaging in inter-firm relationships will be based on an organisational strategy (or at a lower level strategy). The need to manage that inter-firm relationship is a consequence of that decision. It will need to be carefully considered which knowledge is necessary to manage that inter-firm relationship, knowledge domains will be identified. For each of these domains a gap evaluation will be made, which will provide an overview for which domains a knowledge sourcing strategy needs to be developed.

In the next chapter a field study for a realistic case will be executed to test the knowledge sourcing strategy developed in this chapter. It will be primarily focused at testing the developed framework, since this is the prominent innovation presented in this chapter. The other contributions in this chapter are more common in the business research and have already proven themselves in practice. The case study is there for primarily aimed at the knowledge sourcing strategy framework.

4 METHODOLOGY

In the previous chapter a knowledge sourcing strategy framework was presented. How can the framework be applied in an organization setting? This is the objective of the last part of this research. It will provide a realistic study that will answer the research question: *"How can the Ministry of Oil of Iraq reduce their knowledge asymmetry?"*
The result of this chapter will be a method that allows for a realistic and accurate application of the framework and will enable to consequently answer the posed question in the upcoming chapters. As the developed framework requires data as input, measurement of the criteria is necessary. Creating a method that allows the measuring of these criteria is the upmost and foremost objective as a start to answer the posed question.
In this chapter the case study will be presented and the research strategy will be described. It will present the primary data sample, the design of the questionnaire, and the operationalization of the framework. The communication with the respondents and a time path of the questionnaire is introduced. At last the method to analyse the responses to the questionnaire is described.

4.1 EXPLORING A KNOWLEDGE SOURCING STRATEGY FOR THE MINISTRY OF OIL OF IRAQ

Since the United States invaded Iraq in 2003, one of the largest oil resources worldwide has to be redeveloped. Iraq has chosen to redevelop the oil sources by extending exploitation of these sources to International Oil Companies (IOC) (New York Times, 2008). The cooperation with the IOC is chosen to provide technical expertise and increase the oil production of the oil sources (New York Times, 2008). It is expected that IOC will approximately invest $150 billion in Iraq for the development of oil sources (New York Times, 2011).

Iraq has organised public bidding rounds since 2008 to which the IOC could subscribe. However, the first two rounds had ample success (New York Times, 2009a).

The decision to cooperate with IOC's using service-contracts is a drastic shift in the operational responsibilities of the Ministry of Oil (MoO). Requirements have to be created, followed by a contract, and management and control during the execution phase of the service contracts is necessary. However, since the war many (technical) experts have fled the country, or worse, lost their lives. Iraq lacks hundreds of thousands engineers and technicians according to a news message in the New York Times (2009b) The MoO is therefore confronted with under capacity of knowledgeable experts (Jiyad, 2009). This affects the bidding process as the capacity of the MoO to negotiate deals is under pressure (United Press International, 2009; New York Times, 2009a).

This under capacity is a practical example of knowledge asymmetry between the IOC's and the MoO. This is witnessed in the news media and articles from experts in the Middle East and Energy topics as stated previously. The points of view gathered from these outlets are also confirmed Karim (2012) who is advisor to the Ministry of Oil.
Al Sa'adoon (2010) wrote in a report that "*it will take time for Iraq government ministries to familiarise themselves with international best practice in tendering and contracting…*". Al

Sa'adoon expects that the Iraq ministries will eventually get to a point where the knowledge asymmetry will be reduced. A knowledge sourcing strategy can drive and accelerate this challenge for the MoO. This, and the clear gap in the knowledge capacities between the principal-agent are the main reasons that the MoO is chosen for this case study, where a knowledge sourcing strategy will be developed for the service-contract management and control domain.

4.2 STRATEGY

The objective of this chapter is to describe a method that is developed to apply the knowledge sourcing framework. How can the developed framework be applied? This section will describe the global strategy to answer that question.

The framework can be reckoned as newly developed theory. According to Saunders et al. (2009) a case study is an appropriate strategy to verify developed theory.
A single case study will be used to provide an in depth analyses of the workings of the framework. According to Saunders et al. (2009) a case study is an appropriate method when the context of the research is important. The characteristics of the organisation which are used as input to the framework can be valued as the context of this research.

A mono-method of qualitative studies will be applied to acquire the necessary data for the analysis of the framework (Saunders et al., 2009). Acquiring qualitative data is most often seen within case studies (Robson, 2002). A multi-method study is, according to Saunders et al. (2009), becoming more common in business studies. However, due to the organisation specific data that is required for this research, the availability and obtaining of data from a secondary data source is found to be too limited. Therefor a mono-method approach is preferred.

A questionnaire is used to gather primary data from respondents to determine the value of the criteria of the framework. There are several reasons to use a questionnaire in this research. 1) the answers to the questions are uniform, 2) it requires less sensitivity to administer than for example interviews (Saunders et al., 2009), 3) the data gathered with the use of a questionnaire is sufficient as input to the framework.

The questionnaire will analyse the organisation at a specific point in time, a cross-sectional time horizon (Saunders et al., 2009). For an analysis of the framework presented in the previous chapter, the state of the organisation at a specific time is important. On the ground of such a 'snapshot' an analysis can be made. Analysing the organisation of the MoO over a longer time period will present changing values as the organisation changes, with distorted values as consequence. A short time span is necessary to measure valid values.

The strategy to test the working of the framework involves a case study, a qualitative mono-method approach. A questionnaire will measure the data needed as input for the framework at a specific point in time. How this data is obtained will be described in the upcoming section.

4.3 OBTAINING DATA FOR THE ANALYSIS OF THE FRAMEWORK

There are two critical questions when you want to obtain data. 1) From who or where can I gather the data? 2) How can I gather the data from the desired source? Both questions will be answered in this paragraph.

4.3.1 PRIMARY DATA SAMPLE

There are two primary sample groups, 1) the Ministry of Oil officials, and 2) external advisors and former employees. The MoO Officials can provide an accurate insight in the characteristics of the organisation, while the external advisors can provide an objective insight from the MoO from a distance and in relation to their experience at other organisations.
The respondents for the questionnaire will be selected using critical case sampling, a form of purposive sampling. This is a method that is frequently used in case studies and allows selecting cases that are specifically knowledgeable on the researched subject (Saunders et al, 2009). The objective of the survey is to acquire a representative image of the characteristics of the organisation by acquiring data from multiple resources (Robson, 2002), one internal source and an external source.
From within the MoO organisation are six departments selected that are involved in the service-contracts with the IOC. 1) The directorate of 'Training and Development', 2) The directorate of, 'Petroleum Contracts and Licensing', 3) The 'Technical' directorate, 4) The directorate of 'reservoir and fields development'. 5) The deputy office of Refineries, 6) The State Company of Oil Projects, and 7) the North Oil Company.
From each department one respondent is requested to fill in the survey, providing in-depth knowledge of the organisation. Since Iraqi organisations are hierarchal (Hofstede, 2012), the approached respondents are top managers, director generals or deputy ministers. Top-managers are also preferred as it is assumed that they have broader knowledge on the characteristics of the organisation and are therefore able to accurately answer the questionnaire. Seven MoO officials will be approached to gather data for this research.

The external advisors and former employees were selected from the network of the supervisor to this thesis who is well known in and with the Iraq Energy sector. The selection is based on two criteria, if they have past working experience at the MoO or are still involved as advisors to the MoO. They can provide a useful insight in the characteristics of the MoO based on their experience, which is useful to triangulate the data gathered from the MoO officials. Five external advisors and or former employees will be approached to gather data for this research.

In General, one single respondent should be able to provide the necessary information needed for the analysis of the framework. However, attaining information from multiple departments provide a more realistic and objective view from the organisation. It allows triangulating the received information between the respondents (Saunders et al. 2009). Personal biases can be filtered using this method, and a more objective view on the characteristics of the MoO can be obtained.

4.3.2 COLLECTING PRIMARY DATA USING QUESTIONNAIRES

According to Saunders et al. (2009) it is possible to use questionnaires for a case study. Using a questionnaire, the opinions of respondents can be measured (Dillman, 2000). These opinions and attitudes on the characteristics of the organisation are the input of the framework.
A choice is made for a self-administered internet-based questionnaire dispersed using e-mail. This has several advantages (Saunders et al., 2009). 1) Due to the distance to Iraq, personal interviews are impossible for this research, 2) There are significant time constraints on the side of the Ministry of Oil (MoO) due to employee under capacity. A self-administered internet-based questionnaire should reduce the necessary time asked from the MoO. 3) Certainty that the right person will receive the questionnaire and the reduced likelihood that the answers of the respondent will be distorted, especially given the cultural factors described by Hofstede (2012), 4) Relatively quick expected response time compared to other questionnaire forms. 5) Each respondent will be provided with exactly the same questions as well as possible answers.
A drawback of self-administered internet questionnaires is the expected low response rate (Saunders et al.,2009). However, due to good relations of one of the supervisors, this potential problem should be reduced to manageable proportions. This should enable to directly approach the selected respondents for this research and increase the response rate (Dillman, 2000).
Both sample groups, the MoO officials and the external advisors and former employees will receive the same questionnaire with exactly the same questions. There is however one distinction in the exact wording of the question. This related to the perspective of the respondents towards the MoO, either internal or external.
In the next section the design of this questionnaire will be described.

4.4 THE DESIGN OF THE QUESTIONNAIRE

According to Peterson (2000) there are three guidelines for an effective questionnaire. 1) Make it easy to administer the questionnaire, 2) The questionnaire should facilitate the efficient transfer of the answers to the questionnaire to the form that is needed for analysing, 3) The questionnaire should be structured to avoid biasing questions.
Guideline one will be described in this section. Guideline two will be described in paragraph 4.5, and guideline three is discussed in the testing procedures paragraph (4.6).

The questionnaire is designed in such a way that it is easy to work with for the respondent. It increases the chance on completing the questionnaire, as well as the accuracy of data. This is achieved by using 1) closed category questions, 2) no requests for confidential data, 3) the questionnaire can be filled in without the need to look up additional data, 4) the questions are not too complex, 5) the length of the survey is kept at a minimum, 6) the measurement scales of the framework and questionnaires are similar, and 7) the questions are grouped by topic.

Closed questions, primarily with ordered response categories will be applied. These types of questions are most friendly to respondents (Dillman, 2000). The questionnaire consists completely of closed category questions (Saunders et al., 2009). Closed category questions are a fit with the data needed to test the framework. A respondent can give only one answer to a question (Saunders et al., 2009). The answers to the closed category questions can be matched

to the presented values of the criteria in the knowledge sourcing strategy framework (Table 2). This approach has two advantages, 1) each answer to a question is exclusively matched to a criteria value. There is no need for additional interpretation of the researcher to match an answer to a criteria value. Respondent answers can be directly mapped into the framework. 2) Offering a minimum number of answers reduces the demand on the respondent (Dillman, 2000). This increases the likelihood that the respondent will finish the questionnaire.

The questionnaire will not request *confidential* data, which will improve the response rate. The questions are designed in such a way that the answers won't reveal any confidential information of the organisation. For example, a question on the financial capacity of the organisation does not request actual figures, but only intents to reveal whether the organisation has the capacity to invest or not. The latter information is significantly less confidential than the actual figures and should positively influence the cooperation of respondents (Dillman, 2000)

The questionnaire will consequently not require the respondent to look up *additional* data. The questions intend to reveal the characteristics of the organisation. As the respondent is employed within that organisation, at an influential position, the answers to the questions should be at his direct disposal. This design should also reduce the *complexity* of the questionnaire. The respondent should be familiar with the organisation characteristics that are evaluated and the questions should therefore be less complex. Both design decisions should increase the cooperation of the respondents (Dillman, 2000).

The *length* of the questionnaire is kept to a minimum to increase the cooperation of the respondents (Dillman, 2000). Each criterion is measured using two questions at most while simultaneously retrieving all necessary data.

The criteria of the framework are valued on a nominal *scale*. The questions of the framework will therefore be measured on the same qualitative scales, nominal as there are no wrong or right answers in the case of analysing the organisation characteristics. No subsequent transformation of scale of the answers is needed as input for the framework.

The questions are grouped by *topic*. This facilitates the comprehension of the questionnaire for the respondents (Dillman, 2000).

