Factors Influencing the Adoption of and Business Case for Cloud Computing in the Public Sector

Eleonora KUIPER¹, Frank VAN DAM², Andreas REITER³, Marijn JANSSEN⁴

¹ Tax Administration, Laan van Westenenk 492, Apeldoorn, 7334 DS, Netherlands
Tel: +31 6 18596886, Email: ej.kuiper@belastingdienst.nl
² Ministry of Economic Affairs, Bezuidenhoutseweg 73, The Hague, 2594 AC, Netherlands
Tel: +31 6 46152070, Fax: + 31 70 3797864, Email: f.vandam@minez.nl
³ Institute for Applied Information Processing and Communications, Graz University of Technology, Inffeldgasse 16a, Graz, 8010, Austria
Tel: +43 316 873-5551, Email: andreas.reiter@iaik.tugraz.at
⁴ Delft University of Technology, Faculty of Technology, Policy and Management, Jaffalaan 5, Delft, 2628 BX, Netherlands,
Tel: +31 15 2781140, Email: M.F.W.H.A.Janssen@tudelft.nl

Abstract: Cloud adoption in the public sector is taking off slowly, which is perceived as a problem. Models of factors influencing cloud adoption are derived for better understanding using literature and results obtained via desk research and surveys by the Cloud for Europe project. We conclude that several factors require further research, such as the culture in countries, climate, legislation, economics and politics, IT staff shortage and feelings of uncertainty, fear and impatience. Adoption factors have impact on the business case for cloud computing. Hence a business case template to compare cloud scenarios with zero scenarios is developed. We recommend to use the risk-adjusted balance between benefits and costs to decide on cloud adoption instead of focussing only on the benefits of cloud computing. Although this makes the business case for adoption of cloud computing less favourable, it provides a more realistic picture leading to sustainable decisions on cloud adoption.

1. Introduction

Cloud computing is an innovative service delivery model in which services are delivered on-line and hosted remotely or on-premise in a cloud. For a definition of cloud computing and its service and deployment models, we refer to the NIST definition [17]. Cloud computing can provide advantages such as cost reduction, increased flexibility and agility [1]. Despite its many potential advantages the adoption of cloud computing lags behind in the public sector. For example Bellamy [1] has found that take-up of cloud computing services is less than 5 % of the ICT footprint in most public sector organizations. This raises the question: Why is adoption slow? To our knowledge there is no model of factors influencing the adoption of cloud computing in the public sector. By building such a model, public organizations can better understand cloud adoption.

The public sector needs to address public values such as maintaining privacy, providing sufficient security and adhering to the legislation, which was never written with the cloud in mind. In case of a severe security or privacy breach, this results in a lot of negative media attention and managerial problems including career degradation, or politicians needing to step down. One reason for slow adoption may be that public managers are reluctant to adopt cloud computing since they are not sure whether the public values can be warranted.
We use results from the Cloud for Europe project (www.cloudforeurope.eu). It is an international Pre-Commercial Procurement (PCP) [5] project carried out by public administrations and research organizations. The objective of Cloud for Europe is to increase cloud adoption by the public sector. The project initiates innovative cloud solutions for the public sector, solutions that build trust and encourage the public sector to adopt cloud computing. The project is funded by the European Commission as part of the implementation of the EU Cloud Strategy [7]. This strategy outlines actions to deliver a net gain of 2.5 million new European jobs, and an annual increase of €160 billion to the EU Gross Domestic Product (GDP) by 2020, see also Figure 2.

Our objective is to create an understanding of the factors influencing the adoption of cloud computing in the public sector. Adoption is “the initial decision regarding whether or not to use a technology service”[20]. This understanding may help to evaluate which factors need to be addressed for cloud adoption, and to evaluate whether cloud computing is the preferred solution. The main research questions in this paper are:

1. Which factors influence the adoption rate of cloud computing in the public sector?
2. How can this be reflected in the making of the business case?

Section 2 describes the methodology used. Section 3 provides models of factors influencing the cloud adoption rate using innovation theory [22] and empirical results. Section 4 presents use cases on cloud adoption showing a slow adoption in 2014 in two Member States. Section 5 provides a short adoption plan related to Cloud for Europe. Since the public sector uses business cases in the decision stage for cloud adoption, in section 6 a template is proposed to arrive at sustainable decisions. In section 7 we conclude with answers to the research questions and with recommendations. The intended audience of this paper consists of researchers, CIOs, policy makers, ICT professionals and EU staff.

