

# **Decision Factors for Outsourcing On-premise Applications of Institutions for Higher Education**

**Rik Nijman**  
HU University of Applied Sciences

**Pim Schouten**  
Verdonck, Klooster & Associates

**Pascal Ravesteijn**  
HU University of Applied Sciences

*In Dutch higher education institutions, IT outsourcing (ITO) is becoming more common. New applications nowadays are executed from the 'cloud'. But what to do with on premise applications? Can they also be outsourced? If so, what factors does a higher education institution have to consider when making the ITO decision of their on-premise applications?*

*This research starts with finding the factors that are already known in existing ITO literature (in different contexts). Then, these decision factors are validated in four explorative interviews before surveying the factors within a higher education context.*

*In total, fourteen factors are deemed to be important for Dutch higher education institutions. Based upon the survey responses by Dutch IT decision makers, a hierarchy exist in these fourteen factors. Also, this research suggest a relationship between outsourcing decision factors and the sourcing models. Additionally, outsourcing objectives seem to influence this relationship.*

## **INTRODUCTION**

This study investigates the factors that need to be taken into account when Higher Education (HE) institutions decide to (out-)source their on premise applications. As the research is executed in the Netherlands the category of higher education institutions consists of both universities and universities of applied sciences (formerly known as vocational universities).

In the Netherlands 'Surf' (a cooperative foundation) stimulates collaboration between higher education institutions. Surf acknowledged the trend of outsourcing IT in HE and therefore started several projects. One example is a project where six HE institutions collaborate together in order to put out a tender for a joint computing centre (Surf, 2015). In the summer of 2016 the project is concluded but the

institutions that were involved are still working together. Hence, outsourcing is no longer a theoretical subject in HE context, but also put into practice.

Besides outsourcing infrastructure, what to do with the applications HE institutions purchased in the past and administer themselves? Should HE institutions keep on administering these applications themselves or is it better to outsource them? Research conducted by Surf states that the decision to outsource IT is made on a strategic level (Surf Taskforce Cloud & Bax, 2012). By sourcing applications, organizations want to achieve certain objectives (Bergstra et al., 2011). The objective of this research is to find the factors that need to be considered when deciding to outsource an application.

Much is published about the ITO decision process, with Dibbern *et al.* (2004) as one of the leading and most cited methods. However, Dibbern et al. also state that when it comes to making the decision ‘Which’ decision process to choose and ‘How’ to decide between sourcing models or vendor selection decision, more research is needed.

Several scientific articles suggest to combine multi criteria methods with clusters of decision factors (Tajdini & Nazari, 2012; Y. C. Tjader, Shang, & Vargas, 2010; Y. Tjader, May, Shang, Vargas, & Gao, 2014; C. Yang & Huang, 2000). But these decision factor clusters are formulated on a high and abstract level. Also much of this research was done in different sectors of industry which are not necessarily applicable to the Dutch education context. The education sector differs from commercial industries, for example because of the availability of educational licenses and different personnel policy.

This research wants to investigate the decision factors higher education institutions should consider when making the decision for the best sourcing model or vendor selection suited for the application, once the strategic decision to outsource has been made.

## RESEARCH METHOD

This study can be characterized as design science because a solution is developed in order to answer the question what factors to consider when making the ITO decision. The factors are harvested through several research strategies and placed in a hierarchy in order to support the ITO decision. In this research no existing theory is tested, but new theory is created that is partially founded in existing knowledge. Therefore the approach is inductive (Verschuren & Doorewaard, 2015). A qualitative approach is chosen to analyse the results across the various research activities. First, a literature study is conducted to determine existing decision factors and ITO objectives. Second, explorative interviews are done with respondents selected for their knowledge and experience in the ITO domain. Finally, the decision factors are tested in a HE context, using an online survey among IT decision makers in HE institutions. Each of the research activities is explained in more detail below.

### Literature Study Approach

Following Hevners design science approach (Hevner, March, Park, & Ram, 2004) ensures a link between practical relevance and the existing (scientific) knowledge base. Therefore, the study starts with investigating what knowledge is already available. For this several scientific databases are consulted: Academic Search Premier (Ebsco), Emerald Insight, Journal of Enterprise Information Management, Journal of Information Technology, Research Gate, ScienceDirect and Google Scholar. The main keywords used in the literature research are: “IT-outsourcing, ITO, IT sourcing, cloud computing, cloud adoption decision, decision models, decision factors, ITO decision factors, IT-outsourcing success factors, outsourcing objectives, reasons for IT-outsourcing, higher education” and combinations of these keywords. Only peer-reviewed articles were considered to be part of the literature study.

After assessing these articles, first by title and abstract, and subsequently by reading the conclusion section, 117 papers were found to be relevant to our study. These papers can be categorized in the following topics: Advantages and challenges of ITO, decision factors, cloud adoption, decision making, generic outsourcing papers, outsourcing objectives, sourcing models, success factors of sourcing and decision methods.

A seminal work on ITO is that by Dibbern *et al.* (2004), they propose a framework to make the ITO decision. Several stages are defined that help decision makers to make the ITO decision. In these stages decision factors, sourcing models and sourcing objectives play a integrated part.

In this research, besides the search for decision factors, also the relationship between decision factors and sourcing models is investigated. Furthermore, the sourcing objective is expected to influence this relationship. To study this relationship and the possible link with the sourcing objective a survey is developed based on the literature study.

### Explorative Interviews

After conducting the literature study, the resulting 16 decision factors were challenged in four explorative interviews. The respondents that were interviewed are selected from both profit and non-profit sectors, but all with extensive knowledge and experience with ITO. All respondents work in or for educational institutes.

**TABLE 1** shows the characteristics of the respondents interviewed. The interviews were semi-structured. The interviews were recorded during the conversations, and transcribed and coded afterwards.

**TABLE 1**  
**RESPONDENT CHARACTERISTICS EXPLORATIVE INTERVIEWS**

<b>Respondent</b>	<b>Experience / knowledge</b>	<b>Profit / non-profit</b>
Respondent 1	Has been active for more than 20 years in a consultancy agency; helps companies to formulate their sourcing strategy.	Profit
Respondent 2	Has more than 20 years of experience as a consultant for several consulting agencies. He is also teacher for a Dutch university. Conducted a PhD research on the sourcing decision subject and published multiple articles on the outsourcing decision topic.	Both
Respondent 3	Has more than 20 years of experience in IT. He worked for several consultancy agencies en currently employed in a management function at a Dutch university where he is a professor for the IT education department. Also did extensive research on ITO decision factors.	Both
Respondent 4	Around 20 years employed at an organization which stimulates collaboration between Dutch HE institutions. Has been closely involved with the tender for a joint computing centre.	Non-profit

### Survey

By means of an online survey IT decision makers in HE institutions are questioned about three clusters of questions in order to find the decision factors important in HE context and the hierarchy between the decision factors. Furthermore the influence of the sourcing objectives on the relationship between the decision factors and the sourcing models is examined in the survey. The three clusters of questions are related to 1) the objectives the respondent has for outsourcing IT, 2) the respondents view on the decision factors important for the ITO decision, and 3) the respondents are asked to divide 10 points over three sourcing models (make, ally and buy) according to how applicable they find the different models.

