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Abstract

The decision process for companies to outsource information technology (IT) or not is a substantial business change and in many cases the competence to take such decisions is limited and has major consequences for the company future performance. Therefore in the paper we have proposed the development of a software application that can be used in the initial phase for deciding to outsource or not in contrast to the external help with consultants that might have their own interests. In fact the development of a software decision tool (SDT) that is business neutral it could be very usefully for the IT managers in support of the decisions regarding to outsource IT or not. By using this SDT the IT mangers could highlight also some potential risks that have might be hidden by their cost-savings efforts regarding IT outsourcing. On the other hand by using the SDT the IT managers can simulate different situations by changing the parameters and very important can document their decisions regarding outsourcing with more confidence. Additionally, this software tool it might require information that the own evaluation did not considered in the beginning and finally may add vital information to advice the IT managers in different situations. In the development of the SDT in taking the IT outsourcing decisions we have used the generic Transaction Cost Theory (TCE) for evaluation that is adapted to the IT risks according to Aubert et al. (2001) and which gives a qualitative measure of the outsourcing risks. In this context our paper has looked mainly to find answers to the following research questions: (1) is it possible to design such a tool and which decision parameters should be collected, how are those inter-related and how should such a decision tree be built up (2) is it possible to reduce all initially known uncertainties regarding outsourcing and highlight on potential risks? (3) How much trust we could have in such a software tool in order to be really used by the IT managers in decisions regarding IT outsourcing?

Keywords: IT Outsourcing (ITO), software decision tool (SDT), transaction cost theory (TCE), IT managers, IT decision makers.

1   INTRODUCTION: RESEARCH MOTIVATION AND GOALS

Today IT Outsourcing (ITO) is a growing area and according to McDougall (2005) we will have a huge increase in offshoring in the near future. From today with less than 5% of IT jobs in the United States and other developed countries that are "offshored" to 30% "offshored" by 2015. Similar predictions are done for the remote infrastructure management outsourcing (RIMO) for example Tisnovsky (2007) refers that in a recent report by the Everest Research Institute that the market from 2005 will increase with $0.8 billion which it will exceed $8 billion over the next five years. Another trend that might encourage ITO is the comeback of Application Service Provider (ASP). Malmqvist (2007) says that four of ten enterprises buy IT support as ASP and the names of these services are: "IT on tap", "IT on demand" and "Functional services". In fact ASP was in the late of 90's a hipped solution in Sweden but after the fall of Dotcom and Telecom several of the providers disappeared and also the ASP-services. According to the trade association the failure of ASP was happened because the services were not fully developed and it took much longer time to implement them than was expected. In opposite to the situation of today, many services are ready, the solutions are "standardized" and ready too for delivery but the expectations are high for a fast increasing market. The consequences of this situation will be according to Niklas Zandelin the president of Exido (Malmqvist 2007) that the IT departments will decrease in size. Companies that already bought an ASP and are satisfied with the services are expected to ask the following question: should we lay out also other parts? In this way this it should dramatically increase the need of ITO.

Not all the ITO are successfully that's why Frauenheim (2003) has predicted that half of information technologies outsourcing projects are considered unsuccessfully because they will not deliver the expected value. Bahli and Rivard (2004) are also referring to several outsourcing cases with undesirable consequences for the client firms. For example the case when an insurance company have to take back the outsourced operations because of the lack of quality or because of the absence of cost reduction causes that are often mentioned as the undesirable consequences for IT Outsourcing.

As many IT specialists believe we assume too that there will be a future need of IT Outsourcing and it is sure that not all ITO will be successfully. Therefore in our research paper we have presented the development of a software tool in order to help the outsourcing companies that are taking decisions to outsource IT or not and also to explain why the one or another decision is preferable. In fact the software decision tool (SDT) developed will guide the IT decision makers through a lot of questions with distinct answers and after the last question the SDT will generate a report, with explanations and recommendations. In this way the result of the different inputs can be compared and analyzed which will help the IT decision makers to take the "best" actions regarding ITO.