2. Methodology

This paper is based on explorative research. It is applied research as the findings from the desk research have been used in a survey for verification. The research can be characterized as practice oriented, as it addresses a practical situation, see [23]. The stage of the practice-oriented research can be characterized as diagnosis, as it focuses on analysing the current situation, problems and causes. We describe the methodology used in work packages 2-4 of the Cloud for Europe project.

In work package 2 the public sector related barriers described in [9] are based on the information obtained from a due diligence exercise performed among the partners of the Cloud for Europe consortium, requesting to list any potential barriers they experience when moving public sector services to a cloud environment in their country.

The method used in work package 3 is a combination of desk research [23] and a survey. The goal of the survey was to determine the position and perception of the EU public sector on cloud computing and cloud computing offerings. The survey was used to verify the findings from the desk research to avoid random errors and increase reliability. To avoid systematic errors and increase validity, the survey has been sent out to participating countries in Europe, to people with a dissimilar background (various levels of public sector, universities, and research institutes). Results were obtained from the Netherlands, Austria, Portugal, Spain, Norway and Belgium. In the survey the participating Member States were asked for information on the status quo of cloud adoption in the public sector in their country. The use cases in section 4 were provided by Cloud for Europe team members based on material of work package 3. The country exploration was supplemented by a literature study using scientific search engines at the university library, Google Scholar on the internet, the research databases Web of Science and the IEEE Xplore Digital Library, and the Cloud for Europe’s literature repository. The literature search was done using the keywords: ‘cloud adoption, ‘cloud adoption factors’, ‘public sector’, ‘public sector cloud’,
‘cloud computing business case’ and ‘cloud computing economics’. Based on the abstracts found, a further selection of the literature took place based on relevance. This served to create models of influences impacting adoption of cloud computing in the public sector.

In work package 4 research challenges were identified to increase cloud adoption by the public sector. The participating Member States supplied suggestions for innovative cloud solutions, needed by the public sector and not available on the market. This served to create challenges for the research community. The results are briefly described in section 5.

3. Models of Factors

In this section we describe two models of factors operating on cloud adoption. We start with a theoretical model based on the general diffusion of innovation theory of Rogers [22], and we enrich this model with empirical evidence based on Roger’s theory. Then we describe a system diagram to model the perspective of the European Commission on cloud adoption by the public sector.

For the theoretical model we use Rogers’ diffusion of innovations theory [22], since this theory was utilized in the literature on cloud adoption, see [16] and [19]. Rogers [22] has described an innovation process consisting of six steps: problem definition, research, development, commercialization, adoption and diffusion, and consequences. For the adoption and diffusion step, five variables influence the rate of adoption of an innovation: perceived characteristics, type of innovation decision, communication channels, nature of the social system, and the extent of change agent’s promotion efforts. Especially the first variable, perceived characteristics, is used in the literature on cloud adoption, see [16] and [19]. This variable consists of five characteristics: relative advantage, compatibility, complexity, observability and trialability.

Figure 1: Theoretical and empirical factors operating on the rate of adoption based on [22], [16], [19], [1]

In [16] these characteristics are described as follows. “‘Relative advantage’ is the degree to which using an innovation is perceived to make one better off than otherwise. ‘Compatibility’ is the degree to which an innovation is perceived to be consistent with internal organizational and information systems environments. ‘Complexity’ is the degree to which using an innovation is perceived to be a difficult task. ‘Trialability’ is the degree to which, prior to adoption, an innovation can be experienced in a limited way. ‘Observability’ is the degree to which the impact of an innovation is observable to and can be communicated to others”, see [16, p. 535]. Figure 1 provides a representation of how these characteristics influence the rate of adoption of innovation, see the solid ovals in Figure 1. The striped ovals show the empirical factors, described in [16], [19] and [1], see below. The small arrows within the ovals indicate how the attribute should change to increase the rate of adoption of innovation according to theory. Relative advantage,
compatibility, trialability and observability should increase and complexity decrease in order to increase the rate of adoption. The reverse is implied in Figure 1: relative advantage, compatibility, trialability and observability should decrease and complexity increase in order to decrease the rate of adoption.