An online survey tool (Lime survey) is used to question IT decision makers to test the decision factors in the Dutch higher education context. Using an online tool simplified the distribution of the questionnaire to the respondents. After the results were harvested, the results could be exported to Excel for further (qualitative) analysis. Analysing the survey results, one question appeared to be difficult to analyse. This was the final question where respondents are asked to divide 10 points per decision factor over the sourcing models. More on this topic follows in the discussions part.

## THEORETICAL BACKGROUND

The goal of this research is to determine what factors Dutch higher education institutions should consider when making IT outsourcing decisions. This section describes the knowledge that is already available in literature. We start with an overview on IT outsourcing literature followed by a discussion on ITO objectives. Subsequently sourcing models are outlined and finally decision factors from existing literature will be described.

### IT Outsourcing

One of the first studies on outsourcing is the research by Loh & Venkatraman (1992) on the outsourcing process of the Kodak data centre to IBM, since then much research has been carried out. Liang et al. (2016) recently conducted a meta study by main path analysis in which 798 papers about IT outsourcing, during the period of 1992 until 2013, are included (Liang, Wang, Xue, & Cui, 2016). In this research the existing literature is divided in two main categories: ITO-decisions and ITO management. Closer investigation showed the ITO-decision papers can be divided into three subcategories: a) to outsource or not, b) how to outsource, and c) re-outsourcing decisions. This division between 'a) to outsource or not?' and 'b) how to outsource' is also shown in Dibbern's outsourcing decision framework (Dibbern, Goles, Hirschheim, & Jayatilaka, 2004). Liang *et al.* recognizes the work of Dibbern *et al.* (2004) to stand out from the rest of the research because of both depth as breadth.

In 2004 Dibbern *et al.* (2004) designed a framework to enable ITO decisions, based upon literature from 1990 until 2004 (Dibbern *et al.*, 2004). In this study it was concluded that, despite the huge amount of literature on the ITO subject, a framework did not exist. Therefore Dibbern et al. developed a framework to map the decision process. Dibbern *et al.* (2004) divide the decision process in two stages: the decision phase and the implementation phase. The decision phase consists of three steps to answer the 'Why?', 'What?' and 'Which?' questions. Following this phase, the implementation phase works out the 'How?' and 'Outcomes' steps.

In the 'why?' step, the motivation or sourcing objectives are investigated. The 'What?' question answers which application, IT component or groups (parcels) should be considered to outsource. And the 'Which?' question completes the decision phase by adopting procedures to make the ITO decision. In this phase guidelines are chosen to assess the criteria important to take the decision. Dibbern et al. state that literature in this step (guidelines and procedures) is scarce. Therefore, with this study, we aim to offer more insight in the 'which step' by finding the decision factors Dutch HE institutions should consider when making the ITO decision.

Liang et al. (2016) also recognize the differentiation between making the ITO decision and choosing a sourcing model to suit the need of the organization when they say: "*Once companies are determined to become involved in ITO, the follow-up question is: 'how to outsource?'*" (Liang et al., 2016)

In the 'How?' step, organizations give direction to the implementation of their ITO decision by focusing on vendor selection, structuring the relationship between vendor and client and managing the outsourcing agreement. The final 'outcomes' step is the evaluation phase, i.e. the actual results of the ITO decision).

### ITO Objectives

As stated in the why step of the framework (Dibbern *et al.*, 2004), organizations need to assess risks and rewards, advantages and disadvantages. Organizations choose to outsource their IT functions in order to achieve certain objectives. Prior research shows that organizations strive for the following clusters of sourcing objectives: 'management goals, technological-, economic- and geopolitical objectives' (Tajdini & Nazari, 2012; C. Yang & Huang, 2000).

In 2011, a consortium of Dutch research institutions and businesses, investigated outsourcing in the Netherlands (Bergstra *et al.*, 2011). This research is also known as the symbiosis research. In this comprehensive case study research different sourcing objectives are presented that organizations expect to achieve by IT outsourcing (see table 2). Apart from the geopolitical objectives, the sourcing objectives

from the symbiosis research correspond with the research of (Tajdini & Nazari, 2012; C. Yang & Huang, 2000).

**TABLE 2**  
**OUTSOURCING OBJECTIVES (BERGSTRA ET AL., 2011)**

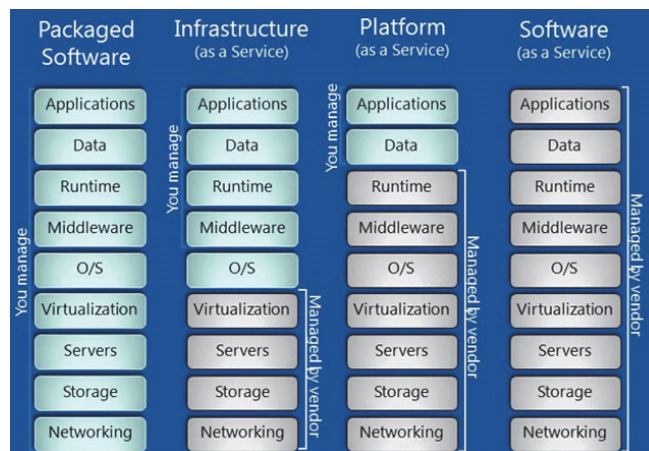
Cluster	Sourcing objectives for ‘outsourcers’
Strategic	Focus on core activities
	Flexibility
	‘Top down pressure’
	Cover IT-risks
	Continuity
Financial	Long term cost reduction
	Short term cost reduction
	Predictable costs
Knowledge & Personnel	Access to IT knowledge and experience
	Access to IT personnel
	Continuity of IT personnel

### Sourcing Models

The IT function can be organized according to different sourcing models. Examples of sourcing models are insourcing, offshoring and business process outsourcing. Sourcing of IT can be carried out in various ways. Kotlarski and Oshri distinguish thirteen different sourcing models (Kotlarsky & Oshri, 2012). In the ‘NIST definition of cloud computing’, Mell & Grance (2011) separate service models (such as IaaS, PaaS, SaaS) from deployment models (private, community public and hybrid cloud).