The design of the questionnaire should increase the chance on cooperation from the respondents as well as the accuracy of the answers received. It should be easy to process and acquire the necessary input for the framework.

4.5 MEASURING INDIVIDUAL FRAMEWORK CRITERIA

Each criterion has to be measured using a question in the questionnaire. Many questionnaires have been designed in academic articles and can serve as a source of questions. These articles are scanned for the criteria in the framework, such are risk measurement and absorptive capacity. The questions that were found in the academic articles and were a fit with this research are used and when needed partially adapted to this research. When no questions were found for a criterion, a question was formulated specifically for this research. The questions

that were used from or based on academic articles will be shortly discussed in this section. A complete overview of the questionnaire can be found in Appendix A

Personal questions are according to Wäyneryd (1996) experienced as a drawback for respondents. It lowers the willingness of the respondent to complete the questionnaire. It is however necessary to record some personal information, the name of the respondent and the department that the respondent works in, to know 1) who completed the questionnaire, and 2) to be able to analyse differences between departments. By asking only these two personal questions considering the name and the department of the respondent (question 1 and 2), the interference of the questionnaire in the respondents 'private domain' is kept to a minimum and therefor will not affect the response rate.

Two elements of the *absorptive capacity* criterion are measured with questions from the academic article of Jansen et al. (2005), direction and routines. They researched organisational antecedents regarding absorptive capacity. Questions 9 and 11 that measure routines and directions are derived from their article.

Risk attitude is measured using a question of Donkers et al. (2001). The risk attitude can be measured using a probability equivalence question or by an investment opportunity question (Donkers et al., 2001). A probability equivalence question is regarded more difficult to answer (Wärneryd, 1996). Therefor an investment opportunity question is used (question 16). The size of the investment is adapted to the context where the MoO operates in to make the question more realistic (Wärneryd, 1996). The respondent should be able to answer the question more easily and accurately.

The mentioned questions are derived from academic articles. All of the other questions are written for this questionnaire to accurately measure the criteria of the knowledge sourcing framework. The complete questionnaire, including the questions is placed in appendix A. This is the questionnaire that was send to the MoO officials. The questionnaire send to the external advisors is not placed in this thesis, since it is similar to the questionnaire found in appendix A.

4.6 TESTING THE QUESTIONNAIRE

Testing is critical to create an effective questionnaire. Small type- or semantic errors may exist in the questionnaire. Questions can be hard to understand for people who were not involved in the design. These are elements that decrease the validity of the questionnaire and increase the non-response rate.
Dillman (2000) therefore proposes a four stage testing procedure. Stage 1) review the questionnaire by knowledgeable colleagues and analysts that have diverse backgrounds. This stage tests the content of the questionnaire. Stage 2) interview people to evaluate cognitive and motivational qualities of the questionnaire. This stage tests the meaning of the questionnaire. Stage 3) a small pilot study, this stage tests the complete questionnaire and shows how people make and experience the questionnaire. Stage 4) a final check by people who were not involved with the research and design of the questionnaire. Stage 4 is a final check to remove the last small errors.

All of the stages of the testing procedure were executed, however on a smaller scale and level than Dillman (2000) describes in his book. The first stage was executed to test the questionnaire with some friends that have different backgrounds. They returned feedback on the content of the questions as well as the order and structure of the questionnaire.
The second stage was not executed exactly as proposed by Dilman, however it was executed simultaneously with stage four. A friend that was not involved and consulted with the design of the questionnaire was asked to complete the questionnaire. He was asked specifically to test the questionnaire on content and context, more specifically if there were any small errors left regarding the content of the questionnaire as well as if he did understand the questions. This friend has considerable experience at multinational organisations and therefore deemed appropriate to effectively test this questionnaire.
The third stage was executed by sending the questionnaire to two Iraqi PhD students. One of them gave his feedback. He suggested to simplify and clarify the questions and to explain some of the terms used in the questionnaire (Al-Furaiji, 2012). The feedback was implemented in the questionnaire by making the decision to measure one criterion only with one question and by leaving unnecessary difficult questions out of the questionnaire or by substituting them for a simpler question. Some terms were ambiguous, this error was addressed by using the same terms throughout the questionnaire.

By executing the four stages of the test procedure, every effort to remove all of the errors from the questionnaire was taken. This created the most effective questionnaire that should be clear and comprehensible for the respondents and thereby increase the response rate as well as the accuracy of their responses.

4.7 QUESTIONNAIRE COMMUNICATION

The communication with the respondent consists of four phases. 1) Pre-notice letter, 2) Cover letter, 3) Reminder letter, and 4) Thank you letter (Dillman, 2000). These letters can be found in appendix B.

The first phase is the pre-notice letter that will inform the respondent on the upcoming questionnaire. It is a letter that briefly requests the respondents contribution for an important study. According to Dillman (2002, p. 156), a pre-notice letter “should be brief, personalised, positively worded, and aimed at building participation”. Research has shown that using a pre-notice letter increases the response rate. This is important as a self-administered questionnaire generally have lower response rates (Dillman, 2000).
The pre-notice letter used for this questionnaire complies with the concept that Dillman (2000, p. 157) describes. The letter is sent directly to each respondent. It briefly indicates what will happen in the near future, why it is important and thanks the respondent in advance. Normally the second phase of communication will be the cover letter. However, the pre-notice letter was positively noticed by the respondents and a request for more detailed information was requested. This request was fulfilled by the pre-notice letter follow up. Mister Karim confirmed the origin of the pre-notice letter, supported the questionnaire and politely requested their cooperation with this research.

The second phase in the communication with the respondent is the cover letter that is accompanied by the questionnaire. According to Dillman (2000, p. 162) a cover letter should consist of several elements. An ‘inside address’, ‘the request’, ‘why you were selected’, ‘usefulness of the questionnaire’, ‘confidentially’, ‘token of appreciation’, ‘willingness to answer questions’, ‘thank-you’ and a ‘real signature’. All of these elements are present in the cover letter for this questionnaire, except for the token of appreciation. The decision was made not to include a token of appreciation. A token of appreciation could be controversial as the Ministry of Oil is a government organisation. It also can influence the validity of the questionnaire as the objective of the respondent may alter due to the incentive. Several elements were added to the letter as well, ‘you will get in return’, and ‘deadline’. These elements were added to communicate how this research can benefit the Ministry of Oil. A clear timeline was presented to the respondent. The date of a reminder letter was presented as well as the final deadline of the questionnaire, also to create a subtle sense of urgency.

The third phase of communication is the reminder letter. A reminder letter greatly increases the response rate and is therefore critical in the communication with the respondent (Dillman, 2000). This letter is send only to the respondents that did not complete the questionnaire. In the reminder letter a slightly more persuasive appeal can be made on the respondent (Dillman, 2000). However, the letter should not become offensive.
A reminder letter is similar to a cover letter, only several elements are added. The elements ‘feedback: We have not heard from you’ and ‘others have responded’ can be placed at the beginning of the letter. Both elements reinforce the importance of the respondent for the success of the questionnaire (Dillman, 2000). It should persuade the respondent to complete the questionnaire.
Dillman (2000) advices to create a follow-up procedure that consists of multiple reminder letters. However, due to the time constraints of this research the decision is made to send only one reminder to the respondents. The selected respondents in this research are furthermore top-managers that have limited time available. Too many contact moments in a short time period can create an adverse reaction.

The fourth and last phase of communication with the respondent is the ‘thank you’ letter. The appreciation of the researcher for completing the questionnaire is conveyed to the respondent. This is accomplished by a brief letter.

4.8 TIME PATH QUESTIONNAIRE

Based on all the information provided in the previous sections, a time path for the questionnaire can be created. The time path of the questionnaire takes 128 days in total, from sending the concept questionnaire to the test panel to the 'appreciation card to the respondents.

Questionnaire Communication with respondents		
Phase	**Date**	**Description**
1	03-04-2012	Sending the concept questionnaire to the test panel, consisting of two Iraqi students.
2	04-04-2012	Sending the pre-notice letter to the respondents.
3	08-04-2012	Confirmation of mister Karim of the validity of the questionnaire.
4	09-04-2012	Follow up as response from the respondents to the pre-notice letter.
5	11-04-2012	Incorporate feedback from the test panel in the questionnaire.
6	12-04-2012	Sending the cover letter, including a hyperlink to the online questionnaire and deadline.
7	24-04-2012	First reminder towards the respondents.
8	09-05-2012	Second reminder towards the respondents.
9	25-05-2012	Closing of the questionnaire.
10	01-06-2012	Analysing the questionnaire data and creating a report.
11	09-08-2012	Sending a personal 'Thank you' note, including the report to the respondents

4.9 ANALYSING THE PRIMARY DATA

4.9.1 ANALYSING THE PRIMARY DATA OF A SINGLE RESPONDENT

A distinction has to be made between criteria of the knowledge sourcing framework that are measured using one question, and criteria that are measured using multiple questions. All of the questions are measured on a nominal scale and the sample size is small. The possibility to apply statistical analysis on the results of the questionnaire is therefore limited. Using a statistical analysis on these results could also be misleading. The statistical conclusions based on such a small sample can lead to an over interpretation and inflated statistical validity of these results, while the data on itself can't provide such 'hard' conclusions. The question becomes therefore: "*How can the answers of a respondent be analysed accurately?*"

Criteria that are measured using one question can be mapped directly to a value in the framework. Since each answer corresponds to a value of the criteria.

To compare the association between multiple questions that are used to measure a single criteria, a limited number of statistical methods are qualified. As the questions are nominal measures, only the Chi square test, McNemars, Cramers V and the contingency coefficient can be applied (Kurtz, 1999; Blaikie, 2003).

The chi square test can't be used as the expected frequencies for each cell must be greater than five. As this questionnaire has a maximum of six respondents, that restriction can't be fulfilled (Kurtz, 1999). McNemar's test is only suitable for 2x2 tables (Blaikie, 2003), in the questionnaire tables larger than 2x2 needs to be analysed. McNemar's test is therefore also not suitable to analyse this questionnaire. Cramérs V as well as the contingency coefficient are also not suitable to analyse the questionnaire as they are derived from, or use chi square which has limitations that cannot be fulfilled in this research (Blaikie, 2003).

The following tables (3 and 4) are therefore constructed to resolve this statistical shortcoming using a non-statistical method[17]. The criteria *absorptive capacity* and *knowledge availability* are the only two criteria that are measured using multiple questions. Firstly, each of the questions with the possible outcomes is mapped in a table. Secondly a numerical value is given to each of the outcomes (low=1, medium=2, and high=3). Based on the answers of the respondent a numerical value can be calculated. This result can consequently be mapped to the value for the criteria. With the use of these two tables, the answers to the multiple questions that construct one criterion can be converted into one single value that is used as input for the knowledge sourcing framework.

Computed value of Absorptive Capacity			
Criteria	Low	Medium	High
Knowledge base	1	2	3
Knowledge gap	1	2	3
Internal and External links	1	2	3
Routines	1	2	3
Direction	1	2	3

Legend	Points	Probability
low	5-8	61/263
medium	9-11	141/263
high	12-15	61/263

Table 3: Absorptive Capacity

Computed value of Knowledge Availability		
Criteria	Yes	No
Protection	1	2
Maturity	1	2
Type	1	2
Specificity	1	2

Legend	Points	Probability
Low	4-5	5/16
Medium	6	6/16
High	7-8	5/16

Table 4: Knowledge Availability

[17] When a larger sample size is used in further research, the most appropriate statistical method as described in the previous section can be applied.

4.9.2 ANALYSING THE DATA OF ALL RESPONDENTS

The data from each group of respondents can be analysed using a contingency table. This is the only applicable method, given the nominal measure of the criteria and the limited number of respondents. To describe the midpoint of the data acquired, the mode can used to describe the most appropriate value for each criterion (Denscombe, 2010). There is however a chance that there is no mode (ibid.), especially given the limited number of respondents in this questionnaire. If such a situation may occur, a comparison with the results of the other group can provide an indication of an accurate and realistic value. When this won't provide clear value, all values that are answered should be mapped in the knowledge sourcing framework.

