



PICSE: Procurement Innovation for Cloud Services in Europe

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Abstract: This document provides a state of the art analysis of how public research organisations procure ICT services and identifies the challenges of procuring cloud services. The document presents different models to procure cloud services suitable for public research organisations and provides procurement checklists that can be used by IT managers and procurers working in the public sector.

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DISCLAIMER

PICSE (644014) is a Coordination and Support Action funded by the EU Framework Programme for Research and Innovation Horizon 2020. The PICSE Procurers' Platform will give access to a unique repository of information supporting the move from outright purchase to 'pay-per-usage' made possible by the arrival of cloud computing. It builds on the Helix Nebula collaboration between supply and demand of which the three PICSE partners are key members.

This document contains information on PICSE core activities, findings and outcomes and it may also contain contributions from distinguished experts who contribute to PICSE. Any reference to content in this document should clearly indicate the authors, source, organisation and publication date. The content of this publication is the sole responsibility of the PICSE consortium and cannot be considered to reflect the views of the European Commission.

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Executive Summary

Optimising the public procurement of Information and Communications Technology (ICT) is important for two reasons. Firstly, maximising cost savings on the EU's annual ICT expenditure of €100bn¹ is a key goal. Secondly, **purchasing power could be wielded to drive innovation and competitiveness in the ICT market, which in turn will create jobs and spur entrepreneurship. It is therefore paramount that public bodies know how to procure ICT efficiently and responsibly, promoting competition and innovation in the ICT industry and making the best use of public funds.**

With the rise of cloud computing, the consumption of ICT services is going through the same fundamental change that has occurred in many other markets and is now consumed as a utility. Initiatives such as Helix Nebula² have demonstrated that cloud services are also suitable for scientific workloads and public research organisations could benefit from procuring cloud services on a significant scale. However, while cloud services continue to proliferate and evolve rapidly, institutional **procurement processes and policies of many research organisations have not evolved at the same rate. They are therefore unsuitable for the on-demand model that comes with cloud computing.** As a result, **public research organisations face institutional barriers in procuring services from cloud service providers.**

In order for public research organisations of all sizes to take advantage of the best the cloud market has to offer, **a more flexible and agile procurement model must be identified and implemented.**

In order to create a procurement model³ suitable for cloud services, **it is first necessary to understand how public research organisations are currently purchasing ICT services.** PICSE has carried out extensive desktop research and has consulted with the main European public research organisations to identify the five main steps that are typically part of the standard process for procuring ICT services in the research sector:

1. **Planning & Preparatory phase** (including the market consultation);
2. **Selection of the most appropriate procurement approach;**
3. **Implementation of the procurement approach**
4. **Contract Award & Negotiation;**

Contract & performance management/monitoring. So how is cloud computing impacting standard ICT procurement processes?

- Procuring innovative services, such as cloud services, requires new skills and competences, as with any new, innovative technology.
- Many cloud services are not designed flexibly enough to enable cloud service providers to respond to Invitation to tenders or Request for quotations easily. Rather, they are built as take-it-or-leave-it on-demand services.

¹ For example, it was estimated that total EU government expenditure for public procurement of ICT was €94 billion in 2007. Estimates of IT spending in the UK public sector in 2010, (estimated as the highest spender in the EU with 23% of EU IT expenditure) are approximately €18 billion per year (Source: Guidelines for Public Procurement of ICT Goods and Services, SMART 2011/0044, 2012).

² www.helix-nebula.eu

³ A template document describing all the steps necessary to purchase goods and services

- Calculating the financial benefits and costs of migrating to the cloud is different from a standard ICT purchase, for example, organisations find it difficult to do, especially if they do not have analytical accounting processes. Also, the risks inherent in non-cloud systems are often taken for granted.
- Legal or policy issues may be encountered e.g. applicable law, data location restrictions, data protection, etc. and taken into consideration in the early phase of the procurement process.
- Security certifications, covering network security, data protection, privacy, data and service portability, and interoperability are to be considered when identifying the cloud solutions to purchase.
- A standard legal and contractual framework for cloud services does not exist. The contractual & negotiation phase could be complicated and critical.
- Performance & billing monitoring systems have to be put in place.