In [16] the theoretical model of Rogers [22] was used to research cloud adoption by IT staff in Taiwan. The interviews revealed that compatibility was the major concern for the adoption of cloud solutions, that is compatibility with the organization’s products and services, policy, values, experience and business needs. Based on case studies and interviews, see [19], Morgan et al. conclude that of the five theoretical characteristics in Figure 1 relative advantage, compatibility, complexity and trialability are important for cloud adoption. Observability was not mentioned by them. They perceive these characteristics as belonging to the category Technical. The relative advantage lies in cost savings, increased scalability and time savings. Compatibility with the technical environment enhances adoption. Cloud complexity results in resistance to its adoption. Trialability was found important since adopters wanted to try out cloud solutions prior to adoption. In addition to the five characteristics of Rogers [22] several other factors were described by [19] in the categories Organizational and Environmental. They mention collaboration, traceability and auditability, convincing IT managers as Organizational, and security and legal issues plus the perception of the term cloud as Environmental. In [1] it was found that risks are slowing down the adoption of cloud computing. Especially information assurance risks, loss of control, performance risks and vendor lock-in. To summarize the empirical factors we added Risks, Legal issues, Security issues, Management concerns and Auditability to the model in Figure 1. Factors with an unclear direction, like perception of terminology, or which looked more like results, like collaboration, were not added to the model in Figure 1.

In a system diagram [18] we describe some influences that so far have not been fully explored in relation to cloud adoption, see Figure 2.

![Figure 2: System diagram for cloud adoption in the public sector as perceived by the European Commission](image)

The system diagram puts cloud adoption into the context of the European Commission and in the perspective of the current timeframe, whereas the model in Figure 1 is more theory-based and independent of the timeframe. The system diagram shows on the left the steering instruments of the European Commission used to enhance cloud adoption: the EU cloud strategy, innovative procurement tools like Pre-Commercial Procurement, research funding, and personal instruments like the European Cloud Partnership and standardization groups. External influences at the top of Figure 2 influence the cloud adoption at the macro level. External influences include the legislation, the climate (energy use and emissions), the culture in the countries, the economy and politics. On the right of Figure 2, the expected
outcome of cloud adoption is shown: more jobs, increased GDP in Europe and a better service of the public sector to other public organizations and to society.

The external influences can be described as follows. Legislation: the legislation is national, whereas cloud computing has no borders. Legislative barriers have a negative influence on cloud adoption. The main barriers in a public sector cloud environment can be summarized as follows, see [9, p. 3], “(1) a patchwork of national conflicting laws resulting from local implementation of European legislation, with the European Data protection legislation as an area of focus, (2) fragmented and diverging national legislation in the public sector, with often no clear or even conflicting national legislation on whether data in the relevant domains can be transferred to a(n) (international) cloud environment, (4) national legislation discouraging the transfer of data to a(n) (international) cloud environment, (5) inappropriate public procurement legislation (6), hesitance to transfer data to the cloud given the extra-territorial enforcement needs and the foreign intelligence gathering.” Climate: the environment needs CO2 reduction and a cut down in energy used by ICT. This presents a positive influence on cloud adoption. Culture: the countries have a specific culture [10]. Cultural dimensions, such as uncertainty avoidance, can influence cloud adoption. Many people working for the government are risk-averse [12]. In ICT most public organizations are trend followers. The organizations want to use robust, proven technology. High uncertainty avoidance and risk-averseness have a negative influence on cloud adoption. The effect of culture will depend on the country scores for uncertainty avoidance. Economy: due to the economic crisis in Europe there is a constant urge in the public sector to do more with less. Cost reduction is important, budgets and staff are being cut. The crisis has an undetermined influence on cloud adoption. On the one hand the cost reduction promise of cloud computing will positively influence cloud adoption in an economic crisis. But the organizations need to invest first in innovation and this may be a problem due to budget cuts. Politics: in government, political decisions can have both a positive or negative influence on the adoption of cloud computing, depending on the political agenda. Promotion of cloud computing by important people, like the president in Estonia, may boost adoption of cloud computing. When the focus of the political agenda is on (data) security or on the failure of large ICT projects in government, the influence is negative. When the political debate is about modernization of government, the influence is positive. So the influence of politics is undetermined.