In our research we focus on the administration of on-premise applications. Therefore, applications do not only cover infrastructure, platform or software layers but can also be more specific. Therefore another classification of sourcing models is needed. In **FIGURE 1** the NIST service models and OSI layer model are integrated.

**FIGURE 1**  
**SERVICE MODELS AND OSI-MODEL (VENTUREBEAT, 2011)**



In contrast to Kotlarski and Oshri, Siep Eilander (Chief procurement officer for the Dutch government) distinguishes just three different forms of sourcing: ‘make, ally and buy’ (Eilander, 2009). As this study focuses on Dutch higher education we also use these three forms of sourcing.

### **Decision Factors in Literature**

As Dibbern *et al.* (2004) stated, literature about the ‘which’ phase is scarcely available. In contrast, success factors for outsourcing are investigated by many researchers (Bergstra *et al.*, 2011; G. Delen, 2005; G. P. A. J. Delen, Peters, Verhoef, & van Vlijmen, 2016; Kettler & Walstrom, 1993; Reilly, 2014; L. P. Willcocks & Lacity, 1999). Many of these studies describe the reasons why outsourcing projects fail or succeed. However, the factors organizations should consider before making the ITO decision are not readily available.

Kettler & Walstrom (1993) describe outsourcing factors on a high level (‘personnel’, ‘economic’, ‘risk vs control’, ‘data or segment characteristics’, ‘organization characteristics’ and ‘supplier and contract issues’). Similarly, other researchers like Kremic *et al.* (2004) or Lian *et al.* (2014) also show similar high level clusters of decision factors (Kremic, Tukel, & Rom, 2006; Lian, Yen, & Wang, 2014) where some factors correspond but others differ.

Our literature study resulted in the collection of sixteen publications (from between 1993 until 2016) related to different branches of industry in which ITO decision factors are discussed. Kettler & Wallstrom (1993) published ‘The outsourcing decision, in which they describe what lessons they draw from the ITO decision making in three American company case studies. In 1995 Wilcocks *et al.* (1995) derived six decision factors in their case study research about 30 middle and large companies from the United Kingdom and Europe. (L. Willcocks, Fitzgerald, & Feeny, 1995). Alan Shepperd interviewed five large British companies in 1999, spending over 10 million pounds on their IT budget (Shepherd, 1999), and also found several decision factors. Likewise, the research of Patricia Woods states six decision factors in an education context for ERIC digest (Wood, 2000). Using the Analytical Hierarchy Process theory (Saaty, 1987), Yang & Huang propose a decision model containing five tangible and non-tangible decision factors (C. Yang & Huang, 2000). In order to develop a decision making model for outsourcing business processes (BPO), Yang *et al.* (2007) also use AHP, and whilst specifically developed for BPO their decision methodology is also applicable for ITO (D.-H. Yang, Kim, Nam, & Min, 2007). Similarly, Tajdini used AHP decision method and factor analysis in a specific HE context during a study in Iran (Tajdini & Nazari, 2012). In 2014, Tjader *et al.* (2014) developed a decision making model, based upon balanced score card and NHP decision making theory, conducting a case study in a commercial US company (Y. Tjader *et al.*, 2014)

Baldwin *et al.* (2001) conducted a case study in 2001, investigating an organization in the banking sector in the United Kingdom (Baldwin, Irani, & Love, 2001). More specific to the Dutch context, Erik Beulen developed a decision support model for outsourcing IT (Beulen, 2004). This model is not specific for one branch of industry, but Surf adopted this research into their outsourcing toolkit (Surf Foundation, 2011) in a higher educational context. In 2005 Guus Delen, also a Dutch researcher, developed his ‘decision and control factors for IT sourcing’. For his research he carried out a case study, investigating eighteen Dutch companies and put together a list of generic sourcing factors. In another Dutch study by the company Transition Experts, the lessons of several practical case studies of outsourcing in the Netherlands is described. From this research nine factors are derived which are also used by a Dutch consultancy agency that provides advice on the ITO decision. (Heurn & Sicheme, 2016)

Kremic *et al.* (2006) developed a business case based on a four factor decision model in which expected benefits are assessed against potential risks. In another study in the context of IT sourcing strategy for service providing companies, Wilcocks and Graig proposed a dynamic sourcing strategy model. This research was conducted for Logica in association with the London school of Economics (Logica, Wilcocks, & Craig, 2010). Assaf *et al.* (2011) searched for decision factors in a maintenance company in Saudi Arabia. This article is not about service providing companies or ITO, but the decision factors they found are applicable to the ITO decision as many factors correspond with earlier ITO research. The only factor not applicable from this research is ‘Lack of spare parts’, which is a typical

maintenance factor. Although it could be argued that even this factor is relevant to ITO, considering for example that data centres also need hardware and probably spare parts to offer the required level of continuity. However, given the application context of this research, this factor is not included into the decision factor matrix (Appendix 1 Table of literature decision factors).

Lian et al. proposed five factors based on their investigation of cloud computing adoption in a Taiwanese hospital (Lian *et al.*, 2014).

All of the studies discussed above state decision factors that can be used in ITO decision making (an overview of which is given in appendix 1). Although both geographic areas as well as the branches of industry differ across the studies, most decision factors seem to be applicable in Dutch HE context. Whether or not these factors actually can be applied in this context is investigated in more detail in this research by means of an online survey.

From the literature research we derived sixteen factors (appendix 1) that are presented to four experts in outsourcing via four explorative interviews. Following the interviews, the decision factors were investigated in the specific context of Dutch Higher Education.

## RESULTS & DISCUSSION

In the previous chapter the literature on ITO objectives, decision factors and sourcing models is discussed. Following the literature study, the sixteen remaining decision factors are discussed in four explorative interviews, conducted with respondents carefully chosen because of their knowledge and experience on ITO. This resulted in fourteen final decision factors that are validated in a higher education context, by surveying IT decision makers in universities.

### Results from Literature Review

As stated above Dibbern *et al.* (2004) separate the outsourcing decision from how to outsource (decision making and implementation). The decision factors to consider according to existing literature is discussed in the previous section. Summarizing all these factors in a matrix, resulted in a total of 219 lines of factors. Next, the factors were merged by manually judging the factors in comparison to the others. This process resulted in sixteen (clustered) decision factors, presented in the matrix shown in appendix 1, which are: *'control & management, communications, contract, data characteristics, environment, finance, knowledge, quality & innovation power, suppliers & market, dis entanglement of the application (integrations with other applications), organization, personnel, risk, security & privacy, strategy and technology'*.