These challenges have an impact on all five steps of the procurement process.

The result of this analysis has allowed PICSE to put together **a first set of cloud procurement models, which describe the procurement steps in a cloud environment:**

- **Commercial procurement**
- **Joint procurement & pre-commercial procurement**
- **Public procurement of innovation for procurement of innovative services**

The procurement models are described through checklists that are also the basis of the PICSE Wizard, a web-based application that public research organisations can use to obtain guidelines on the most suitable model for procuring cloud services, to make a self-assessment and evaluate their procurement procedures. Each checklist comes with a set of recommendations & tips. The PICSE Wizard has been designed to support IT managers & procurers in charge of the procurement of cloud services in public research organisations and is available at wiz.picse.eu.

Glossary

Term	Definition
Tenderer⁴	The economic operator that has submitted a tender
Bid (same as Offer, Proposal, Quotation and Tender)	A response from a supplier, contractor or service provider to a solicitation request that, if recommended for award, would bind the supplier, contractor or service provider to perform in accordance with the contract.
Commercial Procurement	The act of purchasing goods and services available on the market.
Invitations to Tender (ITT)	For contracts above a certain threshold public research organisations have to set up a tender procedure.
Joint Procurement	Joint procurement means combining the procurement actions of two or more contracting authorities. The key-defining characteristic is that there should be only one tender published on behalf of all participating authorities.
Negotiated procedure	Negotiated procedures are procedures whereby contracting authorities consult the service providers of their choice and negotiate with one or more of them the contract conditions, for example, the technical, administrative or financial conditions. In the negotiated procedure the contracting authority has the possibility of acting as a free economic operator not only in the award of the contract, but in the preliminary discussions. However, this procedure cannot be assimilated to one of complete freedom of contract. The contracting authority must respect certain rules of good administration when: <ol style="list-style-type: none"> 1. setting the contractual conditions, notably as to price, deadlines and technical characteristics; 2. comparing the offers and their respective advantages; 3. applying the principle of equality of treatment among the candidates.
Open procedure	In an open procedure any interested service provider may submit an offer in response to the publication of the contract notice.
Pre-commercial Procurement (PCP)⁵	PCP is an approach for procuring R&D services, which enables public procurers to: <ul style="list-style-type: none"> • Share the risks and benefits of designing, prototyping and testing a limited volume of new products and services with the suppliers, without involving State aid; • Create the optimum conditions for wide commercialization and take-up of R&D results through standardization and/or publication. • Pool the efforts of several procurers.
Procurement (or	Procurement is the acquisition of goods, services or works from an external source. It is favourable that the goods, services or works are appropriate and that they are procured at the best possible cost to meet the needs of the acquirer in terms of quality and quantity, time, and location ⁶ .

⁴ <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014L0024&from=IT>

⁵ <https://ec.europa.eu/digital-agenda/en/innovation-procurement>

⁶ Weele, Arjan J. van (2010). Purchasing and Supply Chain Management: Analysis, Strategy, Planning and Practice (5th ed. ed.). Andover: Cengage Learning. ISBN 978-1-4080-1896-5.