Internal influences within the cloud adoption system are related to feelings, staff shortage and innovation potential. Feelings: feelings involved are fear [12], trust and impatience. Fear is described in the context of loosing jobs, and changing jobs. But it goes deeper as well, as shown by the following conversation in spring 2014 between an IT architect at a government computing center and a Cloud for Europe team member. “If you and your project succeed in removing the barriers to cloud adoption, our entire computer center can close down” (IT architect). “I do not see it that way. I think that our computer center will both consume commercial cloud services and provide its own cloud services to public organizations” (Cloud for Europe team member). Feelings of low trust are often associated with security concerns about cloud offerings. These feelings of fear and low trust have a negative influence on cloud adoption. We noticed feelings of impatience at the business side of public sector organizations. The business wants functionality sooner than the governmental computing centers can deliver it. This may have a positive influence on cloud adoption, when the business shops in the cloud. Staff shortage: in the public sector the shortage of IT staff on the market is felt even more than in the private sector, since the public sector has difficulty in providing similar salaries than the private sector to IT staff, and thus many IT professionals accept jobs in the private sector. The effect of this staff shortage is undetermined: on the one hand it influences cloud adoption positively since managers will consider that cloud adoption allows a more effective use of human resources.
involved in IT. But the shortage of IT staff may also hinder new cloud developments. Innovation potential: there is little innovation potential left at governmental computer centers. It was found, see [6], that over 80-85 % of the ICT budget is spent on keeping the existing ICT, leaving only 15-20 % of the ICT budget for innovation. This was named the IT innovation squeeze: IT innovation is squeezed out by the resources, staff and budget, required to keep the existing IT landscape up and running.

4. Use Cases of Cloud Computing in Europe

The use cases in this section describe the slow adoption of cloud computing in the public sector. In [3] a model is introduced reflecting the current state of the cloud adoption of a Member State. This model is used in the use cases to position where a country is with respect to cloud adoption. The adoption model is described as a five-step process:

1. Position: the government has established a position and has released positioning papers.
2. Strategy: the government has established a strategy paper and a planning on how the cloud strategy will be realized.
3. Preparation: major preparations are conducted (e.g. the tender process has started) to implement cloud computing in the Member State.
4. Implementation: the Member State has reached the level of technical cloud computing implementation.
5. Operation: the government runs and maintains a cloud computing infrastructure.

In general it should be noted that most clouds operated by the public sector in 2014 are private clouds, often on-premises in government computing centres.

We provide two use cases of cloud adoption as an illustration of adoption mechanisms and the status quo of cloud computing, first the Netherlands and then Austria, since we are most familiar with these countries.

In the Netherlands, cloud computing is seen as a means to achieve efficiency and as a way to help facing budget cuts, to modernize the IT landscape and to better support organizational and political changes. There is a cloud position paper that describes a closed governmental cloud. However, most IT decision makers and CIOs in government are confused when it comes to cloud computing, due to the enormous variety of cloud offerings, aspects, types of delivery models, the demanded services, since there is not yet a government procurement and marketplace for cloud offerings like G-cloud in the UK. There is an appstore in an experimental phase [3]. Some civil servants use commercial cloud services to experiment with on a personal basis. Government layers like provinces, municipalities and the education sector publish tenders for cloud solutions. Some of these tenders are about outsourcing and within that, the option for cloud-based outsourcing is seriously considered [3]. A large government computer centre is implementing a private cloud for one of its line of business applications to the citizens. There were problems with the line of business application and the supplier recommended a private cloud solution as a remedy to these problems. This public organization is in step 4 of the five-step adoption process [3], but other public sector organizations in the Netherlands are still at steps 1-3.

The level of cloud adoption in Austria is described in Zwattendorfer’s analyses, see [24]. A cloud positioning paper from the Platform Digital Austria of the Federal Chancellery has been published in 2012 [21]. “This position paper especially covers legal, organizational, economic, and technical aspects, as well as opportunities and risks of cloud computing for public sector use. According to this paper, Austrian e-Government applications might be deployed in a private, community, or public cloud in the future. Moreover, they see all service levels applicable. IaaS could be used for archiving or backup purposes. By relying on PaaS, a particular platform supporting an easy applicable framework for developing e-Government cloud services is imaginable. On software level, future cloud services might include specific collaboration suites for public authorities or
more security related services such as Identity as a Service” [24, p.7]. In conclusion, Austria is still at step 1 of the adoption process [3], but has made interesting plans for the future.

5. Cloud adoption plan

Various cloud adoption plans exist, see for instance the plan by Deussen et al. [4]. In this section we focus on the Cloud for Europe adoption plan, which is to address or remove barriers for cloud adoption related to legal and security aspects. Cloud for Europe has identified various barriers to cloud adoption in the public sector and gaps in cloud offerings. Then Cloud for Europe selected three main research areas: legislation execution, legislation-aware storage, and brokering of certified cloud services across Europe. Legislation-awareness and legislation execution will address legal barriers and overcome some of these barriers. Brokering of certified cloud services will speed up cloud adoption, since public sector organizations need not do the certification of cloud services themselves and know better which services are offered across Europe. The research and development of the challenges will be procured using Pre-Commercial Procurement in the 2014-2016 timeframe. In 2016 the commercialisation can start and public organizations can use the research results.