Organizations choose to outsource ITO for a reason (Why?). The sourcing objectives chosen for this research are adopted from the symbiosis study (Bergstra *et al.*, 2011). The categorization of sourcing models that we adhere to in this study is: 'make, ally and buy', as defined by Eilander (2009).

In order to check if any factors are missing the factors are validated in explorative interviews before we developed the survey.

### Explorative Interviews Results

The sixteen decision factors derived from existing literature are checked in four explorative interviews to respondents selected for their knowledge and experience about ITO. The interviews were semi-structured, meaning that no fixed line of questioning was used, but only topics in order to give the researcher freedom during the interviews to discuss issues in more detail when necessary. During the first part of the interview, respondents were asked what factors are important according to their knowledge and experience. The second part of the interview consisted of a discussion of the decision factors that were found in literature. The respondents were specifically asked for their opinion about whether these factors are important for ITO decision making in Dutch HE institutions.

The interviews were recorded and transcribed afterwards. The transcriptions were coded with NVIVO software. Two of the sixteen factors were dismissed in these interviews: resulting in the following fourteen factors: *'Control & Management, Data characteristics, Environment, Finance, Knowledge,*

*Quality & innovation power, suppliers & market, dis entanglement of the application (integrations with other applications), organization, Personnel, Risk, Security & privacy, Strategy and Technology’.*

Appendix 2 Decision factors for ITO with source, show the decision factors along with a description and the source they are derived from.

The decision factors, together with the sourcing objectives and sourcing models are subsequently surveyed with at a larger population of IT decision makers from Dutch higher education institutions, the results of which are presented below.

### Survey Results

Before sending the survey to the decision makers, the questionnaire that was constructed was tested by a small group of people that were not involved in the research before. The goal was to see if the questions were clear and interpreted in a similar manner. After some minor adjustments the questionnaire was transferred to an online survey tool to facilitate the distribution and processing of the results.

In order to determine who to invite, an estimation was made of the population. Based upon a case at HU University of Applied Sciences Utrecht, an average of three decision makers per education institution are estimated. Since there are fifty five higher education institutions in the Netherlands (StudieLink, 2016), the population IT decision makers in Dutch higher education is estimated at 165 people.

Invitations were send to several mailing list, trying to reach all of the estimated decision makers at all institutions. The mailing lists covered 78% of the people at the 55 institutions so not the entire population was reached directly. In the invitation receivers were asked to forward the invitation to the decision makers in their institution in order to try to increase the targeted audience. One month after sending the invitation, a reminder was send to all respondents. After two months, forty nine (49) respondents completely or partially filled out the survey. The response therefor was 29.7% of the total estimated population. With a reliability of 95%, an error margin of 11,77% has to be taken into account.

### Sourcing Objectives

In the first cluster of questions, respondents were asked which sourcing objectives they have when outsourcing their on-premise applications. Forty respondents filled out this question, resulting in a response of 24.2%. With a reliability of 95%, an error margin of 13,53% has to be taken into account.

Seventy percent (70%) of the respondents want to achieve strategic objectives. Eighteen percent (18%) want to achieve knowledge & personnel objectives. The remaining twelve percent (12%) want to achieve financial objectives by outsourcing their IT.

When comparing the two types of HE institutions, the financial objective stands out. None of the university respondents indicate to outsource their on-premise applications for financial objectives, while the other two objectives are relatively similar (See

Table 3). As three respondents are working for a consulting company and not actually for an HE institution (they are only there for the duration of a project), the number of respondents in this comparison is 37.

**TABLE 3  
SOURCING OBJECTIVES DUTCH HIGHER EDUCATION INSTITUTIONS**

<i>type</i>	Sourcing objectives			
	<i>n</i>	<i>Strategic</i>	<i>Knowledge &amp; personnel</i>	<i>Financial</i>
<i>Universities of applied sciences</i>	28	71%	18%	11%
<i>Universities</i>	9	78%	22%	0%

### Decision Factors

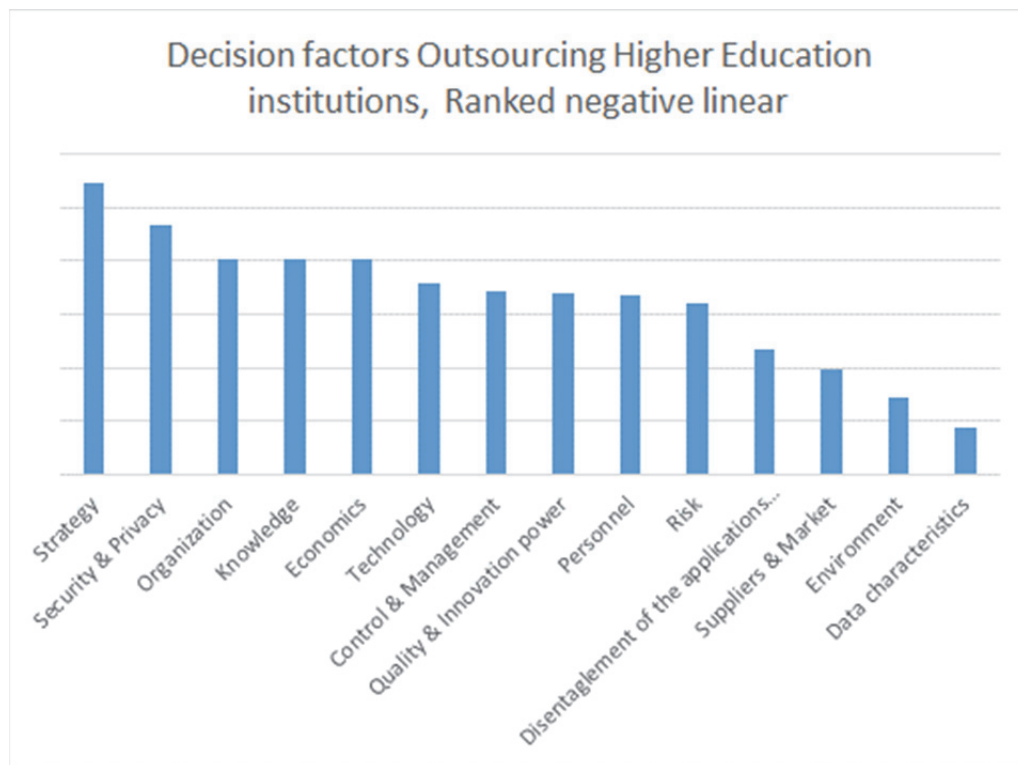
In the second part of the questionnaire, the respondents were asked to indicate what factors are important when making the ITO decision. First they were challenged to fill out the factors they find



important via an open question before presenting the fourteen factors from the literature study and expert interviews. No new factors were mentioned in comparison with the fourteen factors. Following this the respondents were asked to rank the decision factors, putting the most important factor at the top and finishing with the least important factor. The respondents were obliged to fill out at least six factors. This question has been filled out by 36 of the respondents, with a reliability of 95%, an error margin of 14,49% has to be taken into account.