2   THEORETICAL BACKGROUND

2.1   Transaction Cost Theory

The Transaction Cost Theory (TCE) examines how different institutional arrangements are used to organize and control economic activity. On the other hand transactions differ in terms of contractual problems while organizational forms differ in their ability to solve related problems. Williamson (1985) has defined the problem of economic organizations as a problem of contracting which it can be organized in several alternative ways. One way is to organize the work internally, called "vertical integration" or "hierarchy". The opposite is to do it externally that is outsourcing with selling out of human resources with or without equipments and assets. This is called market solution because there is a market to select outsourcing partner and the market conditions are available for seller and buyer. Williamson (1993) refers also to a hybrid form, e.g. joint venture and franchising which is characterized by flexibility and informality where both parties invest in this solution and have high incentives to succeed. In conclusion we could say that the TCE is the tool that it could answers to the question: which institutional arrangements (governance structures, contractual arrangements) provide the most efficient setting for economic transactions: hierarchies or markets?

On the other hand the transaction costs according to Arrow[1] (1969) are the costs of running the economic system which are consisting from a wide variety of sources that is believed to represent over one third of all economic activity in the United States. For example in less developed economies according to Hagel and Singer (1999) transaction costs are thought to make up an even higher fraction of the overall gross domestic product (GDP) - which is value of the all final good and services produced within a nation in a given year.

According to Coase (1960) transaction costs are very important because: "in order to carry out a market transaction it is necessary to discover who it is that one wishes to deal with, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on". Coase in fact is the first one who has introduced transaction cost theory (TCE) looking to explain the optimal size of a company. After Coase researchers like Williamson, North (1993) and others added new aspects to the theory which is the TCE used today. In fact Williamson (1985) is writing that there are rational economic reasons for organizing some transactions in one or other way and other transactions in another. According to Klein (2000) the different components in the TCE are shown in figure 1 where is described the impact of inter-organizational systems on industrial organization and where we observed that on the left side we have the different variables used to describe the transaction costs and depending on the result of the analyze one of the 3 organization forms from the right side will be the best solution..
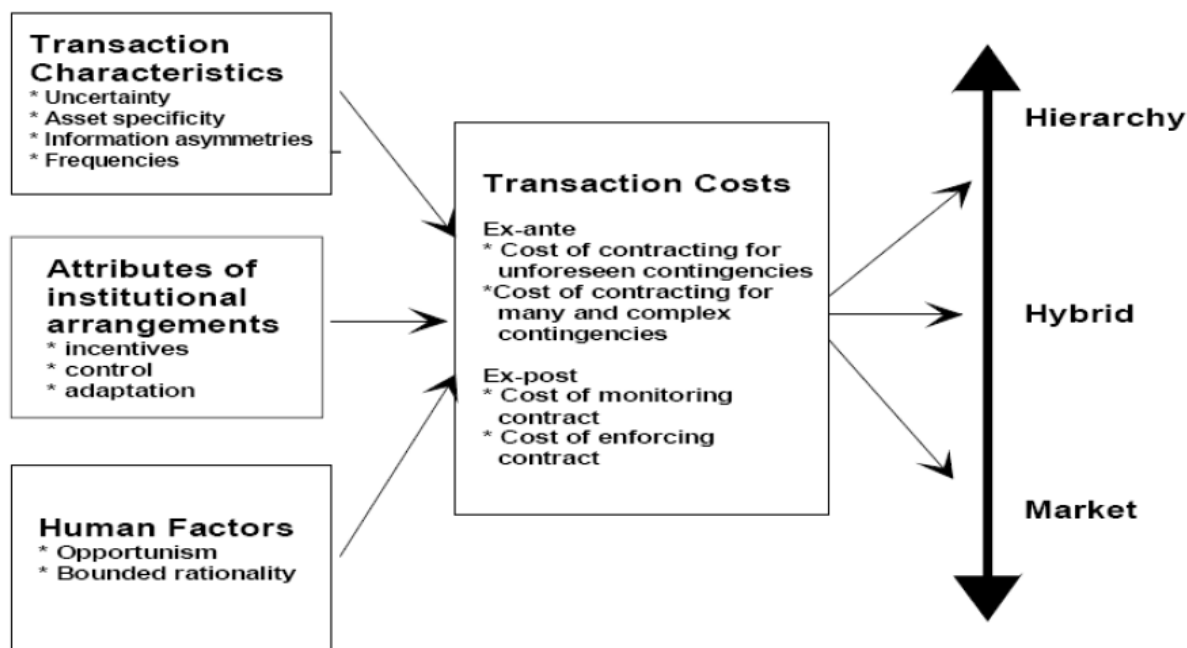

Figure 1.   The impact of inter-organizational systems (IOS) on industrial organization