The results of the contingency tables of both groups can consequently be transferred into the knowledge sourcing framework. This will provide a clear overview of the results of both groups in one framework. Contradicting results may exist for one or more criteria. In that situation an alternative approach has to be used. Since there are no statistical methods to apply, only a subjective analysis is possible. This subjective analysis is supported, when applicable and available, by secondary sources such as news reports from industry or region websites. These sources may provide additional information that is helpful to decide on the most accurate value.

4.10 A QUESTIONNAIRE TO ACQUIRE INFORMATION FOR THE KNOWLEDGE SOURCING STRATEGY FRAMEWORK

The objective of this chapter was to develop a method to acquire data that can be used as input for the knowledge sourcing strategy. A strategy is developed to acquire the input from the MoO as an external party. A questionnaire to acquire the necessary data is chosen, as the MoO is not directly accessible due to the geographical distance.
The first purpose of the methods described in this chapter is to approach and design the questions in such a way that the respondents are persuaded to respond and complete the questionnaire. Secondly the questionnaire should be effective to measure the necessary data accurately. The third purpose of this method is to acquire data that can be uniformly analysed.
Respondents were selected from the MoO that should have interest in the subject of knowledge sourcing in the domains of capacity building, particularly the demand created by service-contract management and control. The questionnaire is endorsed by the MoO, and introduced for approval by Karim, the principal to this thesis. Additionally were a few start up contacts made to communicate with the respondent and bring the questionnaire to their attention. The questionnaire is designed with the respondents in mind, as such that it will allow them to 'easily' complete the questionnaire, without affecting the accuracy and the validity of their answers. It is short, to the point and stripped down to the bear necessity.
Procedures were written and executed to test the questionnaire. A time path is created to coordinate the questionnaire as well as communicate to the respondents what they can expect at a given time.
The last section of this chapter presents how the answers to the questions of a single respondent can be analysed as well as the data that is acquired from all respondents. This is connects the current and the next chapter as it describes how the data acquired in this chapter

can be interpreted in the next chapter. It provides a clear framework for the analysis of the results in the next chapter.

The current method describes a demonstrative case-study of the developed knowledge sourcing strategy framework. Not meant to satisfy statistical requirements of an empirical research, but to demonstrate the procedure, the functionality of the framework and provide preliminary conclusions.

5 DEVELOPING A KNOWLEDGE SOURCING STRATEGY FOR THE MINISTRY OF OIL OF IRAQ

In chapter two is argued that the only possibility to reduce knowledge asymmetry is, to acquire knowledge. In chapter four, a framework is developed to determine a strategy to source knowledge. The characteristics that are used in that framework were measured at the MoO using the method as described in chapter four. The results of that method will be analysed in this chapter to provide a strategy to source the knowledge. This analysis will answer the question *"What is the most optimal knowledge sourcing strategy for the Ministry of Oil of Iraq?"* at the end of this chapter.

The results of the questionnaire as presented in appendix C are placed in the knowledge sourcing strategy framework. Two versions are presented, one for each group; the MoO officials and the advisors and former employees. The dark blue cells represent the final value as described in appendix C. The light blue cells represent the possible values where the respondents were divided in between in their responses. At first the results of the MoO officials will be analysed (section 5.1), after which the results of the advisors will be separately analysed (section 5.2). In section 5.3 an analysis of the combined results will be made, which should result in a final suggestion on a knowledge sourcing strategy.

5.1 ANALYSING THE KNOWLEDGE SOURCING STRATEGY FRAMEWORK FOR THE MOO OFFICIALS

Knowledge Sourcing Framework – MoO Officials					
		Grow	Transfer	Buy	Hire
Organisation characteristics	Absorptive capacity	Medium			
	Human resource capacity			Understaffed	Understaffed
	Financial capacity	High	High		
	Risk attitude	Risk seeking	Risk seeking		
Knowledge characteristics	Core competence	Core	Core		
	Knowledge availability			High	High
	Time to knowledge	Long	Long	Medium	Short
	Knowledge time-span	Long-term	Long-term		

Table 5: Knowledge sourcing strategy framework with the results of the Ministry of Oil officials

The framework (table 5) shows that the most cells are aligned in the column of the grow strategy, on that observation, this would be the most suitable strategy. There are nonetheless three characteristics that deviate from this pattern, the human resource capacity, knowledge availability, and time to knowledge characteristics.
The values of knowledge availability can also match the grow strategy since a high knowledge availability is a 'better' value than 'low' knowledge availability and therefore can also be mapped to a grow strategy. Consequently, a 'high' knowledge availability does not refrain an organisation from developing that knowledge internally.
The human resource capacity and time to knowledge however don't match with the grow strategy. These values can however support the realisation of the grow strategy, this will be explained shortly. For a grow strategy, sufficient human resources are necessary. Two of the three respondents answered that there are sufficient human resources in the MoO, although their capacities do not align with the needs of the MoO. There are thus human resources that can be used to realise the grow strategy.
The values of the time to knowledge also partly support the grow strategy (the respondents were evenly divided on this characteristic). A grow strategy is therefore a viable strategy based on the results of the MoO officials.

The alternative values of the time to knowledge also suggest a buy or hire strategy. This can be combined with realisation of the grow strategy. A grow strategy is a strategy that can be realised on the long-term. It is possible to immediately realise a buy or hire strategy. Since the knowledge availability is high, and there is financial capacity, this is an appropriate possibility. It will allow the MoO to directly attract knowledge in this domain while they

grow it internally. It will concurrently overcome the time between the immediate need for the knowledge in the domain and the time it will take for the grow strategy to show results.

Based on the results of the MoO officials a grow strategy as end state would be advised, preceded with a buy or hire strategy.

5.2 ANALYSING THE KNOWLEDGE SOURCING STRATEGY FRAMEWORK FOR THE EXTERNAL ADVISORS AND FORMER EMPLOYEES

Knowledge Sourcing Framework – External Advisors and former employees

		Grow	Transfer	Buy	Hire
Organisation characteristics	Absorptive capacity	Medium			
	Human resource capacity	overstaffed	overstaffed		
	Financial capacity			Medium	
	Risk attitude			Risk averse	Risk averse
Knowledge characteristics	Core competence	Core	Core		
	Knowledge availability	Low	Medium		
	Time to knowledge				short
	Knowledge time-span				Short-term

Table 6: Knowledge sourcing strategy framework with the results of the external advisors and former employees

The results of the external advisors and former employees show a more diverse pattern (table 6). Two strategies, grow and hire would be the logical choice based on the number of dark blue cells. Both are however each other opposites. It will be necessary to analyse the values of the specific characteristics in more detail.
At first the four knowledge specific characteristics will be analysed. 1) The advisors have valued this knowledge domain as an (future) core competence of the MoO. It indicates that the MoO should focus at this knowledge domain and not outsource it (Grant and Baden-Fuller, 2004). The value of this characteristic is of great importance for the decisive advice as it is a critical determinant of the organisational strategy. 2) The advisors are divided on the knowledge availability. They answered that the knowledge availability may be ‘low’ or ‘medium’. Both values nevertheless match the strategies related to a ‘core’ core competence. The values of the time to knowledge and knowledge time-span do not match with the previous two characteristics. 3) The time to knowledge is valued ‘short’ by the advisors, this value is not only a mismatch with the grow strategy, it can’t be matched to the value of the knowledge availability. The advisors indicated that in their perception the knoweldge in this domain is limited to somewhat available. There is no solution to this mismatch, since knowledge can’t be acquired quickly when it is not available to your organisation. 4) The knowledge time-span

can also not be matched to the grow strategy. This value is also rather unexpected. Since the contracts that the MoO have signed have a time-span of at least 20 years (Jiyad, 2012). It is expected that the knowledge to manage and control these contracts would be necessary for the long-term. This value is however answered by only one respondent. Another respondent has answered ‘mid-term’ while two respondents have answered short-term. It should therefore be concluded that the question was either not well written, ambigious, unclear, misunderstood or open to various interpretations. The value ‘short-term’ that is presented in the framework can’t be acknowledged given the information on the durations of the contracts.
The combination of a ‘core’ core competence and ‘low’ to ‘medium’ knowledge availability inherently should have a grow strategy as outcome, based on these characteristics. The knowledge time-span is not regarded in this decision. That the respodents urge to quickly acquire knowledge in this domain can’t be combined with the limited availability of knowledge. Based on the analysis of these four characteristics a grow strategy would be advised. After the analysis of the organisational specific characteristics a final advise can be formulated.

A quick observation of the values of the absorptive and human resource capacity versus the values of the financial capacity and risk attitude shows that they are at opposite ends of each other. Each of the four characteristic will be explored in more detail.
1) The absorptive capacity is valued ‘medium’ which is a match to the ‘core’ value of the core competence characteristic. It indicates that the capacity to grow new knowledge and effectuate the core competence is supported by the absorptive capacity. 2) The human resource capacity is regarded overstaffed by two respondents, while one respondent indicated that the human resources are overstaffed, although not aligned with the organisational needs, and one respondent answered that the MoO is understaffed. Both values of the absorptive and human resource capacity support a grow strategy.
3) The financial capacity is valued ‘medium’ nonetheless and is a match to a buy strategy. For a grow strategy, more financial resources are necessary. 4) The risk attitude of the MoO does not match a grow strategy according to the advisors. The respondents have valued the risk attitude unanimously ‘risk averse’. A buy or hire strategy would be more suitable given the risk averse value in the framework.

Based on the analysis of both organizational as knowledge specific characteristics a final advice has to be drawn. There are two characteristic that are in direct contrast with advising a grow strategy, the financial capacity and risk attitude. The values of the core competence and knowledge availability are decisive in this analysis. The ‘medium’ financial capacity can possibly support the realisation of the grow strategy at a lower rate. Whether the risk seeking characteristic of the grow strategy is acceptable to the MoO (as regarded by the advisors) should be taken into consideration by the MoO.

5.3 RECOMMENDED KNOWLEDGE SOURCING STRATEGY

In table 3, the results of the MoO officials and advisors are combined to provide an overview of the values of both groups. The **darkest colored cells** are the values from the advisors, the **lightest colored cells** are the values where both groups have the same value. **The color** in between the darkest and lightest colour represents the values of the MoO officials.

Both groups have only given the core competence and the absorptive capacity of the MoO the same value. The time to knowledge only slightly overlaps due to the indecisive answers of the MoO officials. How do the values of the remaining characteristics relate to each other?

The MoO officials regard their *human resource* capacity as understaffed, while the advisors have valued it as overstaffed. Publications have already stated that Iraq lacks thousands of engineers and is confronted with under capacity of knowledgeable experts (Jiyad, 2009; New York Times, 2009b). Regarding the value of the MoO officials in combination with those external sources, an understaffed MoO is more likely.

The *financial capacity* is regarded 'high' by the MoO officials, and is regarded 'medium' by the advisors. Although both values are no opposites, and somewhat close to each other, there is a difference. The question remains what the most realistic value would be? The revenues from the oil export were $83 billion in 2011 (Jiyad, 2012). Although the oil revenues are most certainly not equal to the budget of the MoO (and it is probably a sensitive political issue), it could (or should) be assumed that there would be sufficient financial capacity available to support the 'high' financial capacity value, which is supported by the MoO officials. Financially sound business cases such as a more effective and efficient management and control of the service contracts could be supported with the necessary financial means. 'High' is regarded the final value for the financial capacity characteristic.

The MoO officials regard the *risk attitude* of the MoO as risk seeking, while the advisors value the risk attitude as risk averse. The research into cultural dimensions of Hofstede (2012) can assist in determining the most accurate value. One of the five dimensions is the uncertainty avoidance index UAI, it resembles how a society coops with uncertain events (and future). Hofstede (2012) has valued the AUI for Iraq on 85 (on a scale of 100) and "*thus has a high preference for avoiding uncertainty.*" This conclusion of Hofstede supports a more risk-averse mind-set of the Iraq society and it is seen as the most realistic assumption of the risk attitude for the MoO. The final risk attitude value is therefore risk averse.