Procurement Process):	Procurement is the process which creates, manages and fulfils contracts. Procurement can, as such, be described as a succession of logically related actions occurring or performed in a definite manner and which culminate in the completion of a major deliverable or the attainment of a milestone. Processes, in turn, are underpinned by methods (i.e. a documented, systematically-ordered collection of rules or approaches) and procedures (i.e. the formal steps to be taken in the performance of a specific task), which are informed and shaped by the policy of an employer ⁷ .
Procurement document⁸	Any document produced or referred to by the contracting authority to describe or determine elements of the procurement or the procedure, including the contract notice, the prior information notice where it is used as a means of calling for competition, the technical specifications, the descriptive document, proposed conditions of contract, formats for the presentation of documents by candidates and tenderers, information on generally applicable obligations and any additional documents.
Procurement Model (or Schema):	A procurement model is a document designed to be used as a template. It describes the procedures necessary to purchase goods and services.
Procurement Principles	The primary values that govern the procurement process. They also guide the conduct of procurement practitioners and other actors and stakeholders involved in the procurement process.
Procurement Procedures⁹	Procurement procedures are the methods used to purchase goods and services. Examples of procurement procedures are open procedure, restricted procedure, negotiated procedure, competitive dialogue, etc. (See http://ec.europa.eu/internal_market/publicprocurement/docs/guidelines/services_en.pdf).
Public Procurement¹⁰	Public procurement is the procurement of goods and services on behalf of a public authority, such as a government agency.
Public Procurement of Innovation (PPI)¹¹	Public Procurement of Innovative solutions can be used when challenges can be addressed by innovative solutions that are nearly or already in small quantity on the market and don't need new R&D.
Request for Quotations (RFQ)¹²	It is a procurement method that is used for small value procurements of readily available off-the-shelf goods and services. It does not require the preparation of tender documents. The invitations are not complex and this method is considered non-

⁷ <https://www.iso.org/obp/ui/#iso:std:iso:10845:-1:ed-1:v1:en>

⁸ <http://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:32014L0024&from=IT>

⁹ <https://www.iso.org/obp/ui/#iso:std:iso:10845:-1:ed-1:v1:en>

¹⁰ http://en.wikipedia.org/wiki/Government_procurement

¹¹ <https://ec.europa.eu/digital-agenda/en/innovation-procurement>

¹² This procurement method is also known as invitation to quote.

	competitive because the procuring entity determines which contractors, suppliers or service providers, to request quotations from as long as a minimum of three are invited.
Restricted procedure	In a restricted procedure there are two stages. In the first stage any interested service provider may submit a request to participate in response to the publication of the contract notice. Such service provider is called a "candidate". In the second stage the contracting authority invites the submission of tenders from selected candidates. A restricted procedure may be accelerated when urgency renders it impracticable to respect the normal deadlines for restricted procedures. Since this is an exception which may limit competition, it must be interpreted restrictively and limited to those cases where the contracting authority can prove the existence of objective circumstances giving rise to urgency and a real impossibility of respecting the normal deadlines for restricted procedures. The reasons justifying recourse to the accelerated procedure must be set out in the contract notice published in the Official Journal.
Total Cost of Ownership (TCO):	Total cost of ownership (TCO) is a financial estimate intended to help buyers and owners determine the direct and indirect costs of a product or system. Usually it is composed of: <ul style="list-style-type: none"> • Acquisition costs - the direct costs incurred to bring the product/service into operation • Operational costs - costs likely to be incurred throughout the life of the ICT product or service, such as maintenance and updates, staff training and project management costs. Exit costs - costs required to migrate to another ICT product, service or supplier. In the context of avoiding lock-in, exit costs can be significant

1. Introduction

The public procurement of Information and Communications Technology (ICT) is important for a number of reasons. Public sector organisations are a large consumer of ICT, and via their procurement power can have significant influence on innovation and competitiveness in the ICT market. The procurement of ICT by public organisations also represents a significant source of expenditure in public funds.

It is therefore paramount that public bodies know how to procure ICT efficiently and responsibly, promoting competition and innovation in the ICT industry and making the best use of public funds.

With the advent of cloud computing, the delivery of ICT services is going through a fundamental change.

Cloud-based services are replacing traditional local — or on premise — software and infrastructure installations for many public sector organisations. This applies to government but also to public research organisations, including libraries, which currently deal with the big data explosion and the need for additional computing capacity.

In 2020 IDC's baseline scenario shows the **total cloud market to be worth some €44.8bn (€32.7bn for the Public Cloud and €12.06bn for the private)**¹³.