The principal dimensions to which transactions are dealing are the followings: (i) asset specificity (ii) uncertainty (iii) frequency (iv) information asymmetries, with asset specificity as the most important dimension. The first dimension is asset specificity which is referring to the degree to which an asset can be redeployed to alternative uses and by alternative users without sacrificing the product value. In fact Williamson (1991) has identified the following different conditions for asset specificity: site-specificity, physical asset specificity, human asset specificity, dedicated asset specificity, brand capital specificity and temporal specificity. The second dimension is uncertainty and is consisting from the bounded rationality and opportunism where bounded rationality is the limits in human ability to:

[1] Kenneth Arrow 1972 Arrow received the Nobel Laureate in Economics for "the pioneering contributions to general economic equilibrium theory and welfare theory"

collect information, assimilate information, process information and therefore to act upon information. According to Simon (1982) the bounded rationality is caused by the "limitations of the human mind and the structure within which the mind operates" and this sure it will impact the decision models that we assume us to be fully rational. On the other hand Williamson (1993) see bounded rationality as the dimension which is referring to the behaviour that is intended rational but only limitedly so; a condition of limited cognitive competence to receive, store, retrieve, and process information. According to Williamson (1975) the opportunism is referring to that a decision-maker may unconditionally seek his/her self-interests therefore such a behaviour cannot necessarily be predicted,. For example: strategic manipulation of information or misrepresentation of intentions; false or empty, i.e. self-disbelieved, threats or promises. Very important also is that the size of opportunity losses is influenced by information asymmetry e.g., where information related to a transaction is not evenly distributed between the parties to the transaction and this is in some cases the main reason to keep operations in-house. The third dimension frequency is that one who is referring to the repeatability of transactions between two given partners and this dimension is relevant in two aspects: reputation effects and setup costs. For example higher frequency transactions support experience rating to which reputation effects can thereafter be applied and greater frequency enables the cost of specialized management i.e. economy of scale (Williamson 2004, p. 29). In fact according to Williamson (1985) the transactions cost is aligned with the governance structures and market control fits where transactions are low on asset specificity, hybrid control fits better when asset specificity increases, but hierarchies are needed to reduce conflicts between contracting parties when transactions involve high asset specificity. The last dimension is asymmetric information which in fact arises when the actors on the market have different information and gives the actor who has more information an advantage both before contracting and after the contracting. For example the seller has normally an advantage in information for e.g. quality and price. Another situation is occurring also when one party cannot observe or verify or measure contract performance and this can lead to moral hazard. On the other hand long time contracting could expose seller or buyer to use hidden intentions and according to Williamson (1985) the contracting activities for TCE could be: ex ante costs of drafting, negotiating and safeguarding and agreement, and the ex post costs of haggling, costs of governance, bonding costs to secure commitments. For a better understanding of the attributes of the contracting process we have shown in table 1 the different contract types derived from behavioural assumptions and asset specificity (Williamson 1985). Here in table 1 we could observe that if bounded rationality does not exist than the contract is like a planning model. If opportunism does not exist then we have full trust and the contract is like a promise. If asset specificity is low then there is a market with full competition and the contract is like a competition. Finally, when all three characteristics are present then it is a task for the institutions to minimize the transaction costs.

Bounded Rationality	Opportunism	Asset Specificity	Contracting Process
0	+	+	Planning
+	0	+	Promise
+	+	0	Competition
+	+	+	Governance
0: means not existing and +: means significant existing			

Table 1.   The attributes of contracting process (Williamson 1985, p.31)

2.2 Pitfalls and Success Factors for ITO

Even if the business case for ITO is unambiguous advantageous for the outsourcer there are a lot of causes that might prevent the success. According to Méndez et al. (2006) the following multiple risks[2] it can be seen:

- Management weakness
- Personal without experience
- Outdated technological tools
- Lack of an organizational learning
- Danger of the eternal triangle; third part that represent an additional actor
- Unclear approach

Other risks factors regarding ITO are mentioned by Fairchild (2004) which is referring also in his work to the lack of "organizational maturity" as a cause of many unsuccessful ITO. The background for that is the Outsourcing Management Maturity Model a framework established to create effective vendor management structure, create measurable and enforceable service-level agreements, that implement formal processes and drive vendors to improve service quality. In this framework the most critical areas of the Outsourcing Management Maturity Model are:

- Relationship fundamentals: to ensure the relationship management structure is established, success stories are created, and outsourcing goals are accomplished.
- SLAs/metrics: to ensure SLAs exist for all outsourced services, reporting arrangements are enforced, and SLA targets are met or exceeded.
- Formal processes: to adopt a process maturity model to constantly optimize, integrate, and automate outsourcing management processes, where applicable.
- Benchmarks: to continuously assess outsourced services' competitiveness, quality, and responsiveness.
- Credit/debit scheme: to provide an incentive to outsourcing vendors to improve service quality.
- Trust: to build trust between ITOs and outsourcing vendors by leveraging new technology, providing new competencies, increasing security
- Business value: to ensure outsourcing arrangements which contribute to the business's bottom line.

On the other hand Nyrhinen and Dahlberg (2007) has shown that enterprises do not follow the TCE contract recommendations, "which they probably should follow" based upon a research study of 213 enterprises in Finland[3] where the authors has recommended the important facts for choosing of "the right type of contract to balance transaction costs and to achieve better outsourcing success". As a criticism of the paper we could say that the authors doesn't explicitly explain why the enterprises do not follow TCE recommendations and this it could be because is it lack of competence in contracting or simply because this fact was ignored. Rouse and Corbit (2003) has also found several risk areas like path dependency. In fact path dependency it could be a selected technology that is difficult to swap, e.g. formats for multimedia. However path dependency is also applicable for the supplier. In the beginning there might be a market with several competing suppliers, but after contracting, the buyer and seller are entering into a bilateral lock-in situation. In fact Williamson calls this change a "fundamental transformation" that is meaning that the market-power changes into a relationship where both parties are tied together with the contracts. From Rouse and Cobit (2003) work that they have investigated the Australian IT market we found that "not all respondents reported this level of lock-in but many were involved in unsatisfactory arrangements that were difficult to get out". On the other hand several purchasers reported that at the end of the contract they could not attract bids from alternative vendors therefore fundamental transformation is not an optimal situation for none of the partners. In fact in the research literature we have found the example described by Huet (2005) for the situation of the buyer but the vendor can also be locked-in, e.g. with an old technology and might have high costs to attract resources for less modern computers, spare parts etc. Rouse and Corbit (2003)

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[2] Méndez et al. (2006) refers to more risks. We have selected some that not overlap with the risks from TCE.
[3] The authors started with initially 1000 enterprises that cover close to 85% of the Finnish business volume, but due to the lack of response etc. they reduced the investigation to 282 enterprises. From these companies 213 have outsourced IT.

have also described in their work that those complex infrastructure arrangements that have been adapted to different legacy systems which has been reported as costly and the services were inadequate fact that it is in accordance to Williamson's recommendation: high asset specifity should be kept in-house in order to minimize the dependencies because idiosyncrasy leads evidently to ITO risks.

Sure that the list with the threats to succeed in ITO is long and changes of business, unexpected events could altar an initially efficient ITO to undesired business cases for both outsourcer and insourcer. Therefore, our intention is not to develop a SDT that is as a complete framework covering all possible scenarios and in our work we have focus mainly on the followings:

- The identification of the risks with a full explanation of them to the IT decision makers.
- A way to give references with a short description in order to introduce the IT decision makers in that problem area.
- A way to guide the user regarding some items that must be mentioned in the ITO contract.

2.3 Decision Criteria

There are several driving forces on how business decisions are taken within enterprises. A company in crises has a more short-time aspect on ITO. If the outsourcing creates cash directly, e.g. by selling out the infrastructure and rent it, or in another way creating income then the long-term view will get less priority. A classic problem mentioned by the outsourcing practitioners is to outsource a problem area, e.g. the whole IT. This "unmanaged" area creates problems by outsourcing, especially with contracts where the description of this part is the missing part, or is incomplete. There is also a common trend to focus today on the advantages and not after some years. The different incentive programs for top managers are defined in shorter terms than the outsourcing contracts. This situation from both outsourcer and insourcer could obstruct a long term partnership.

2.4 Research Methodology

The research questions defined in our research (1) is it possible to design such a tool and if then which decision parameters should be collected, how are those inter-related and how should such a decision tree be built up and (2) is it possible to reduce all initially known uncertainties regarding outsourcing and highlight on potential risks, it will be detailed explained below.