Knowledge Sourcing Framework – MoO Officials and External Advisors and former employees					
		Grow	Transfer	Buy	Hire
Organisation characteristics	Absorptive capacity	Medium			
	Human resource capacity	overstaffed	overstaffed	Understaffed	Understaffed
	Financial capacity	High	High	Medium	
	Risk attitude	Risk seeking	Risk seeking	Risk averse	Risk averse
Knowledge characteristics	Core competence	Core	Core		
	Knowledge availability	Low	Medium	High	High
	Time to knowledge	Long	Long	Medium	Short
	Knowledge time-span	Long-term	Long-term		Short-term

Table 7: Knowledge sourcing strategy framework with the values of the MoO Officials and external advisors and former employees combined

Both groups are also divided on the value for the *knowledge availability*. To be able to provide a final value for this characteristic, the four elements that compose this characteristic will be analysed in more detail. Both groups regard the knowledge in this to be available from free or paid sources. They also regard the knowledge in this domain to be very specific to the MoO and have answered that you can learn the knowledge by doing, it is tacit. The advisors are only evenly divided on the maturity of the knowledge in this domain. The answers of both the MoO officials and the advisors to the maturity and specificity element are somewhat remarkable. Managing and controlling of service contracts with IOC by governments is not an uncommon situation. Many governments already manage and control service contracts with IOC. The management and control of service contracts within any given industry or organisation by governments is rather common. It is therefore deemed unlikely that knowledge on the management and control of service contracts is highly specific to the MoO, or that the knowledge would be immature. Knowledge should be learned by doing. Based on these considerations a 'high' value of knowledge availability is deemed most likely and therefor the final value for the knowledge availability characteristic.
The MoO officials were indecisive on the *time to knowledge* characteristic, while the advisors regard a 'short' time to knowledge. It is realistic to choose for a 'short' time to knowledge since the service contracts that have to be monitored and controlled by the MoO have already been signed and the execution of the contracts has already started. It would be unrealistic to assume that there is sufficient time to acquire the knowledge in this domain on a long-term, without a negative effect on the management and control of the service contracts by the MoO. Since the service contracts are already executed at this moment, there is no time to be lost. A 'short' time to knowledge is therefore the final value for this characteristic.

Both MoO officials and advisors are also divided on the value for the *knowledge time-span*. Each group has chosen opposite values, the MoO officials regard a 'long-term' knowledge time-span, while the advisors valued a 'short-term' knowledge time-span. The value of the advisors is already discussed in section 5.2. Given the duration of the service contracts, at least 20 years (Jiyad, 2012), a 'short-term' knowledge time-span is deemed unrealistic. 'Long-term' knowledge time-span is therefore acknowledged as final value for this characteristic, mainly given the long-term duration of the service contracts.

All the values of both groups on each characteristic have been carefully analysed, and final values have been chosen. These values can be presented in a final knowledge sourcing strategy framework.

Knowledge Sourcing Framework – The combined values

		Grow	Transfer	Buy	Hire
Organisation characteristics	Absorptive capacity	Medium			
	Human resource capacity			Understaffed	Understaffed
	Financial capacity	High	High		
	Risk attitude			Risk averse	Risk averse
Knowledge characteristics	Core competence	Core	Core		
	Knowledge availability			High	High
	Time to knowledge				Short
	Knowledge time-span	Long-term	Long-term		

Table 8: Knowledge sourcing strategy framework with the combined values for the MoO, based on the MoO officials and external advisors and former employees

Although the final framework (table 8) presents a diverse overview, it is possible to suggest for a possible knowledge sourcing strategy for the MoO of Iraq.
The 'core' value, of the core competence characteristic, will be important in the advice on the knowledge sourcing strategy. This knowledge domain is deemed an essential component of the future strategy and activities of the MoO by both groups. A grow or transfer strategy is therefore the most likely. Is this reconcilable given the sometimes contradicting values of the other characteristics? Yes it is, but a path using a buy and or hire strategy will be necessary to reach the desired end state (the grow strategy). The key characteristics that have contradicting values (assuming a grow strategy) are the human resource capacity, risk attitude and time to knowledge. The MoO does not have sufficient human resources, is risk averse and quite critically, needs the knowledge in short time-span. The effect of the risk attitude is very difficult to determine, the MoO themselves should decide whether the following advice will match their risk attitude.

The knowledge sourcing strategy advice, considering the values as presented in the framework (table 8), is as followed.

Since the knowledge is necessary in a short time-span, knowledge is available and the human resource capacity is limited at the MoO, the immediate execution of a hire strategy is advised as starting point of the knowledge sourcing strategy. The MoO will acquire, using this strategy, the necessary knowledge to immediately perform their management and control function.

Simultaneously a grow strategy can be realised. Since this knowledge domain is considered a core competence, absorbing this knowledge internally is deemed critical for the MoO to successfully reach their goals. It will provide the knowledge that the MoO needs on the long-term. It is possible to slowly develop and realise the grow strategy and build the human resource capacities necessary to succeed. The financial resources are considered sufficient to support this strategy, as well as the absorptive capacity.
The hire strategy can be turned into a buy strategy within time, which provides a more solid base for the MoO, but takes some more time to realise. It can also support the grow strategy that is simultaneously realised. The buy strategy will provide knowledge at very close proximity of the MoO and when the grow strategy is realised, sufficient and additional absorptive capacity is created. It could give a boost to the grow strategy.

When the grow strategy is completely realised to satisfaction of the MoO, the buy strategy can be phased out, allowing the MoO to execute their management and control function of the service contracts without any external knowledge. This suggestion for the knowledge sourcing strategy for the MoO is shown visually in figure 9. The hire and grow strategy that are executed simultaneously. After some time the hire strategy is replaced with the buy strategy, while the grow strategy is maintained. After the grow strategy is successful, the buy strategy can be phased out.

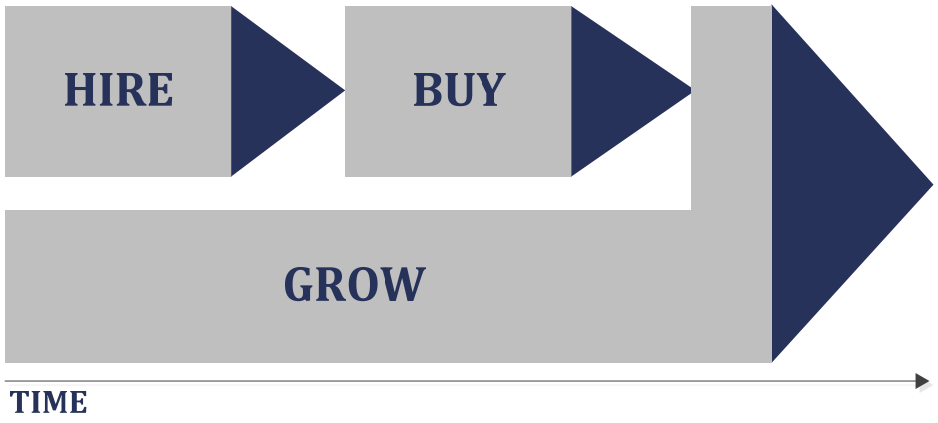

Figure 9: The suggestion of the knowledge sourcing strategy advice for the MoO

5.4 CONCLUSION

The proposed advice also answers the question that was posed at the beginning of this chapter, *"What is the most optimal knowledge sourcing strategy for the Ministry of Oil of Iraq?"* The developed knowledge sourcing strategy framework was put into practice in a case study for the Ministry of Oil of Iraq. The purpose is to explore the working of the framework. Since a suggestion for a knowledge sourcing strategy is presented, the framework can be applied, but how is the method that is used experienced? And is the result of practical significance for organisations, most specifically the MoO?

Based on the experience using this method to create a knowledge sourcing strategy there are some considerations. The method as used in this thesis can preferably be used as a starting point to gather information from the organisation and perceptions from its employees. It can be executed quickly and on a large scale to engage many employees into the development of the knowledge sourcing strategy. Since the number of characteristics is limited, the process of the results is comprehensible, even with a large number of respondents.
The used method however leaves ample room for nuance. There are no more than four possible answers to each question that measures a characteristic and often there are fewer possibilities. A questionnaire is thereby sometimes differently interpreted by various employees. This method is therefore regarded to create an initial overview of the organisational characteristics, a first indication of the values.

The method should be extended to include a phase where these initial results can be analysed within the context of the organisation, the employees, and the environment. To create a thoroughly considered and elaborated knowledge sourcing strategy where the knowledge of the employees is optimally engaged and utilised. Difference between groups, such as business-units or departments can be more accurately analysed in such a setting than the method as applied in this thesis to decide on difference within and between characteristics. With the addition of such a phase there is a good instrument to assist an organisation in sourcing its knowledge.

The framework is very flexible, compact and usable in any organisational context, is experienced during the analysis. The most important is the accuracy of the input of the framework, the values of the characteristics. How these can be derived is already discussed in the previous section. Once these results are placed in the framework it requires analytic capacity to distil the most optimal knowledge sourcing strategy for an organisation. This process was described for the case study of the MoO, and resulted in a suggestion for a knowledge sourcing strategy. Three strategies were suggested to be executed in parallel and or sequential order. Will this however be the most optimal knowledge sourcing strategy? The answer to this question is difficult to argue. It can only be determined when the suggestion for a specific knowledge sourcing strategy is put into practice by an organisation, and the results of that implementation can be analysed.
Until that moment it should be considered a framework that assists the management to structure and narrow all necessary information when the development of a knowledge sourcing strategy is started. This is accomplished by offering four possible strategies and eight characteristics that should be analysed. It is in later phases of the development that the context

of the framework can be enlarged, such as additional characteristics that should be considered or strategies that can be placed in between the presented sourcing strategies.

Is the presented knowledge sourcing strategy the most optimal strategy for the Ministry of Oil of Iraq? Based on the information that was gathered using the chosen method it is. When the MoO executes this framework and accompanied method within the organisation it may lead to different values of the characteristics such as discussed in the previous section. These values can subsequently be analysed in the framework which leads to a more accurate and specific knowledge sourcing strategy for the MoO.

That is why it is an optimal instrument to develop a knowledge sourcing strategy, it is quick to execute, it is compact and limited and it allows organisations to be flexible when necessary and adapt it to their specific context and needs.

6 CONCLUSIONS

6.1 CONCLUSION

The research question that was stated in the first chapter was "*How affects knowledge asymmetry the performance of a contractual inter-firm relationship, and how this newly gained knowledge can be put into organisational practice?*"

Knowledge asymmetry is, through elaborate argumentation, proven a more accurate and realistic concept in the agency theory than information asymmetry. Knowledge is a combination of information, experience, skills and attitude. Information is therefore an element of knowledge, but not vice versa. The experience, skills and attitude, the tacit dimension of knowledge provides it with its specific characteristics in comparison with information. It is more costly to acquire (if possible at all), it can't be easily transferred (if possible at all), and acquiring knowledge is a lengthy process (if possible at all). In both the economic and organisational approach of the agency theory these are important considerations when contractual inter-firm relationships are analysed. Analysing such a contractual inter-firm relationship using the concept of information asymmetry will lead to inaccurate and unrealistic results. That is why the concept of knowledge asymmetry should be embedded in the agency theory.

The concept of knowledge asymmetry is significant since, organisations are increasingly involved in interactions with other organisations, as was written in the introduction of this thesis. The interactions are risky and prone to failure given the agency problems that can occur. Reducing the knowledge asymmetry in such inter-firm relationship has a positive effect on curbing the agency problems, positively affecting the performance of a contractual inter-firm relationship. The agency problems can be curbed using two mechanisms: trust and control. It is hypothesised that reducing the knowledge asymmetry allows for a more accurate assessment of trust, a more effective control mechanism to curb the agency problems. A reduction in knowledge asymmetry also allows for a more accurate assessment of risk (agency problems) and reduces the uncertainties involved in a contractual inter-firm relationship. Knowledge allows to better understand the agent in contrast to information and to use the mechanisms of trust and control more effectively.

The knowledge sourcing strategy framework provides the practical implications for an organisation that wants to use these newly gained insight in the agency theory and wonders how this theoretical research can be put into practice. Decreasing the knowledge asymmetry in a contractual inter-firm relationship can only be accomplished by acquiring knowledge. A knowledge sourcing strategy framework is therefore developed to provide organisations with an instrument to accomplish the development of a knowledge sourcing strategy. Since the academic literature did not provide such a sourcing strategy framework, a new framework is developed. It offers four possible sourcing strategies to an organisation that can be used in parallel and sequential order. Combining multiple strategies can fulfil all knowledge needs for an organisation.
A knowledge sourcing strategy can be analysed easily using the provided method. The case study has shown that it is possible to measure the perceptions of the employees on the

characteristics of the organisation and knowledge. Directly mapping the results from the questionnaire in the framework creates a simple overview of the results which can be analysed to distil the most optimal strategy based on the provided input. These first results on basis of the questionnaire method can be used as input for further discussion within the organisation; a method that is not attended to in this thesis and would need to be developed.