The survey tool processed these rankings in fourteen columns per respondent. In order to transform these lines into one hierarchy ranking, a linear weight was added to the factors. Column one (with the number one factor from all respondents) was given a weight of fourteen, column two was given a weight of thirteen, etc. The fourteenth column was given a weight of one (1). Combining all these weighted factors, the linear hierarchy as shown in Figure 2 was derived.

**FIGURE 2**  
**GRAPHIC REPRESENTATION OF HIERARCHY OF DECISION FACTORS, RANKED LINEAR**



When decision makers are separated according to the type of institution a different ranking arises. The same applies to the size of the institution, measured by the enrolled number of students.

Table 4 presents the differentiation of the top five decision factors when making a breakdown between type of institution (University or University of Applied Science) and size of the institution (more or less than 5000 enrolled students). Three factors appear to be important, despite type of the institution. These factors are: 'Strategy', 'Security & Privacy' and 'Knowledge'. The decision factors small and large institutions have in common are: 'Strategy', 'Security & Privacy' and 'Economics'.

**TABLE 4**  
**TOP FIVE DECISION FACTORS, CATEGORIZED BY INSTITUTION TYPE AND SIZE**

Top five decision factors, sorted after institution type and size						
	All institutions, all sizes	University of Applied Science	University	< 5000 students	> 5000 students	
1	Strategy	Strategy	Security & privacy	Strategy	Security & privacy	
2	Security & privacy	Economics	Strategy	Security & privacy	Quality & Innovation power	
3	Knowledge	Organization	Knowledge	Knowledge	Strategy	
4	Economics	Knowledge	Technology	Economics	Economics	
5	Organization	Security & privacy	Personnel	Organization	Technology	

*Sourcing Models*

The final question of the survey is aimed at detecting a relation between decision factors and sourcing models. The objectives institutions want to achieve with outsourcing their on-premise applications also seems to influence the relationship decision factors have with sourcing models. Therefore, respondents are asked to fill out this question with the sourcing objective in mind which they chose at the beginning of the questionnaire. For this question, respondents were asked to divide 10 points per decision factor, over the three different sourcing models. The sourcing model which the respondent prefers most in relation to a decision factor, should be given the most points. The respondent is free to divide the points over the sourcing models. For example when considering the decision factor ‘security & privacy’, if a respondent decides that administration of the application in-house is more favourable than in the outsourced scenario, than the sourcing model ‘make’ should get the most points and ‘buy’ the least.

27 of the respondents filled out this question. With a reliability of 95%, an error margin of 17.3% has to be taken into account. Despite this rather large error margin and the low response rate (27 out of an estimated population of 165), a pattern seems to occur when highlighting the largest score per decision factor (see Table 5).

**TABLE 5**  
**RELATION BETWEEN DECISION FACTORS ON SOURCING MODELS**

<i>Decision Factor</i>	<i>Sourcing model</i>		
	<i>MAKE</i>	<i>ALLY</i>	<i>BUY</i>
Control & Management	113	82	78
Data characteristics	115	79	87
Environment	90	77	98
Economics	97	61	104
Knowledge	81	73	109
Quality & Innovation power	74	84	104
Suppliers & Market	66	74	121
Disentanglement of the application (integrations)	105	73	85
Organization	103	69	91
Personnel	101	64	98
Risk	90	67	106
Security & Privacy	112	67	84
Strategy	118	61	84
Technology	61	71	129

As is shown in table 5, when including the sourcing objective into the study, an interesting pattern seems to arise (although the response rate was low and the error margin was high). There seems to be an indication that sourcing objectives influence the importance of decision factors according to a specific sourcing model (See Appendix 3 Influence of sourcing objectives on relation decision factors to sourcing models).

## CONCLUSION, LIMITATIONS AND FUTURE RESEARCH

In this chapter conclusions are formulated, limitations of this research are discussed and suggestions for future research are presented.

### Conclusions

Based on our study we have found that fourteen decision factors are important when considering outsourcing on-premise applications in Dutch higher education institutions. These factors were evaluated by IT decision makers and also ranked in order of importance as follows: ‘Strategy’, ‘Security & Privacy’, ‘Knowledge’, ‘Economics’, ‘Organization’, ‘Technology’, ‘Control & Management’, ‘Quality & Innovation power’, ‘Risk’, ‘Personnel’, ‘Disentanglement of the application (integrations)’, ‘Suppliers & Market’, ‘Environment’ and ‘Data characteristics’. Furthermore, we found that the type and size of the HE institution influences the ranking of the decision factors. Differentiating the survey responses to types of institutions (Universities or Universities of Applied Sciences), changed the ranking of decision factors.

Likewise, differentiating the survey responses to the size of institutions (more or less than 5000) also changed the ranking of decision factors. An additional finding from this research is that seventy percent of the IT decision makers in Dutch higher education institutions want to achieve strategic objectives.

Considering the stated error margin of 11.7% and a reliability of 95% the results show that 70% of the IT decision makers of Dutch higher education institutions choose to outsource their applications in order to achieve strategic objectives. These goals are: ‘focus on core activities’, ‘flexibility’, ‘top-down pressure’, ‘covering IT risk’ and ‘continuity’ (Bergstra *et al.*, 2011). Finally, this study suggests that there is a relationship between decision factors and sourcing models and that the sourcing objectives seem to influence this relationship. Analyzing the relationship between decision factors and sourcing models

through the perspective of sourcing objectives the relationship changes, indicating that the sourcing objectives influences the relationship.

### Limitations

Despite efforts to raise the response rate, it was limited at 29,7% of the estimated population. Therefore the conclusions must be interpreted with certain reservations. As the number of respondents per question was also small the results were processed qualitatively. Some effort was put into a quantitative analysis of the responses but we found that it was not possible to statistically prove a relationship between decision factors and sourcing models, partially due to the format of the data (incomparable scales).

### Future Research

In this study the decision factors for outsourcing on-premise applications were investigated, resulting in fourteen different factors that are important in Dutch HE context. However more research is needed to further substantiate these preliminary findings. First, using these factors in a real situation is recommended in order to be able to obtain more information on how the factors are interpreted and used. In this research Dutch IT decision makers are asked for their opinion about these factors. When applied in an experiment, researchers could be more certain about the actual use of the decision factors. When applied in actual situations, we suggest to test the factors in different settings by differentiating by size and type of organization. Make a distinction between universities and universities of applied sciences, because the results of this research indicate that the factors differ by type and size of institution.