The first step is to investigate if there is any software with our wished functionality, to help the potential IT outsourcer with evaluation. Because we haven't founded till now in the literature such a SDT we have developed one by using the TCE and the work done by Aubert et al. (2001) which is using a qualitative measure of the outsourcing risks. The SDT is an interactive one using distinct questions and depending on these answers, different new questions have to be asked. After that the qualitative dimensions as uncertainties are transformed in numeric values.

In our evaluation to outsource IT or not we have used the following structures:

- The evaluation of the TCE and the different results from research papers.
- An overview of the risks based on lacking: processes, management information etc.
- The evaluation of the costs to keep it in-house versus outsourcing.
- A way to identify out the risks and if it is possible to suggest actions to reduce the risk exposure.

The boundaries of these structures have not distinct outlines; some of the questions are relevant for several structures and the structures slightly overlap.

The risks are assessed and are done through a qualitative measure of the outsourcing from Aubert et al. (2001) and by using what it is called the "risk exposure" that is the set of risks that the different answers to the questions generate. In fact an ITO without risks would hypothetically have the value 0 and there are several reasons for being conservative with the risk exposure. According to Hirscheim and Lacity (2000) we found that managers that make decisions regarding ITO are often overly optimistic which means that the managers take their decisions to outsource based on a best case scenario. In fact we assume that this it could be happened because there is a lot of information about successfully ITO which might encourage the IT decision makers too. On the other hand a situation

regarding a failure of an ITO is not allowed, and this fact might reasonable reduce the correct information you could get from the companies that have outsourced and were not satisfied with the results of an ITO. According to Howard Rubin professor emeritus of the City University of New York, who has conducted a research study in 2004: "Companies may not be looking at the whole picture when they go offshore" (The Outsourcing Institute 2004) and this could be one of the reasons for not reaching the savings because they also must factor in other costs, such as planning, transition, start-up, technology and communications, remote management and oversight. Therefore in order to reduce the risk of the factors mentioned before we will use the risk exposure (RE) defined to be as:

$$RE = P(UO) * L(UO)$$

Where P(UO) is the probability of an undesirable outcome (frequency of an accident) and L(UO) is the loss due to the undesirable outcome (the expected severity). Because each risk creates a risk exposure RE the total RE for the ITO is:

$$RE_{total} = \sum RE_i = \sum P(UO_i) * L(UO_i) \geq 0$$

In the development of the SDT (like it is shown in figure 2 where it is a screenshot from SDT the user is asked to estimate the consequences of an undesired outcome) we have calculated the RE by using the formula described before.
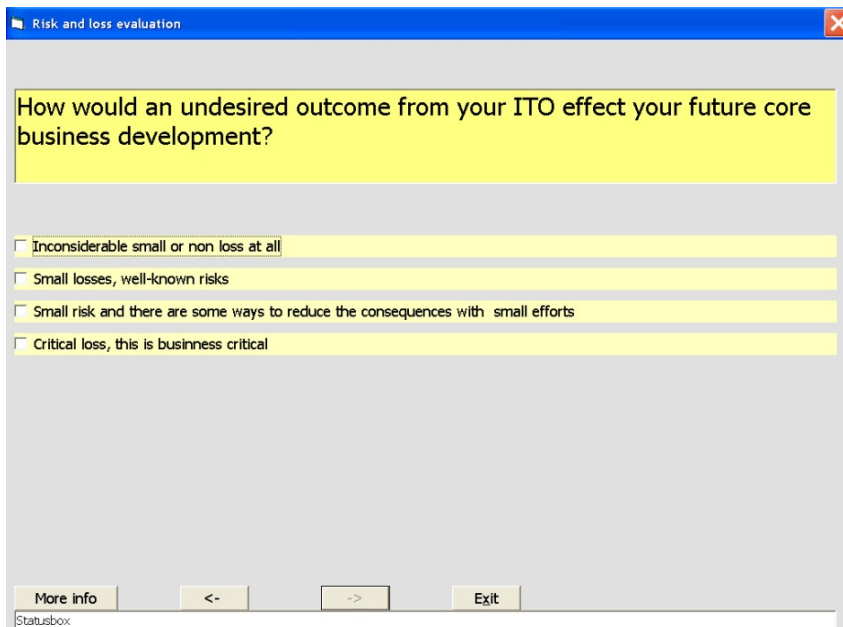

Figure 2.   Screenshot from SDT which asks the user to estimate the consequences of an undesired outcome