The knowledge sourcing framework contributes to the practical relevance of this thesis for organisations, while the concept of knowledge asymmetry and the effect of knowledge asymmetry contribute to the theoretical relevance of this thesis. The objectives for this thesis that were stated are accomplished. The concept of knowledge asymmetry is argued, the practical implications for organisations is described, and the case study shows how it can be applied in an organisational setting. The combination of elements in this thesis contribute to improving the performance of an inter-firm relationship.

In the upcoming section the limitations, but most importantly the strength of this thesis will be provided. It acknowledges the significance of the findings in this thesis. In the last section of this chapter targets for further research are explored to take the concept of knowledge asymmetry and its practical implications to a higher level.

6.2 STRENGTHS AND LIMITATIONS

There are three limitations to this research. At first, the concept of knowledge asymmetry is not embedded in the economic models of the agency theory. The introduction of the concept in the literature is therefore not yet economically sound. This undermines the validity of the concept as proposed.

The propositions that connect knowledge asymmetry to performance of a contractual inter-firm relationship have to be empirically verified. It is possible that there is no statistical significance that supports the propositions. However based on earlier research into the effect of knowledge on risk, trust and control which is referred to in chapter two, there is confidence that the hypothesis will be acknowledged in further research.

The framework is newly developed and only applied in a specific case study. There has not been an opportunity to test the validity of the framework and it’s completeness regarding the characteristics. There is for example also no distinction for the quality of knowledge in the framework (for example, between outdated and up-to-date knowledge).

Although there are some significant limitations based on academic grounds, overcoming the limitations is a matter of time, not a question whether these can be resolved. It is the first comprehensive contribution of knowledge asymmetry in the academic literature. The most important contribution of this thesis is the addition of knowledge asymmetry to the agency theory. It is a more powerful concept to model the contractual inter-firm relationship, and will provide more realistic insight and outcomes on the effect of knowledge asymmetry in the contractual inter-firm relationship between a principal and an agent.

The concept of knowledge asymmetry is also an important contribution to the organisation theory and provides practical relevance to organisations. It provides a better instrument in

contractual relationships for organisations in contrast to information asymmetry. It is argued that knowledge asymmetry is a critical element in the performance of a contractual inter-firm relationship. Organisations that attend to knowledge asymmetry can increase the performance of their contractual inter-firm relationships.

The last valuable contribution of this research follows on that last argument. Using the knowledge sourcing strategy framework, an organisation can quickly and easily analyse how the necessary knowledge can be acquired. The simplicity of the framework does not weaken its value. Analysing a limited number of organisational and knowledge characteristics increases the practical and immediate use. The developed method to analyse the characteristics of the framework can be quickly executed and will provide a useful starting point for the further and more detailed development of the knowledge sourcing strategy in joint effort with the employees within the organisation. The design of the framework allows it to be used not only on an organisational level, but also on business-unit or department level, where there are more specific and detailed knowledge needs. It is quick, flexible, easy to use, and to interpreted by its users. The developed framework is an essential tool in establishing a knowledge sourcing strategy.

6.3 FURTHER RESEARCH

Based on the strengths and limitations there are three suggestions for further research.
At first it will be valuable to embed knowledge asymmetry in economic agency model. This will provide a basic model that can be used by academics for further research to analyse the effect and the contribution of the new concept of knowledge asymmetry to the agency theory.

Secondly will it also be valuable to empirically validate the hypotheses that describe the effect of knowledge asymmetry on the performance of a contractual inter-firm relationship. Valid results will contribute to the understanding of inter-firm relationships, which is relevant since these are risky and often are unsuccessful. The model in this thesis connects knowledge asymmetry to the performance of a contractual inter-firm relationship. Increased understanding of inter-firm relationships will contribute to the performance of an inter-firm relationship and increase our understanding of the performance of an inter-firm relationship.

Thirdly is it necessary to validate the knowledge sourcing framework. The completeness of the current characteristics will have to be verified and the questionnaire will have to be further developed. The quality of knowledge should also be incorporated in the framework as that is not yet incorporated.

6.4 DISCUSSION

This thesis provides a knowledge sourcing strategy that assists an individual organisation to find an answer to the question "*How can an individual organisation source the identified knowledge?"* No similar approaches to this question in previous academic research has been found. In this section a reflection on the work in this article in comparison with research that already has been published and has comparable elements will be presented. It will position the developed knowledge sourcing strategy in the current academic research, and argue the added

value of this knowledge sourcing strategy to the academic field in comparison with previous research.

When analysing the available academic research, several different approaches to knowledge (sourcing) strategies can be distilled. Three categories can be distinguished. 1) The *process* of knowledge sourcing, 2) the *context* of knowledge sourcing, and 3) the *source* of knowledge.

The first category on the *process* of knowledge sourcing is aimed at how the knowledge is sourced. March (1991) distinguishes between the exploration of new knowledge and the exploitation of old knowledge. Von Krogh et al. (2000) distinguish between knowledge creation and knowledge transfer. Both perspectives are comparable to each other and show similarities. The source of the knowledge is however not regarded in these articles.

The *source* of knowledge is however regarded by Chen and Lin (2004), Mason et al. (2004), and Murray et al. (2009). Chen and Lin (2004) and Murray et al. (2009) distinguish between the internal and external sourcing of knowledge. Mason et al. (2004) is only aimed at sourcing from external sources. These articles however do not recognise the process of knowledge sourcing, how an organisation can source it.

The last category, the *context* of knowledge sourcing is described by many authors. Hamel (1991), Lam (1997), Howell et al. (2004), Grant and Baden-Fuller (2004), and De Clerq and Dimov (2008) focused their articles at the sourcing of knowledge in inter-firm relationships such as alliances or ventures. The creation of knowledge within an organisation is however not attended to in these articles.

The knowledge sourcing strategy as presented in this thesis resembles many elements that are found as separate elements in each of the presented individual articles. The knowledge sourcing strategy has brought these elements together in one model. It incorporates the possibility of internal and external sourcing, as well as absorbing or accessing knowledge. The model can be applied in many contexts, as the model is indifferent to a specific context. It can be applied in inter-firm relationships or as solo organisation that has a need to source knowledge, from an organisational level, business unit level or individual level. It provides a simple framework offering a complete palette of possibilities for an organisation that is confronted with a challenge to source knowledge.

7 BIBLIOGRAPHY

Akerlof, G. (1970). The Market for "Lemmons": Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics, 84*(3), 488-500.

Al Sa'adoon, O. (2010). *Negotiating Construction Contracts with an Iraqi Government Entity.* Iraq Energy Institute.

Al-Furaiji, M. (2012). Personal Communication.

Almeida, P. (1996). Knowledge Sourcing by Foreign Multinationals: Patent Citation Analysis in the US Semiconductor Industry. *Strategic Management Journal, 17*(Winter Special Issue), 155-165.

Anand, V., Manz, C., & Glick, W. (1998). An Organizational Memory Approach to Information Management. *The Academy of Management Review, 23*(4), 796-809.

Baiman, S. (1982). Agency Research in Managerial Accounting: A Survey. *Journal of Accounting Literature, 1*, 154-213.

Baiman, S. (1990). Agency Research in Managerial Accounting: A Second Look. *Accounting, Organizations and Society, 15*(4), 341-371.

Berends, H., & Boersma, K. W. (2003). The Structuration of Organizational Learning. *Human Relations, 56*(9), 1035-1056.

Bierly, P., & Chakrabarti, A. (1996). Generic Knowledge Strategies in the U.S. Pharmaceutical Industry. *Strategic Management Journal, 17*(Knowledge and the Firm), 123-135.

Blackler, F. (1995). Knowledge, Knowledge Work and Organizations: An Overview and Interpretation. *Organization Studies, 16*(6), 1021-1046.

Blaikie, N. (2003). *Analyzing Quantitative Data.* London Thousand Oaks, CA: Sage Publications.

Bostrom, A. (1997). Risk Perceptions: "Experts" vs. "Lay People". *Duke Environmental Law and Policy Forum, 8*(101), 101-113.

Brown, T., Potoski, M., & Van Slyke, D. (2006). Managing Public Service Contracts: Aligning Values, Institutions, and Markets. *Public Administration Review*(May - June), 323-331.

Casselman, R., & Samson, D. (2007). Aligning Knowledge Strategy and Knowledge Capabilities. *Technology Analysis & Strategic Management, 19*(1), 69-81.

Cassiman, B., & Veugelers, R. (1999). Complementarity between Technology Make and Buy in Innovation Strategies: Evidence from Belgian Manufacturing Firms. *Research Policy, 28*(1), 63-80.

Chen, C., & Lin, B. (2004). The Effects of Environment, Knowledge Attribute, Organizational Climate, and Firm Characteristics on Knowledge Sourcing Decisions. *R&D Management, 34*(2), 137-146.

Cohen, W., & Levinthal, D. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly, 35*(1), 128-152.

Conlon, E., & Parks, J. (1990). Effects of Monitoring and Tradition on Compensation Arrangements: An Experiment with Principal-Agent Dyads. *The Academy of Management Journal*, 603-622.

Cook, S., & Brown, J. (1999). Bridging Epistemologies: The Generative Dance between Organisational Knowledge and Organisational Knowing. *Organization Science, 10*(4), 381-400.

Cravens, D., Ingram, T., LaForge, R., & Young, C. (1993). Behavior-based and Outcome-based Salesforce Control Systems. *Journal of Marketing, 57*(4), 47-59.

Das, T. (2004). Time-Span and Risk of Partner Opportunism in Strategic Alliances. *Journal of Manegerial Psycholoy, 19*(8), 744-759.

Das, T., & Teng, B. (1996). Risk Types and Inter-Firm Alliance Structures. *Journal of Management Studies, 33*(6), 827-843.

Das, T., & Teng, B. (1999). Managing Risks in Strategic Alliances. *Academy of Managent Executive, 13*(4), 50-62.

Das, T., & Teng, B. (2001). Trust, Control, and Risk in Strategic Alliances: An Integrated Framework. *Organization Studies, 22*(2), 251-283.

Dawson, G., Watson, R., & Boudreau, M. (2010). Information Asymmetry in Information System Consulting: Toward a Theory of Relationship Constraints. *Journal of Management Information Systems, 27*(3), 143-177.

de Clerq, D., & Dimov, D. (2008). Internal Knowledge Development and External Knowledge Access in Venture Capital Investment Performance. *Journal of Management Studies, 45*(3), 585-612.

Denscombe, M. (2010). *Ground rules for social research : guidelines for good practice.* Maidenhead: Open University Press.

Dillman, D. (2000). *Mail and Internet Surveys: The Tailored Design Method* (2nd ed.). New York: Wiley.

Dobbin, F., & Jung, J. (2010). The Misapplication of Mr. Michael Jensen: How Agency Theory Brouhgt Down the Economy and why it Might Again. In M. Lounsbury, & P. Hirsch, *Markets on Trial: The Economic Sociology of the U.S. Financial Crisis: Part B* (pp. 29-64). Bingley: Emerald.

Donkers, B., Melenberg, B., & van Soest, A. (2001). Estimating Risk Attitudes using Lotteries; a Large Sample Approach. *Journal of Risk and Uncertainty, 22*(3), 165-195.

Dyer, J., & Singh, H. (1998). The Relational View: Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *Academy of Management Review*, 660-679.

Eisenhardt, K. (1985). Control: Organizational and Economic Approaches. *Management Science, 31*(2), 134-149.

Eisenhardt, K. (1989). Agency Theory: An Assessment and Review. *Academy of Management Review, 14*(1), 57-74.

Fama, E. (1980). Agency Problems and the Theory of the Firm. *Journal of Political Economy, 88*(2), 288-307.