The survey we used was analysed qualitatively, however to be more certain about the relation between decision factors and sourcing models a new survey should be constructed focused on studying these relationships. Also the sourcing objectives seem to be influencing the outcomes of this relation and this could be included in future research. Finally, in order to make the ITO decision, the decision factors should be incorporated into a decision model. Dibbern et al (2004) suggested a framework to make the decision. In the 'which' and 'how' step these decision factors could be of help in order to choose a sourcing model suitable per the application, therefore we suggest extending this framework based on our findings.

### REFERENCES

- Assaf, S., Hassanain, M. a., Al-Hammad, A.-M., & Al-Nehmi, A. (2011). Factors affecting outsourcing decisions of maintenance services in Saudi Arabian universities. *Property Management*, 29(2), 195–212. <https://doi.org/10.1108/02637471111122471>
- Baldwin, L. P., Irani, Z., & Love, P. E. D. (2001). Outsourcing information systems: Drawing lessons from a banking case study. *European Journal of Information System*, 10, 15–24. <https://doi.org/10.1057/palgrave.ejis.3000372>
- Bergstra, J., Delen, G., Hoogeveen, D., Leeuw, K. de, Peters, R., Vermeire, I., & Vlijmen, B. van. (2011). *Outsourcing in NL - Op zoek naar sourcingsucces [resultaten van het Symbiosis onderzoek]*. Verdonck, Klooster & Associates.
- Beulen, E. (2004). Beslissingsondersteuningsmodel uitbesteding van IT-dienstverlening.
- Delen, G. (2005). Decision- en controlfactoren voor sourcing van IT, 233.
- Delen, G. P. A. J., Peters, R. J., Verhoef, C., & van Vlijmen, S. F. M. (2016). Lessons from Dutch IT-outsourcing success and failure. *Science of Computer Programming*, 1–52. <https://doi.org/10.1016/j.scico.2016.04.001>
- Dibbern, J., Goles, T., Hirschheim, R., & Jayatilaka, B. (2004). *Information Systems Outsourcing*. *Information Systems Outsourcing* (Vol. 35). <https://doi.org/10.1007/978-3-540-88851-2>
- Eilander, S. (2009). *Onderweg naar Sourcing; bestuurlijke handreiking sourcing*. Den Haag.
- Heurn, F. van, & Sicheme, D. van. (2016). *Denk Nou Eerst Eens Na Joh!* Utrecht: Transition Experts B.V. Retrieved from [www.transiionexperts.nl](http://www.transiionexperts.nl)

- Hevner, B. A. R., March, S. T., Park, J., & Ram, S. (2004). DESIGN SCIENCE IN INFORMATION SYSTEMS RESEARCH. *MIS Quarterly Executive*, 28(March), 75–106.
- Kettler, K., & Walstrom, J. (1993, December). The outsourcing decision. *International Journal of Information Management*, 449–459.
- Kotlarsky, J., & Oshri, I. (2012). *Your guide to sourcing models*.
- Kremic, T., Tukel, O. I., & Rom, W. O. (2006). Outsourcing decision support: a survey of benefits, risks, and decision factors. *Supply Chain Management: An International Journal*, 11(6), 467–482. <https://doi.org/10.1108/13598540610703864>
- Lian, J. W., Yen, D. C., & Wang, Y. T. (2014). An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital. *International Journal of Information Management*, 34(1), 28–36. <https://doi.org/10.1016/j.ijinfomgt.2013.09.004>
- Liang, H., Wang, J.-J., Xue, Y., & Cui, X. (2016). IT Outsourcing Research from 1992 to 2013: A Literature Review Based on Main Path Analysis. *Information & Management*, 53(2), 227–251. <https://doi.org/10.1016/j.im.2015.10.001>
- Logica, Wilcocks, L., & Craig, A. S. (2010). OUTSOURCING IN DIFFICULT TIMES: RELEASEING COSTS, BUT MAINTAINING CONTROL.
- Reilly, P. (2014). Outsourcing decision making : Can we make it more considered ? *IES Report 504*. Retrieved from [www.employment-studies.co.uk](http://www.employment-studies.co.uk)
- Saaty, R. W. (1987). The analytic hierarchy process-what it is and how it is used. *Mathematical Modelling*, 9(3–5), 161–176. [https://doi.org/10.1016/0270-0255\(87\)90473-8](https://doi.org/10.1016/0270-0255(87)90473-8)
- Shepherd, A. (1999). Outsourcing IT in a changing world. *European Management Journal*, 17(1), 64–84. [https://doi.org/10.1016/S0263-2373\(98\)00064-4](https://doi.org/10.1016/S0263-2373(98)00064-4)
- StudieLink. (2016). Aantal onderwijsinstellingen Nederland. Retrieved December 28, 2016, from <http://info.studielink.nl/nl/studenten/overzichtonderwijsinstellingen/Pages/Default.aspx>
- Surf. (2015). Surf kubus project IaaS voor onderwijsinstellingen. Retrieved April 12, 2016, from <https://www.surf.nl/innovatieprojecten/cloud/surf-cloudproject-kubus.html>
- Surf Foundation. (2011). T029-Beslissingsondersteuningsmodel voor sourcing Korte omschrijving Waarvoor is dit instrument nodig ?
- Surf Taskforce Cloud, & Bax, S. (2012). *Sourcing Strategy*.
- Tajdini, S., & Nazari, M. (2012). Is Outsourcing Decision: A Quantitative Approach. *International Journal of Business and Management*, 7(2), 113–129. <https://doi.org/10.5539/ijbm.v7n2p113>
- Tjader, Y. C., Shang, J. S., & Vargas, L. G. (2010). Offshore outsourcing decision making: A policy-maker's perspective. *European Journal of Operational Research*, 207(1), 434–444. <https://doi.org/10.1016/j.ejor.2010.03.042>
- Tjader, Y., May, J. H., Shang, J., Vargas, L. G., & Gao, N. (2014). Firm-level outsourcing decision making: A balanced scorecard-based analytic network process model. *International Journal of Production Economics*, 147(PART C), 614–623. <https://doi.org/10.1016/j.ijpe.2013.04.017>
- Venturebeat. (2011). Service models and OSI-model. Retrieved January 12, 2017, from <http://venturebeat.com/2011/11/14/cloud-iaas-paas-saas/>
- Verschuren, P., & Doorewaard, H. (2015). *Het ontwerpen van een onderzoek* (vijfde dru). Amsterdam: Boom Lemma Uitgevers.
- Willcocks, L., Fitzgerald, G., & Feeny, D. (1995). Outsourcing IT: The strategic implications. *Long Range Planning*, 28(5), 59–70. [https://doi.org/10.1016/0024-6301\(95\)00038-K](https://doi.org/10.1016/0024-6301(95)00038-K)
- Willcocks, L. P., & Lacity, M. C. (1999). IT outsourcing in insurance services: risk, creative contracting and business advantage. *Information Systems Journal*, 9(3), 163–180. <https://doi.org/10.1046/j.1365-2575.1999.00061.x>
- Wood, P. A. (2000). Outsourcing in Higher Education. ERIC Digest. Retrieved June 6, 2016, from <http://www.ericdigests.org/2001-3/outsourcing.htm>
- Yang, C., & Huang, J.-B. (2000). A decision model for IS outsourcing. *International Journal of Information Management*, 20(3), 225–240. Retrieved from <http://web.a.ebscohost.com/ehost/detail/detail?vid=13&sid=363d3325-9d02-451f-b4ec->