6. Business Case

There is a lack of a framework for building business cases, see [1]. In the public sector business cases with cost-benefit analyses are prepared, see for example [8] and [14], to determine which scenario is best to select for a certain functionality. Solutions for innovative technologies are compared to the scenario “Continue the status quo”, the so-called zero scenario. Usually the business case is a document, which is made at a certain point in time as a final step in a decision process to arrive at an adoption decision. We first reflect on the diffusion of innovation theory and its relation to the business case. Then a business case template and checklist are provided.

The business case seeks a justification of a project. Compared to the model in Figure 1, the comparison between a scenario with an innovative cloud service and a zero scenario, are in a sense what Rogers [22] called relative advantage, that is the degree to which using an innovation is perceived to make one better off than otherwise [16], see Table 1 for the relation between the innovation characteristics and the business case elements.

<table>
<thead>
<tr>
<th>Innovations characteristic [22]</th>
<th>Business case element</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observability</td>
<td>Costs</td>
<td>Cost of reference visits, market research</td>
</tr>
<tr>
<td>Trialability</td>
<td>Costs</td>
<td>Costs of pilots and experiments</td>
</tr>
<tr>
<td>Complexity</td>
<td>Costs</td>
<td>Costs of dealing with complexity</td>
</tr>
<tr>
<td>Compatibility</td>
<td>Costs or Benefits</td>
<td>Depends on level of compatibility</td>
</tr>
<tr>
<td>Relative advantage</td>
<td>Risk-adjusted balance</td>
<td>(Benefits-Costs)-Costs of risk</td>
</tr>
</tbody>
</table>

When the relative advantage is positive for the cloud scenario, the business case is likely to result in the adoption of the cloud scenario. A practice in the public sector of dealing with risks is to keep them out of the cost-benefit analysis and only describe risk mitigation. However, adjusting the benefits-costs balance for risks is likely to give a more realistic view on the scenarios since risks have a cost associated to them for the measures to be taken, or for addressing the damages that occur despite these measures. Also since risks are so important for cloud adoption, see [1] and the model in Figure 1, we opt for explicitly handling risks. The adjustment for risks can be done by monetizing the risks and subtracting the resulting amount from the benefits-costs balance. A disadvantage of this method is that the costs of risks and risk mitigation are difficult to assess. A way to take
risks into account is described in [11] where a risk score is calculated, and the risk score is combined with costs and benefits.

In Table 2 we propose a business case template, inspired by the evaluation of infrastructure projects in [8], where a welfare economical approach is advocated. We add to that approach the explicit consideration of the risks in the Costs column and the innovation factors of Table 1 in the Costs and Benefits columns. All amounts are preferably expressed in Net Present Values.

Table 2: Initial template for a cloud business case of a single organization

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct effects</td>
<td>Direct effects</td>
</tr>
<tr>
<td>- Operating income</td>
<td>- Investments, maintenance, operation</td>
</tr>
<tr>
<td>- Increased flexibility, agility, scalability</td>
<td>- Costs for observability, trialability</td>
</tr>
<tr>
<td>- Time savings</td>
<td>- Costs for complexity, low compatibility</td>
</tr>
<tr>
<td>- Other direct effects (possibly high compatibility)</td>
<td>- Other direct effects</td>
</tr>
<tr>
<td>Indirect / strategic welfare effects</td>
<td>Indirect effects</td>
</tr>
<tr>
<td>- Environment emissions decrease, energy cuts</td>
<td>- Reorganization costs</td>
</tr>
<tr>
<td>- Other indirect effects</td>
<td>- Other indirect effects</td>
</tr>
<tr>
<td>Total benefits: A+B =</td>
<td>Total costs: D+E =</td>
</tr>
<tr>
<td>Balance (benefits-costs)</td>
<td>Balance (benefits-costs)</td>
</tr>
<tr>
<td>Risk-adjusted balance</td>
<td>Risk-adjusted balance</td>
</tr>
<tr>
<td>G-H = I</td>
<td></td>
</tr>
</tbody>
</table>

Pro Memory (PM) items
- Items related to goals (increase of jobs, GDP, service quality etcetera)
- Intangible items

Final appraisal: weighing of the risk-adjusted balance, I, up against the Pro Memory items

In the final appraisal of the business case, the risk-adjusted balance, I, must be weighed up against the Pro Memory items. Now by comparing the results of the cloud-computing scenario with the zero scenario, public sector organizations can determine the relative advantage and which scenario is best to adopt. Kundra [15] proposes to look merely at the demonstrable benefits of cloud computing scenarios. However, this may lead to cloud adoption in risky situations, leading to costly risk mitigations, overshadowing the benefits of cloud computing. By taking the risks into account as recommended, the adoption of cloud computing by the public sector will be lower than when just the benefits are considered, but it will lead to a more realistic picture and sustainable results.