Financial Times. (2010, March 29). *IP fuels speculation by hiring McKinsey*. Retrieved February 10, 2012, from FT.com: http://www.ft.com/intl/cms/s/0/a303e01a-3ab6-11df-b6d5-00144feabdc0.html#axzz1lu0dLFKy

Financial Times. (2011, May 10). *Microsoft in $8.5bn Skype gamble*. Retrieved February 9, 2012, from FT.com: http://www.ft.com/cms/s/2/9461dbb4-7ab8-11e0-8762-00144feabdc0.html#axzz1lu0dLFKy

Flamholtz, E., Das, T., & Tsui, A. (1985). Toward an Integrative Framework of Organisational Control. *Accounting Organizations and Society, 10*(1), 35-50.

Grant, R. (1996). Toward a Knowledge-Based Theory of the Firm. *Strategic Management Journal, 17*(Winter Issue), 109-122.

Grant, R., & Baden-Fuller, C. (2004). A Knowledge Accessing Theory of Strategic Alliances. *Journal of Management Studies, 41*(1), 61-84.

Greenwald, B. (1986). Adverse Selection in the Labour Market. *The Review of Economic Studies, 53*(3), 325-347.

Gulati, R., & Nickerson, J. (2008). Inter-organisational Trust Governance Form and Exchange Performance. *Organization Science, 19*(5), 688-708.

Hamel, G. (1991). Competition for Competence and Inter-Partner Learning within International Strategies. *Strategic Management Journal, 12*(Summer), 83-103.

Hardin, R. (2002). *Trust and Trustworthiness.* New York: Russel Sage Foundation.

Hayek, F. (1945). The Use of Knowledge in Society. *The American Economic Review, 35*(4), 519-530.

Hefetz, A., & Warner, M. (2004). Privitization and Its Reverse: Explaining the Dynamics of the Government Contracting Process. *Journal of Public Administration Research and Theory, 14*(2), 171-190.

Hofstede, G. (2012). *National Culture Comparison (Netherlands - Iraq)*. Retrieved March 13, 2012, from Geert Hofdstede: http://geert-hofstede.com/iraq.html

Hosmer, L. (1995). Trust: The Connecting Link between Organizational Theory and Philosophical Ethics. *The Academy of Management Review, 20*(2), 379-403.

Hovland, I., Janis, I., & Kelley, H. (1952). *Communications and Persuasion: Psychological studies of Opinion Change.* New Haven: Yale University Press.

Howells, J., James, A., & Malik, K. (2003). The Sourcing of Technological Knowledge: Distributed Innovation Processes and Dynamic Change. *R&D Management, 33*(4), 395-409.

Jansen, J., van den Bosch, F., & Volberda, H. (2005). Managing Potential and Realized Absorptive Capacity: How do Organizational Antecedents Matter? *Academy of Management Journal, 48*(6), 999-1015.

Jensen, M., & Meckling, W. (1976). Theory of the Firm: Managerial Behavior, Agency Cost and Ownership Structure. *Journal of Financial Economics*, 305-360.

Jensen, M., & Meckling, W. (1992). Specific and General Knowledge, and Organizational Structure. In L. Werin, & H. Wijkander, *Contract Economics* (pp. 251-274). Oxford: Blackwell.

Jiyad, A. (2009, April 12). *Iraq Enterprise.* Retrieved April 20, 2012, from Iraq Enterprise: http://www.iraq-enterprise.com/rep/jiyad.pdf

Jiyad, A. (2012). *Regimes Governing the Development of and Revenues from Upstream Petroleum Sector in Iraq.* Iraq Development Consultancy and Research.

Karim, U. (2012). Personal Conversation. (R. Dellemijn, Interviewer)

Kishore, R., Agrawal, M., & Raghav Rao, H. (2004). Determinants of Sourcing During Technology Growth and Maturity: An Emperical Study of e-Commerce Sourcing. *Journal of Management Information Systems, 21*(3), 47-82.

Klein, B., & Leffler, K. (1981). The Role of Market Forces in Assuring Corporate Contractual Performance. *Journal of Political Economy, 89*(4), 615-641.

Kosnik, R. (1987). Greenmail: A Study of Board Performance in Corporate Governance. *Administrative Science Quarterly, 32*(2), 163-185.

Kramer, R. (1999). Trust and Distrust in Organizations: Emerging Perspectives, Enduring Questions. *Annual Review of Psychology, 50*, 569-598.

Kurtz, N. (1999). *Statistical Analysis for Social Sciences.* Boston: Allyn and Bacon.

Lane, C., & Bachman, R. (1996). The Social Constitution of Trust: Supplier Relations in Britain and Germany. *Organization Studies, 17*(3), 365-395.

Lee, S., Liang, H., & Liu, C. (2010). The Effects of Absorptive Capacity, Knowledge Sourcing Strategy, and Alliance Forms on Firm Performance. *The Service Industries Journal, 30*(14), 2421-2440.

Lewis, T., & Sappington, D. (1991). Incentives for Monitoring Quality. *The RAND Journal of Economics, 22*(3), 370-384.

Liesch, P., Welch, L., & Buckley, P. (2011). Risk and Uncertainty in Internationalisation and International Entrepreneurship Studies - Review and Conceptual Development. *Management International Review, 51*, 851-873.

Lueg, C. (2001). Information, knowledge, and networked minds. *Journal of Knowledge Management, 5*(2), 151-160.

March, J. (1991). Exploration and Explotation in Organizational Learning. *Organization Science, 2*(1), 71-87.

March, J., & Shapira, Z. (1987). Managerial Perspectives on Risk and Risk Taking. *Management Science, 33*(11), 1404-1418.

Mason, G., Beltramo, J., & Paul, J. (2004). External Knowledge Sourcing in Different National Settings: a Comparison of Electronics Establishments in Britain and France. *Research Policy, 33*(1), 53-72.

Mayer, R., Davis, J., & Schoorman, F. (1995). An Integrative Model of Organizational Trust. *The Academy of Management Review, 20*(3), 709-734.

Milward, H., & Provan, K. (2000). Governing the Hollow State. *Journal of Public Administration Research and Theory, 10*(2), 359-379.

New York Times. (2008, July 1). *Iraq to Open Oil Fields for 35 Foreign Companies; Initial No-Bid Contracts Delayed*. Retrieved April 19, 2012, from NYTimes.com: http://www.nytimes.com/2008/07/01/world/middleeast/01iraq.html?_r=1&ref=oil

New York Times. (2009a, July 2). *Oil in Iraq*. Retrieved april 19, 2012, from NYTimes.com: http://topics.nytimes.com/topics/news/international/countriesandterritories/iraq/oil/index.html?s=oldest&

New York Times. (2009b, October 13). *As Iraq Seeks Oil Investors, They See an Uncertain Bet*. Retrieved April 20, 2012, from NYTimes.com: http://www.nytimes.com/2009/10/14/world/middleeast/14iraqoil.html?ref=oil

New York Times. (2011, June 16). *In Rebuilding Iraq's Oil Industry, U.S. Subcontractors Hold Sway*. Retrieved April 19, 2012, from NYtimes.com:

http://www.nytimes.com/2011/06/17/business/energy-environment/17oil.html?pagewanted=all

Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-Creating Company.* New York: Oxford University Press.

Nooteboom, B. (1996). Trust, Opportunism and Governance: A Process and Control Model. *Organization Studies, 10*(6), 985-1010.

Ouchi, W. (1977). The Relationship Between Organizational Structure and Organizational Control. *Administrative Science Quarterly, 22*(1), 95-113.

Ouchi, W. (1979). A Conceptual Framework for the Design of Organizational Control Mechanisms. *Management Science, 25*(9), 833-848.

Ouchi, W. (1980). Markets, Bureaucracies, and Clans. *Administrative Science Quarterly, 25*(1), 129-141.

Oxford Dictionaries. (2011). *Asymmetry*. Retrieved 12 29, 2011, from Oxford Dictionaries: http://oxforddictionaries.com/definition/asymmetry?q=asymmetry

Pauly, M. (1968). The Economics of Moral Hazard: Comment. *The American Economic Review, 58*(3), 531-537.

Peterson, R. (2000). *Constructing Effective Questionnaires.* Thousand Oaks: Sage Publications.

Polanyi, M. (1966). *The Tacit Dimension.* Magnolia, MA: Peter Smith.

Poppo, L., & Zenger, T. (2002). Do Formal Contracts and Relational Governance Function as Substitutes or Complements. *Strategic Management Journal, 23*(8), 707-725.

Prager, J. (1994). Contracting Out Government Services: Lessons from the Private Sector. *Public Administration Review, 54*(2), 176-184.

Prahalad, C., & Hamel, G. (1990). The Core Competence of the Corporation. *Harvard Business Review*(may-june), 1-15.

Robson, C. (2002). *Real world research : a resource for social scientists and practitioner-researchers.* Oxford: Blackwell Publishers.

Rothwell, R. (1991). External Networking and Innovation in Small and Medium-sized Manufacturing Firms in Europe. *Technovation, 11*(2), 93-112.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students.* New York: Prentice Hall.

Schoorman, F., Mayer, R., & Davis, J. (2007). An Integrative Model of Organizational Trust: Past, Present, and Future. *Academy of Management Review, 32*(2), 344-354.

Shapiro, S. (2005). Agency Theory. *Annual Review of Sociology, 31*, 263-284.

Sharma, A. (1997). Professional as an Agent: Knowledge Asymmetry in Agency Exchange. *Academy of Management Review, 22*(3), 758-798.

Sheppard, B., & Tuchinsky, M. (1996). Micro-OB and the network organisation. In R. Kramer, & T. Tyler, *Trust in Organizations: Frontiers of Theory and Research* (pp. 140-165). Thousand Oaks, CA: Sage Publications, Inc.

Smith, A. (1776). *An Inquiry into the Nature and Causes of the Wealth of Nations.* London: Methuen & Co., Ltd.

Smith, W. (1895). Knowledge. *Mind, 4*(16), 489-505.

Strausz, R. (1997). Delegation of Monitoring in a Principal-Agent Relationship. *The Review of Economic Studies, 64*(3), 337-357.

Subramani, M., & Venkatraman, N. (2003). Safeguarding Investments in Asymmetric Interorganizational Relationships: Theory and Evidence. *Academy of Management Journal, 46*(1), 46-62.

Tate, W., Ellram, L., Bals, L., Hartmann, E., & van der Valk, W. (2010). An Agency Theory Perspective on the Purchase of Marketing Services. *Industrial Marketing Management, 39*(5), 806-819.

Tirole, J. (1986). Procurement and Renegotiation. *Journal of Political Economy, 94*(2), 235-259.

Tirole, J. (1999). Incomplete Contracts: Where do we Stand. *Econometrica, 67*(4), 741-781.

Tiwana, A., & Keil, M. (2007). Does Peripheral Knowledge Complement Control? An Emperical Test in Technology Outsourcing Alliances. *Strategic Management Journal, 28*(6), 623-634.

Turner, K., & Makhija, M. (2006). The Role of Organizational Controls in Managing Knowledge. *Academy of Management Review, 31*(1), 197-217.

uit Bijerse, R. (1999). Questions in Knowledge Management: Defining and Conceptualising a Phenomenon. *Journal of Knowledge Management, 3*(2), 94-109.

United Press International. (2009, February 13). *Report pans Iraq oil contracts, further politicizes oil policy*. Retrieved April 20, 2012, from UPI.com: http://www.upi.com/Business_News/Energy-Resources/2009/02/13/Report-pans-Iraq-oil-contracts-further-politicizes-oil-policy/UPI-14211234559474/

van Daal, B., de Haas, M., & Weggeman, M. (1999). The Knowledge Matrix: A Participatory Method for Individual Knowledge Gap Determination. *Knowledge and Process Management, 5*(4), 255-263.

van der Vrande, V., Lemmens, C., & Vanhaverbeke, W. (2006). Choosing Governance Modes for External Technology Sourcing. *R&D Management, 36*(3), 347-363.

Vanhaverbeeke, W., Cloodt, M., & Van de Vrande, V. (2008). Connecting Absorptive Capacity and Open Innovation. *Working Paper*, 1-22.

Vermaak, H., & Weggeman, M. (1999). Conspiring Fruitfully with Professionals: New Management Roles for Professional Organisations. *Management Decision*, 29-44.

Verschuren, P., & Doorewaard, H. (2005). *Het Ontwerpen van een Onderzoek.* Utrecht: LEMMA.