fa0486d277a3@sessionmgr4005&hid=4204&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ==#AN=324  
2516&db=bsh

Yang, D.-H., Kim, S., Nam, C., & Min, J.-W. (2007). Developing a decision model for business process outsourcing. *Computers & Operations Research*, 34(12), 3769–3778. <https://doi.org/10.1016/j.cor.2006.01.012>

**APPENDIX 1**

**TABLE OF LITERATURE DECISION FACTORS**

SOURCE	CATEGORY														
	PERSONNEL	FINANCE	CONTROL & MANAGEMENT ORGANIZATION	SUPPLIERS & MARKET	INTEGRATIONS	DATA CHARACTERISTICS	KNOWLEDGE	SECURITY & PRIVACY	STRATEGY	QUALITY & INNOVATION POWER	ENVIRONMENT	RISK	COMMUNICATIONS	CONTRACT	TECHNOLOGY
Kettler & Walstrom - The outsourcing decision (1993)	X	X	X	X	X	X									
Rush, Kempner & Goldstein, 1995 (FROM: ERIC DIGEST, 2005)	X	X	X						X	X		X			
Wilcocks, Fitzgerald & Feeny - Outsourcing IT : the strategic implications (1995)				X	X	X	X	X	X	X		X			
Allan Shepperd - Outsourcing IT in a changing world (1999)			X	X						X				X	
Yang & Huang - A decision model for IS outsourcing. (2000)	X	X	X						X	X		X	X		X
LP Baldwin et al - Outsourcing information systems: Drawing lessons from a banking case study (2001)	X	X		X	X								X	X	
Erik Beulen - Beslissingondersteuningsmodel uitbesteding van IT-dienstverlening (2004)			X		X		X	X	X	X				X	
Guus Delen - Decision- en controliactoren voor IT-sourcing (2005)	X	X		X		X	X								
Kremic et al. - Outsourcing decision support: a survey of benefits, risks, and decision factors (2006)	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Yang e al. - Developing a decision model for business process outsourcing (2007)			X	X	X	X			X	X	X				
Logica; Leslie P. Wilcocks, Andrew G. Craig - OUTSOURCING IN DIFFICULT TIMES: RELEASEING COSTS, BUT MAINTAINING CONTROL (2010)	X	X			X		X			X	X	X			
Hassanain et al. - Factors affecting outsourcing decisions of maintenance services in Saudi Arabian universities (2011)			X	X	X	X	X	X	X	X					X
Tjader et al. - Firm-level outsourcing decision making: A balanced scorecard-based analytic network process model (2014)			X	X		X		X	X						X
Lian, Yen, Wang - An exploratory study to understand the critical factors affecting the decision to adopt cloud computing in Taiwan hospital (2014)	X	X		X		X		X	X						
vka - Denk nou eerst eens even na joh (2016)	X	X			X	X	X	X	X	X					

APPENDIX 2

DECISION FACTORS FOR ITO WITH SOURCE

Factor	Description	Source
Control & Management	Does managing of the application become more complex when changing the sourcing model?	(Assaf, Hassanain, Al-Hammad, & Al-Nehmi, 2011; Kettler & Walstrom, 1993; Shepherd, 1999; Y. Tjader <i>et al.</i> , 2014; Wood, 2000; C. Yang & Huang, 2000)
Data characteristics	Is it necessary to convert the data structures when outsourcing the application?	(Assaf <i>et al.</i> , 2011; Kettler & Walstrom, 1993)
Environment	Does the (geographic) location of the application matter to organizations after outsourcing the application? Also take in mind government support in case of offshoring.	(Logica <i>et al.</i> , 2010)
Economics	What financial consequence does outsourcing bring on the short and long term? Are currency differences important when outsourcing?	(Baldwin <i>et al.</i> , 2001; Beulen, 2004; G. Delen, 2005; Heurn & Sicheme, 2016; Kettler & Walstrom, 1993; Lian <i>et al.</i> , 2014; Logica <i>et al.</i> , 2010; Shepherd, 1999; Y. Tjader <i>et al.</i> , 2014; Wood, 2000; C. Yang & Huang, 2000)
Knowledge	Does your organization need specific knowledge to maintain the application? Also is there sufficient knowledge available in your company of in the market?	(Assaf <i>et al.</i> , 2011; Beulen, 2004; G. Delen, 2005; Heurn & Sicheme, 2016; Lian <i>et al.</i> , 2014; Logica <i>et al.</i> , 2010; Y. Tjader <i>et al.</i> , 2014; L. Willcocks <i>et al.</i> , 1995)
Quality & Innovation power	What consequences does changing the sourcing model have on the quality and innovation power of the application administration?	(Assaf <i>et al.</i> , 2011; Beulen, 2004; Heurn & Sicheme, 2016; Logica <i>et al.</i> , 2010; Shepherd, 1999; L. Willcocks <i>et al.</i> , 1995; Wood, 2000; C. Yang & Huang, 2000)
Suppliers & market	Does the market offer sufficient vendors to enable education institutions to choose between vendors?	(Assaf <i>et al.</i> , 2011; Baldwin <i>et al.</i> , 2001; Beulen, 2004; Heurn & Sicheme, 2016; Kettler & Walstrom, 1993; Logica <i>et al.</i> , 2010; Y. Tjader <i>et al.</i> , 2014; L. Willcocks <i>et al.</i> , 1995)
Integrations	How complex is it to ‘free’ the application from the integrations already existing in the current infrastructure?	(Assaf <i>et al.</i> , 2011; G. Delen, 2005; Heurn & Sicheme, 2016; Lian <i>et al.</i> , 2014; L. Willcocks <i>et al.</i> , 1995)
Organization	What consequences does outsourcing bring to the organization. Hereby think about resources, capabilities and culture.	(Assaf <i>et al.</i> , 2011; Baldwin <i>et al.</i> , 2001; G. Delen, 2005; Kettler & Walstrom, 1993; Lian <i>et al.</i> , 2014; L. Willcocks <i>et al.</i> , 1995)
Personnel	How will outsourcing of the application effect the current personnel. Not only for IT personnel, but also for functional management employees in the current company.	(Baldwin <i>et al.</i> , 2001; G. Delen, 2005; Heurn & Sicheme, 2016; Kettler & Walstrom, 1993; Kremic <i>et al.</i> , 2006; Lian <i>et al.</i> , 2014; Logica <i>et al.</i> , 2010; Wood, 2000)