Regarding the calculation of the RE this is done in the following way: the P(UO) is selected by SDT due to the estimation we have found it from the literature and represents the empery and after that the L(UO) has to be selected by the user, i.e. the responsible for ITO decision and the L(OU) criteria used in the SDT that it is shown in table 2:

Loss due undesirable outcome L(OU)	Value (%)
Inconsiderable small or non loss at all	3
Small loss	20
Medium loss	50
Critical loss	95

Table 2.   Values used in SDT for loss due to undesirable outcome L(OU)

In fact we observe that in letting the user to select the grade of loss we expect a better awareness of the actual risk exposure and the losses we are focus manly are: loss of customer's revenues, internal added costs, reputation etc. The losses are in many cases impossible to estimate, but to think about, to be aware of the risk is one of the main targets for our SDT.

Regarding the exogenous risks according to Black (2004) and Aubert et al. (2001) these are that ones over which we don't have control and which are not affected by our actions, e.g. earthquakes and hurricanes. The opposite are endogenous risks that are dependent on our actions, e.g. car accident where the probability of an accident is strongly influenced by the driver's behaviour and ability. Here is also an exogenous part; the driver can not influence the behaviour of the road users or other resources.

In the development of the SDT there are patterns that are perfect for outsourcing and others that are definitively not suitable to outsource. Solutions that diverge from the "perfect" outsourcing are documented and explained to the users by using the SDT. The number of deviations will be an indicator for how well the user's situation deviates from the recommended outsourcing versus "keep it in-house". As with all decision tools there is an area "in-between" that you have to handle because when the result says 50% for and 50% against ITO the SDT will recommend not to outsource because ITO generates a risk that it can be avoided.

Regarding the last research question; (3) how much trust we could have in such a software tool in order to be really used by the IT managers in decisions regarding outsourcing the answer it is based at this moment only on some partially results.

3   DATA ANALYSIS, RESULTS AND FURTHER RESEARCH

From the research literature we did not find till now any software that can help the outsourcer. Instead we have found a big number of advices for ITO both from the companies that have insourced IT services and also from consulting companies that are advising and performing different IT activities.

At this moment our SDT it is used and distributed to a small number of IT decision makers in Sweden. After more users will be used the SDT, the questions about usability and confidence of such a tool it will be available in support of our research. In fact we expect as with all the software development that we will have: software failures, problems with notations, priority to use SDT, lack of initial training and education etc that will prolong the testing time. On the other hand in order to fully trust the efficiency of our SDT there is also needed to have more information about the problems in usage together with a constant feedback from the IT decision makers about the value of the SDT.

Regarding our further research we are looking to present the SDT to the insourcing companies and here we anticipate to have a large impact because if their interests is to minimize the own risks but also to minimize the risks of their customer for a long term relationship our SDT it could be a business neutral diagnostic tool. Here it is very important to point out too that in fact our SDT's main tasks are to highlight out potential and hypothetical risks by running different scenarios so as the IT decision maker see the risk management and should focus on in order to reduce the risk exposure. Also safeguards that are used to cover uncertainties and which are implemented today in the contracts and in the SDT will be highlighted where this thing it will be possible.

4   CONCLUSIONS

The SDT that has been developed is still under test at this moment. Therefore in our conclusions we could summarize only which are the main important facts that so far we have observed regarding the usage of the SDT: (1) The TCE does not explicitly cover all needed facts as quality assurance, project performance, incomplete contracts etc. (2) It is impossible to develop a software tool that covers all possible cases/scenarios (3) To deep and breed the analysis causes we need in fact to ask many questions to the users regarding the usage and efficiency of our SDT. In this context we see as very important to find an optimal balance between the number of questions and the value for the user to use

SDT. On the other hand we have to remember that the decision makers to whom we address our SDT have also other priorities and also that the knowledge about IT and business differs between IT decision makers from different companies.

In addition to the issues mentioned above we could include also the followings: (i) the development of SDT is far more complex than the initial assumption (ii) The TCE is difficult to apply with quantitative tools and also hard to apply to all trading situations (iii) the risk management cannot be replaced by SDT but gives usefully and strong warnings to IT decision makers. In spite of these obstacles and based upon the partially results obtained till now we are still convinced that such a tool is usefully and necessary mainly as a complement to support decisions regarding IT outsourcing in order to reduce all initially known uncertainties and highlight some of the potential risks as a "second opinion" that is business neutral.

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