Verschuren, P., & Doorewaard, H. (2007). *Het Ontwerpen van een Onderzoek.* Den Haag: Lemma.

von Krogh, G., Nonaka, I., & Aben, M. (2001). Making the Most of Your Company's Knowledge: A Strategic Framework. *Long Range Planning, 34*(4), 421-439.

Walsh, J., & Seward, J. (1990). On the Efficiency of Internal and External Corporate Control Mechanisms. *The Academy of Management Review*, 421-458.

Wang, M., Keller, C., & Siegrist, M. (2011). The Less You Know, the More You Are Afraid of - A Survey on Risk Perceptions of Investment Products. *The Journal of Behavioral Finance, 12*(1), 9-19.

Wärneryd, K. (1996). Risk Attitudes and Risky Behaviour. *Journal of Economic Psychology, 17*(6), 749-770.

Weggeman, M. (1997). *Kennismanagement. Inrichting en Besturing van Kennisintensieve Organisaties.* Schiedam: Scriptum.

Williamson, O. (1973). Markets and Hierarchies: Some Elementary Considerations. *The American Economic Review, 63*(2), 316-325.

Williamson, O. (2002). The Theory of the Firm as a Governance Structure: From Choice to Contract. *Journal of Economic Perspectives, 16*(3), 175-191.

Wilson, R., & Crouch, E. (1987). Risk Assessment and Comparisons: An Introduction. *Science*, 267-270.

Zack, M. (2006). Developing a Knowledge Strategy. In L. Prusak, & E. Matson, *Knowledge Management and Organizational Learning : a Reader* (pp. 30-51). Oxford: Oxford University Press.

Zaheer, A., McEvily, B., & Perrone, V. (1998). Does Trust Matter? Exploring the Effects of Interorganizational and Interpersonal Trust on Performance. *Organization Science, 9*(2), 141-159.

A. QUESTIONNAIRE FORM

A.1 QUESTIONNAIRE INTRODUCTION

Dear Madam/Mister,

Please read this introduction carefully.

Welcome to the questionnaire that will analyse the characteristics of your organisation with the objective to formulate a knowledge sourcing strategy for your organisation.

This questionnaire will take approximately 10 minutes to complete.

There are 18 multiple-choice questions divided over three pages. Each page consists of multiple questions and is preceded with a short introduction. Each question consists of multiple answers. Please pick the answer that is the most closely related to your perception of the organisation. In the context of this research there are no right or wrong answers. Only one answer can be given at each question.

A knowledge sourcing strategy is determined for each separate knowledge domain. As different knowledge domains are of different relevance to the organisation, separate strategies are necessary for an optimal result. A knowledge domain can for example on a general level be knowledge on 'building an driling rig', 'operating an oil well', 'transporting oil' or 'safety on oil wells'.

In consultation with Dr. Karim, service-contract control and management is chosen as knowledge domain for this questionnaire. Please regard this knowledge domain when answering each question. Answer each question as if you will be going to acquire this knowledge in your department.

Thank you for your attention so far, success with completing the questionnaire. Please start the questionnaire by clicking on the next button at the bottom of this page.

Yours Sincerely,
Robert Dellemijn

A.2 KNOWLEDGE AND THE ORGANISATION

The questions on this page are aimed to determine some general characteristics of the department, some details on your knowledge needs and the availability of the knowledge.

Please remember that you can only give one answer at each question. Choose the answer that accurately matches your perception of the organisation. There are no right or wrong answers to these questions.

Personal Information

Name:

Department:

Time to knowledge

1) The new knowledge within this domain is needed within this time span.
    - 0-3 months (very short)
    - 3-6 months (short)
    - 6-12 months (medium)
    - >12 months (long)

Knowledge Time Span

2) The knowledge in this domain is needed at the department for a time of.
    - 0-6 months (short)
    - 6-24 months (medium)
    - >24 months (long)

Knowledge availability

3) Would the department consider the knowledge within this domain to be well developed at external sources?
    - Yes
    - No
4) Would the department regard this knowledge to be very specific to this own department?
    - Yes
    - No
5) Would external sources to this department share this knowledge with this department (free or paid)?
    - Yes
    - No
6) Would the department consider this knowledge to be available from books or learning by doing?
    - Books
    - Learning by doing

A.3 ORGANISATION RESOURCES AND CAPACITY

Please remember that you can only give one answer at each question. Choose the answer that accurately matches your perception of the organisation. There are no right or wrong answers to these questions.

Absorptive Capacity

7) The amount of knowledge the department has in this knowledge domain:
    - No knowledge
    - Limited knowledge
    - Some knowledge

- Knowledgeable

8) What would an accurate estimate of the current knowledge of the department in this knowledge domain, compared to the level of knowledge you would like to achieve in this knowledge domain?
    - It is challenging for the department to get a grasp of the new knowledge as it is difficult to understand it given our current knowledge base.
    - The department has partial understanding. It is beginning to learn the knowledge in this domain.
    - The department already has significant knowledge in this knowledge domain and has no difficulties to understand the new knowledge.
9) The department periodically organizes meetings with customers, competitors, suppliers or other third parties to acquire new insights and knowledge. The approximate number of meetings organized in a year:
    - 0-1 a year
    - 2-4 a year
    - 5-8 a year
10) The department has employee(s) who act as intermediaries to connect staff and their (knowledge) needs within the organization. The approximate number of employees in our department that perform this function:
    - 0
    - 1
    - >2
11) The department and employees periodically organize internal 'events' to share knowledge, experiences and new insights with each other. The approximate number of meetings organized in a year:
    - 0-1 a year
    - 2-4 a year
    - 5-8 a year

Human Resource Capacity

12) Does the department have sufficient staff to reach this years goals
    - Yes, we have sufficient staff (Overstaffed)
    - We have sufficient staff but capacities do not align with future challenges (understaffed)
    - No, we are short on staff (Understaffed)

Financial Capacity

13) Is the budget of the department sufficient to fulfill next years goals?
    - No, the budget is tight and forces the department, to make critical decisions regarding scarce financial resources. (Low)
    - Yes the budget is just sufficient (Medium)

- Yes the budget is sufficient and the department has the resources to invest in additional projects that support the strategy (High)

A.4 ORGANISATION VISION AND ATTITUDE

This is the last page of the survey. Please complete the last questions, it will be greatly appreciated.

Core Competence

14) Would this knowledge domain be critical for the operation of the department and the achievement of its strategy?
    - Without the knowledge in this domain would it be impossible to execute our strategy (core)
    - This knowledge domain supports the strategy but is not critical to execute our strategy (neutral)
    - The execution of the strategy could be managed without the knowledge in this domain. (non-core)

Risk Attitude

15) The department has two possible investment projects that are closely related to the department operations. Both require the same financial investment. Which of the two following investment options would you choose?
    - You invest in project A that has a chance of 75% for a return of $60.000 within a year (or 25% chance for a return of $0). (Risk Seeking)
    - You invest in project B with a guaranteed return of $40.000 within a year. (Risk Averse)

A.5 THANK YOU!

Dear Madam/Mister,

I would like to sincerely thank you for your help, it is greatly appreciated.

The results of the research will be provided to you within 2 months.

Yours Sincerely,
Robert Dellemijn

As this questionnaire only consists of closed questions I would like to provide the opportunity to you to leave any comments you would like. Do you have a remark on the questionnaire, on the subject of my research or if you would like to leave a comment on a different subject? Please feel free to do so.

B. QUESTIONNAIRE COMMUNICATION

B.1 PRE-NOTICE LETTER

R.N.J.C. Dellemijn
The Netherlands

April 4st, 2012

Deputy Minister Ahmed A. Al-shamma
Deputy Office for Refineries
Ministry of Oil
Portsa'id Street - Oil Complex
Bagdad - Zayonah
Iraq

Dear Mister Al-shamma,

Within two weeks you will receive a research questionnaire in your e-mail. The intention of this questionnaire is to gain a better understanding of your organisation. I would be honoured if you could share your knowledge and expertise of your organisation and thereby contribute to my research. Your help would be greatly appreciated.

This research is executed by me personally and supervised by Dr. U.F.A. Karim, Dr. A.H. van Reekum and Dr. P. de Vries, all affiliated to Twente University. Dr. Karim is known to the DG Training & Development and to the Deputy Minister for Refineries and has recommended your name for conducting this questionnaire.

Your response to the questionnaire will be greatly appreciated in these busy times. The cover letter attached to the questionnaire will describe the request and the usefulness of the questionnaire in more detail. This will be send to you within two weeks.

Yours Sincerely,

Robert Dellemijn, BSc

B.2 PRE-NOTICE LETTER FOLLOW UP

R.N.J.C. Dellemijn
The Netherlands

April 9st, 2012

Adressed to:
Acting Director General Iqdam M. Ridha of the Training and Development Directorate

Deputy Minister Ahmed A. Al-Shamma of the Deputy Office for Refineries
Acting Director General Fayadh H. Niima of the Technical Directorate
Acting Director General Nehad A. Moosa of the State Company of Oil Projects
Acting Director General Abdulmahdi H. Al-Omaidi of the Petroleum Contracts & Licenses Directorate
Director General of the Reservoir & Fields and Development Directorate

Ministry of Oil
Portsa'id Street - Oil Complex
Bagdad - Zayonah
Iraq

Dear Mister Iqdam,

Dear Sir/Madam,

Thank you for calling Mister Karim so promptly about my request that I've send you last week. I was positively surprised by such a swift response. I'm writing to you to explain my request in more detail.

Mister Karim is supervising my academic thesis. I had a meeting with him several months ago at the start of my thesis. We discussed the challenges that the Ministry of Oil is confronted with, especially regarding the TS contracts with many International Oil Companies. Contracts that deliver complex products and services and that require tight monitoring and control by your organization. Managing this process is a great challenge, since these TS contracts are complex to implement. The challenge intrigued me as a researcher and I have chosen to look at the subject in more depth for my master study program at the University of Twente.

As groundwork for my academic thesis I first argued that knowledge is important in a relationship (much more important than information). Secondly I argued that the smaller the knowledge gap is between a buyer and a supplier, the better the performance of a relationship between the buyer and seller will be. This all based on a vast amount of academic sources.

Based on that conclusion I stated that the only way to decrease the knowledge gap is to acquire knowledge. I therefore created a knowledge sourcing strategy that I would like to apply to your organization as a field study, the final part of my academic thesis and the only missing part for completion. I have one month to collect the data on your organisation and finalise my field study.

Please be assured that the type of research is of academic nature and is of benefit to your organization. The survey that you will receive will show that no questions are asked that are of confidential or sensitive nature. Your response will be acknowledged but can also be treated in complete confidentiality according to your wish. You will receive the results of the research in the form of the final thesis with acknowledgement of the Ministry. You can review the information before it is published.

I will send the questionnaire this week. It will include a cover letter that will describe the questionnaire in more detail, for example what I request, why It is useful for you and how I will approach the confidentiality of this questionnaire.

I hope to contribute some results of this research that are useful to your organization on a very important energy resource that is significant to your country and the world at large, and would like to sincerely thank you for your interest thus far.

Yours Sincerely,

Robert Dellemijn, BSc

B.3 REMINDER LETTER

Deputy Minister Ahmed A. Al-Shamma
Deputy Office for Refineries
Ministry of Oil
Portsa'id Street - Oil Complex
Bagdad - Zayonah
Iraq

April 24, 2012

Dear Mister Al-Shamma,

On the 12th of April I have sent you a questionnaire. Your contribution to this research is critical and would be greatly appreciated, however until now not everyone has responded. I would like to remind you that the questionnaire closes at the 11th of May.
The questionnaire statistics show that the website was visited by a number of people, however the questionnaire was not completed for reasons unknown to me. If there is anything regarding the questionnaire that is withholding you from completing it, please feel free to contact me.

Your contribution to this study by completing this questionnaire is of importance for your organisation. I can only formulate a knowledge sourcing strategy with your help. This strategy can assist you in attracting new knowledge that you deem necessary for the (future) operations of your department.

The questionnaire is available at this website:

http://www.eSurveysPro.com/Survey.aspx

I have attached the cover letter that was provided with the previous e-mail that requested your help. It contains more detailed information about the questionnaire.