<b>Continuation</b>		
<b>Factor</b>	<b>Description</b>	<b>Source</b>
Risk	Does outsourcing increase or decrease the level of uncertainty About the future business environment?	(Logica <i>et al.</i> , 2010; L. Willcocks <i>et al.</i> , 1995; Wood, 2000; C. Yang & Huang, 2000)
Security & privacy	Is the data that the application store to such a degree that certain sourcing models are not to be considered?	(Heurn & Sicheme, 2016; Lian <i>et al.</i> , 2014)
Strategy	What is the strategic importance of the application to the organization? Does this application enable the organization to differentiate itself from its competitors?	(Assaf <i>et al.</i> , 2011; Beulen, 2004; Heurn & Sicheme, 2016; Kremic <i>et al.</i> , 2006; Y. Tjader <i>et al.</i> , 2014; L. Willcocks <i>et al.</i> , 1995; Wood, 2000; C. Yang & Huang, 2000)
Technology	Does technology contribute to increasing the quality of the competitive position? Also does the organization possesses sufficient technical knowledge to maintain the application (now and in the future)?	(Assaf <i>et al.</i> , 2011; Y. Tjader <i>et al.</i> , 2014; C. Yang & Huang, 2000)



APPENDIX 3

INFLUENCE OF SOURCING OBJECTIVES ON RELATION DECISION FACTORS TO SOURCING MODELS

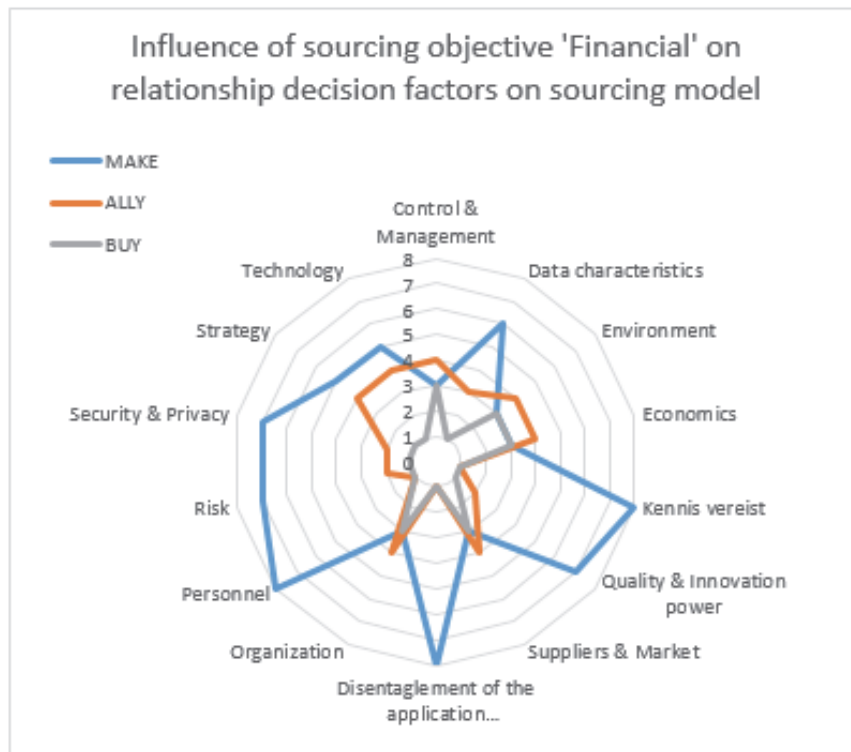
FIGURE 3  
INFLUENCE OF STRATEGIC OBJECTIVE ON DECISION FACTOR TO SOURCING MODEL

STRATEGIC DECISION FACTOR	SOURCING MODEL		
	MAKE	ALLY	BUY
Control & Management	90	53	70
Data characteristics	88	55	78
Environment	80	52	83
Economics	78	44	90
Kennis vereist	63	53	97
Quality & Innovation power	56	62	95
Suppliers & Market	58	53	100
Disentanglement of the application (integral)	81	53	79
Organization	80	49	84
Personnel	71	49	93
Risk	67	50	96
Security & Privacy	88	48	77
Strategy	95	40	78
Technology	47	53	111



**FIGURE 4**  
**INFLUENCE OF FINANCIAL OBJECTIVE ON DECISION FACTOR TO SOURCING MODEL**

FINANCIAL	SOURCING MODEL		
DECISION FACTOR	MAKE	ALLY	BUY
Control & Management	3	4	3
Data characteristics	6	3	1
Environment	3	4	3
Economics	3	4	3
Kennis vereist	8	1	1
Quality & Innovation power	7	2	1
Suppliers & Market	3	4	3
Disentanglement of the application (integra	8	1	1
Organization	3	4	3
Personnel	8	1	1
Risk	7	2	1
Security & Privacy	7	2	1
Strategy	5	4	1
Technology	5	4	1



**FIGURE 5**  
**INFLUENCE OF KNOWLEDGE & PERSONNEL OBJECTIVE ON DECISION**  
**FACTOR TO SOURCING MODEL**

KNOWLEDGE & PERSONNEL DECISION FACTOR	SOURCING MODEL		
	MAKE	ALLY	BUY
Control & Management	20	25	5
Data characteristics	21	21	8
Environment	7	21	12
Economics	16	13	11
Kennis vereist	10	19	11
Quality & Innovation power	11	20	8
Suppliers & Market	5	17	18
Disentanglement of the application (integrat	16	19	5
Organization	20	16	4
Personnel	22	14	4
Risk	16	15	9
Security & Privacy	17	17	6
Strategy	18	17	5
Technology	9	14	17