The initial template in Table 2 is extended with cloud-specific benefits, costs and risks in Table 3. This is an initial checklist for a cloud computing business case based on literature as a first attempt. It needs to be completed further using the literature on economics of cloud computing.

Table 3: Initial checklist cloud computing business case

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Costs</th>
<th>Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faster service offerings [1] and faster development environments [16]</td>
<td>Configuration costs [1]</td>
<td>Inability to maintain confidentiality, integrity and availability [1]</td>
</tr>
<tr>
<td>Reduced initial costs [1], reduction in capital investments [16]</td>
<td>Data migration costs [1]</td>
<td>Loss of control of information service design [1]</td>
</tr>
<tr>
<td>Free access to value adding capabilities (optional) [1]</td>
<td>Transaction costs [12]</td>
<td>Inability to assure service performance [1]</td>
</tr>
<tr>
<td>Delivery to mobile devices [1]</td>
<td>Sunk costs of existing IT, which becomes redundant by cloud usage,</td>
<td>Vendor lock-in leading to exploitative behaviour [1] [16], data lock-in [16]</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Influence</th>
<th>Information</th>
<th>Direction to improve adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative advantage</td>
<td>Cost savings, scalability, time saving, ease of use, speed of development, agility, flexibility</td>
<td>Increase</td>
</tr>
<tr>
<td>Compatibility</td>
<td>With the existing products, services, values, experience and business needs. With the business model, the ICT environment, the policy.</td>
<td>Increase</td>
</tr>
<tr>
<td>Complexity</td>
<td>Developing for parallel computing, debugging more difficult</td>
<td>Decrease</td>
</tr>
<tr>
<td>Trialability</td>
<td>Need to experiment with cloud services</td>
<td>Increase</td>
</tr>
<tr>
<td>Observability</td>
<td>Benefits must be clear and references to success cases are needed</td>
<td>Increase</td>
</tr>
<tr>
<td>Collaboration</td>
<td>More collaboration along the supply chain</td>
<td>? More a result of using cloud computing</td>
</tr>
<tr>
<td>Traceability and auditability</td>
<td>Need for audit trail demonstrates compliance and data integrity</td>
<td>Increase</td>
</tr>
<tr>
<td>Convincing IT managers</td>
<td>Fear of losing control, fear of losing jobs</td>
<td>Increase</td>
</tr>
<tr>
<td>Security and legal issues</td>
<td>Data protection and privacy</td>
<td>Decrease</td>
</tr>
<tr>
<td>Perception of the term cloud</td>
<td>Term evokes negative reaction</td>
<td></td>
</tr>
<tr>
<td>Risk</td>
<td>Information assurance risks, loss of control risks, performance risks, vendor lock-in risks</td>
<td>Decrease</td>
</tr>
</tbody>
</table>

7. Conclusions

Which factors are influencing the usage of cloud computing in the public sector and in which way? We showed factors, derived based on the diffusion of innovations theory [22] in a model in Figure 1. Table 4 summarizes these factors.

Table 4: Summary of influences on cloud adoption rate based on [22], [16], [19] and [1]

In addition we showed time-specific factors such as IT staff shortage, innovation squeeze, feelings, climate (energy use and emissions), culture, economy and politics in a system diagram in Figure 2. We expect that the following external influences and internal influences have a positive impact: climate and impatience of the business; a negative impact have: legislation, fear, low trust; and an undetermined impact have: culture (uncertainty avoidance and risk-averseness differ per country), economy and staff shortage. Further work is needed to determine their actual impact on cloud adoption.

How can this be reflected in the making of the business case? We propose to use a business case template that compares cloud with non-cloud scenario’s based on the risk-adjusted balance weighed up against the Pro Memory items, see Table 2. By taking the risks explicitly into account, the business case for the adoption of cloud computing is less
positive, but more realistic. Further work is needed on making the business case template more complete and specific for cloud scenarios.

References

[1] M. Bellamy, Adoption of Cloud Computing services by public sector organizations. 2013 IEEE Ninth World Congres on Services, 2013, pp. 201-208