Yours Sincerely,

Robert Dellemijn, BSc

B.4 COVERLETTER

R.N.J.C. Dellemijn
The Netherlands

April 12th, 2012

Acting Director General Abdulmahdi H. Al-Omaidi
Petroleum Contracts & Licenses Directorate
Ministry of Oil
Portsa'id Street - Oil Complex
Bagdad - Zayonah
Iraq

Dear Mister Al-Omaidi,

The request: I am writing you to help me understand your organisation, more specifically the characteristics of your organisation. Based on the information that you provide I can develop a knowledge sourcing strategy, using a self-developed tool. This tool can assist in the capacity building of your organisation. The questionnaire will take approximately 10 minutes to complete.

Why were you selected: Information on the characteristics of the organisation is critical as input for the knowledge sourcing strategy framework. As Acting Director General of your department I have the expectation that you have the most accurate insight on these organisation characteristics. Together with Dr. Karim, who supports and supervises this research, you are valued as critical contributor to this research.

Usefulness of this survey: My research is aimed at the monitoring and control of external suppliers, such as International Oil Companies. In my research I argue the importance of knowledge in relationships with suppliers, especially in relationships where the supplier has a powerful position or delivers complex products or service. Having knowledge on the products or services that are acquired is critical for the performance of the relationship with the supplier. This will increase the chance that you will receive the product as you ordered. Hence, I developed a tool to determine an optimal knowledge sourcing strategy so that the knowledge gap between the buyer and the supplier can be narrowed. At the end this tool should assist you to effectively acquire new knowledge and increase consequently the effectiveness of the monitor and control of relationships with suppliers.

You will get in return: Based on you answers to this questionnaire I will develop a knowledge sourcing strategy that is specifically designed for your organisation. This knowledge sourcing strategy as well as my thesis will be provided to you in exchange as acknowledgement for you helpful cooperation. You will be able to fully and freely use the outcomes of this research for your organisation.

Confidentiality: Your answers to this questionnaire will be completely confidential. Your answers will anonymised upon processing and cannot be traced back to yourself. This

questionnaire is used only for this research. Your answers to this questionnaire will not be used for any other purpose. As a researcher I will not cooperate with any request for the data of this research from third parties. The survey will not ask confidential or sensitive organizational information. You can review the information that is provided by this questionnaire before publication of the research.

Deadline: I would appreciate it if you could complete the questionnaire as soon as possible. The questionnaire will close on 11 may 2012. I will send a reminder on the 24th of April, if you haven't been able to complete the questionnaire before that time.

Questions: If you have any questions regarding this questionnaire I am happy to answer these. Please contact me using the information provided at the bottom of the letter.

Thank you!: I hope that you are able to find some of your sparse time to answer the questionnaire. I can only thank you in advance for your interest and cooperation thus far.

Yours Sincerely,

Robert Dellemijn, BSc

B.5 APPRECIATION LETTER

Dear Mister,

I would like to sincerely thank you for your cooperation with my research. It has provided me with a valuable insight into the MoO and enabled me to complete my research.

I would like to share the results of my research with you, it is attached as a pdf file to this e-mail. If you have any questions or comments regarding the results or like to share your thoughts on the piece, please contact me.

Once again my sincere appreciation for your cooperation, and many thanks.

Yours Sincerely,

Robert Dellemijn

C. QUESTIONNAIRE RESULTS

In this chapter the results of the questionnaire will be presented. The results of each group will be described and the main differences between the two groups. The result of each individual question is separately placed in a table. The answers are placed in this table for both groups, the MoO officials and the external advisors and former employees (from here on referred to as advisors). The results presented in the tables are the answers in absolute numbers. Two colours are used in the tables to indicate the mode (dark blue), and the possible values where the respondents were divided in between in their responses (light blue).

From the MoO officials there are three respondents, and consequently three answers to each question. A response rate of three out of seven. The advisors completed four questionnaires, a response rate of four out of six. Four answers of those respondents will be presented at each separate question.

At first, the questions and the results that measured the organisation specific characteristics will be presented (section C.1). In the subsequent section (C.2), the questions and result of the knowledge specific characteristics will be presented.

C.1 RESULTS OF THE ORGANISATIONAL SPECIFIC CHARACTERISTICS QUESTIONS

Absorptive Capacity - Composed Value				
	Low	Medium	High	
MoO Officials		3		
Advisors		3	1	

With the use of table 2 in section 4.9.1 the overall value of the absorptive capacity is calculated, based on the answers to the next five questions. These questions measure the elements of absorptive capacity, that combined determine the composed value of absorptive capacity.
The three MoO officials have valued, after calculation, a medium absorptive capacity. This is the mode of the absorptive capacity and the final value of this question.
The mode of the advisors is also 'medium'. One respondent has a high absorptive capacity as calculated value.

The final calculated value for this question is medium, given the modes of both groups.

The composed value of absorptive capacity is measured with five separate questions. These five questions will be introduced in the subsequent sections.

Absorptive Capacity – Knowledge Base				
	None	Limited	Some	Expert
MoO Officials		2	1	
Advisors		1	2	1

The MoO officials answered that the department has limited knowledge in this domain. It is the mode. One respondent has answered that the department has some knowledge in this domain, an adjacent value. Limited knowledge in this knowledge domain is the final answer for the MoO officials.

The answers of the advisors are more divergent. The mode, with two respondents is some knowledge in the domain. One respondent answered limited, and one respondent answered expert in this knowledge domain. Some knowledge is the final answer for the advisors.

The answers of both groups do not show a final answer to this question. The modes of both groups are however of adjacent values (Limited and some).

Absorptive Capacity – Knowledge Gap				
	Limited	Partial	Significant	
MoO Officials	1	2		
Advisors		2	2	

The mode of the MoO officials regards that the MoO currently has partial knowledge in this domain. One respondent has answered that the MoO has limited knowledge in this domain.
The advisors are evenly divided between the values, partial and significant knowledge in this domain. There is no final answer.

Both groups do not show a final answer to the question.

Absorptive Capacity – Internal and External Links				
	Few	Some	Many	
MoO Officials	1	2		
Advisors		4		

The mode of the MoO officials shows that the MoO organises some meetings in a year. One respondent has answered a few.
The advisors have all answered some meetings in a year, the mode.

There is a final answer to this question, since the mode of both groups is 'some meetings in a year'. This is the final answer to this question.

Absorptive Capacity – Direction				
	Few	Some	Many	
MoO Officials	1	2		
Advisors	1		3	

Two MoO officials have answered that some employees perform this function, while one respondent has answered a few. The answer 'some' is the mode and the final answer.
Three of the four advisors have answered 'many' to this question, while one respondent has answered a few. This is a single answer at the other end of the scale. The mode is 'many' and therefor the final answers to this question.

Based on the final answers of both groups, no overall final answer can be drawn. Although it can be observed that both modes have adjacent values.

Absorptive Capacity – Routines				
	Few	Some	Many	

MoO Officials	2	1	
Advisors		4	

Two MoO officials have answered that the MoO organizes few meetings, while one employee has answered some meetings, an adjacent value. The mode is 'few' and therefore a final answer.
The advisors have all answered 'some' to the question. It is therefore the mode and a final answer for the advisors to this question.

The modes of both groups do not present a final answer to this question, while it can be observed that both modes have adjacent values.

Human Resource Capacity

	Understaffed	No alignment	Overstaffed
MoO Officials	1	2	
Advisors	1	1	2

Two MoO officials have answered that the MoO is overstaffed, but without alignment between the human resource capacities and the organisational needs. One respondent has answered that the MoO is understaffed. The mode is 'no alignment', the final answer to this question.
The advisors mode is 'overstaffed', while one respondent has answered 'understaffed' and one respondents have answered 'no alignment'. 'Overstaffed' is the final answer since it is the mode.

There is no final answer to be drawn for both groups, since their individual modes do not align. Both are adjacent values however.

Financial Capacity

	Low	Medium	High
MoO Officials	1		2
Advisors	1	3	

Two MoO officials have answered that the financial capacity of the MoO is high, while one respondent has answered low. The mode is high and therefore the final answer for the MoO officials.
The mode of the advisors is medium financial capacity. Three respondents have given that answer, while one respondent answered low. Medium financial capacity is the final answer.

The modes of both groups are different values and present therefore no final answer to this question.

Risk Attitude

	Risk Averse	Risk Seeking
MoO Officials	1	2
Advisors	4	

Two of the MoO officials regard the MoO 'risk seeking', the mode of this question. One MoO official has answered 'risk averse'. 'Risk Averse' is the final answer to this question for the MoO officials.
The mode of the advisors is 'risk averse', all of the four advisors have chosen this answer. It is therefore the final answer for this group.

There is no final answer to this question based on the modes of the two groups. They are each other's opposites. Although the modes have adjacent values, since there are only two values, this is not a valuable observation.

C.2 RESULTS OF THE KNOWLEDGE SPECIFIC CHARACTERISTICS QUESTIONS

Core Competence

	Non-Core	Neutral	Core
MoO Officials			2
Advisors		1	3

All MoO Officials have answered 'core' to this question. This is de mode and final answer for the MoO Officials.
Three out of four advisors have also answered 'core', which is the mode. One advisor has answered 'neutral'. 'Core' is the mode and therefore the final answer to this question for the advisors.

Both groups have the same mode. The final answer to this question is therefore also 'core'.

Knowledge availability – Composed Value

	Low	Medium	High
MoO Officials		1	2
Advisors	2	2	

Based on the previous four question, the overall value of knowledge availability is determined with the use of table 3 from section 4.9.1.
The mode of the MoO officials for the overall value of knowledge availability is high, while one respondent valued a medium knowledge availability. A high knowledge availability is a final answer for the MoO officials.
The advisors are evenly divided over the low and medium value of knowledge availability. No final answer is presented.

The answers of the two groups show some divergence. No final answer can be drawn for the knowledge availability.

The composed value of knowledge availability is measured with five separate questions. These four questions will be introduced in the subsequent sections.

Knowledge Availability - Maturity

	Yes	No
MoO Officials	3	
Advisors	2	2

The answers of the MoO officials to this question are final. All respondents acknowledge that the knowledge in this domain is well developed at external sources.
The advisors however are evenly divided in their answers. Two advisors answered 'yes', while two advisors answered 'no'.
Based on the answers of both groups, there is no final answer.

Knowledge Availability - Specificity		
	Yes	No
MoO Officials	3	
Advisors	4	

Both groups, the MoO officials as well as the advisors have answered in a final matter. All the respondents regard this knowledge specific to their department, which is a final answer.

Knowledge Availability - Protection		
	Yes	No
MoO Officials		3
Advisors		4

Both groups, the MoO officials as well as the advisors have answered in a final matter. All the respondents regard that external sources will share knowledge of this domain with their department, which is the final answer.

Knowledge Availability - Type		
	Doing	Books
MoO Officials	2	1
Advisors	4	

Two of the three MoO officials answered that this knowledge can be obtained when learning by doing. One respondent however answered that the knowledge can be obtained from books. The mode is learning by doing and therefor final.
The advisors are clear, learning by doing is answered by all four respondents.

A final answer can be given for both groups since the mode for both groups is learning by doing.

Time to Knowledge				
	Very short	Short	Medium	Long
MoO Officials		1	1	1
Advisors	1	3		

The MoO officials are divided on the question within which time span the new knowledge will be needed by the MoO. Their answers range from short to long and are evenly divided, between 3 and more than 12 months. There is no mode and no decisive conclusion can be drawn.
The advisers do have a mode, 3 respondents have answered that the knowledge is needed

within a short time span, between 3 and 6 months. One respondent has answered that the knowledge is needed on a shorter time-span, between 0 and 6 months.

The difference between the MoO officials and the advisors is significant. There is no final answers that would represent the results of both the MoO officials as well as the advisors, in particular do to the spread of answers of the MoO officials.

Knowledge Time-span			
	Short-term	Mid-term	Long-term
MoO Officials		1	2
Advisors	2	1	1

The mode of the MoO officials expect that the knowledge in this domain is necessary for the long-term. One respondent has answered a mid-term.
The table shows that the advisors have short-term as mode, while two respondents have answered mid-term and long-term.

The answers of both groups to this question are incongruent, since the mode of both groups is at either end of the scale. There is no decisive answer to be given.