Cloud computing has revolutionized users' ability to access data, software, computing power and collaboration strategies, disrupting the traditional notions of information technology.

While technology service options continue to evolve, however, procurement processes and policies have remained firmly rooted in historical practices that are no longer effective. In order for public research organisations of all sizes to take advantage of the best the market now has to offer, a more flexible and agile procurement model must be identified and implemented.

What is a procurement model?

“Procurement is the purchase of goods, services or works from an external source. It is favourable that the goods, services or works are appropriate and that they are procured at the best possible cost to meet the needs of the acquirer in terms of quality and quantity, time, and location. Corporations and public bodies often define processes intended to promote fair and open competition for their business while minimizing exposure to fraud and collusion.”¹⁴

A procurement model describes all the steps of the procurement process necessary to purchase goods and services & in this context, cloud services.

¹³ Uptake of Cloud in Europe, IDC, 2014 <http://ec.europa.eu/digital-agenda/en/news/final-report-study-smart-20130043-uptake-cloud-europe>

¹⁴ <http://en.wikipedia.org/wiki/Procurement>

This document, built on the early analysis performed in MS2 Procurement Model Interim Release¹⁵ and in D3.1 Procurement Barriers Report¹⁶ and on the extensive desktop research conducted by PICSE, coupled with a consultation with ten of Europe’s leading public research organisations¹⁷, analyses the current state of the art of procurement processes adopted by public research organisations for the purchasing of ICT services and describes how cloud is impacting existing procurement procedures and identifies the main challenges. The document also proposes a first set of cloud procurement models (commercial procurement, joint procurement and pre-commercial procurement & public procurement of innovation for procurement of innovative services) describing the procurement steps in a cloud environment.

The procurement models are described through checklists that are also the basis of the PICSE Wizard, a web-based application that public research organisations can use to obtain guidelines on the most suitable model for procuring cloud services, to make a self-assessment and evaluate their procurement procedures. Each checklist comes with a set of recommendations & tips. The PICSE Wizard has been designed to support IT managers & procurers in charge of the procurement of cloud services in public research organisations and is available at wiz.picse.eu.

Target Audience

This document is designed for use by **procurement officials, IT managers, procurement initiators operating in public research organisations and digital libraries**. The document is intended to help & guide these actors who are responsible for both planning and purchasing cloud services under the EU Procurement Directives to procure cloud services (both commercial & innovative services) in an effective way.

Disclaimer

Information included in this document includes references to consolidated literature documents and existing tools. The results of the analysis have to be considered as guidelines in the procurement process of cloud services for public research organisations and libraries. **The information, views and tips set out in the document are those of the PICSE Consortium & its experts and cannot be considered to reflect the views of the European Commission. These guidelines are not meant to be exhaustive and cannot replace the legal & procurement advice provided by experts.**

¹⁵ <http://www.picse.eu/publications/deliverables/ms2-procurement-model-interim-release>

¹⁶ <http://www.picse.eu/publications/deliverables/d31-procurement-barriers-report>

¹⁷ CERN, Cloud for Europe, DG Translation, ECMWF, ESA, Umeå University, German National Library of Economics, LIBER/UCL, IRSTEA, FAO

2. Procurement of ICT services in public research organisations

Procurement of ICT services in public research organisations involves different stages covering the establishment of a needs request for an ICT solution with specifications, a tendering/request process and an objective evaluation and decision-making process based on rules and regulations of the procuring entity prior to selection and contract with suppliers.

Each public research organisation has its own rules and procedures, which are usually dictated by the type of organisation:

- **European intergovernmental organisations** (e.g. CERN¹⁸, ECMWF¹⁹, EMBL²⁰, ESA²¹, etc.) are large-scale scientific organisations governed by member states and subject to their own legislation²². Member states decide the overall procurement strategy of the organisation and also establish the threshold for public tender. They usually have a procurement office in charge of the procurement action and strict, formal rules. They are often equipped with a supplier database that includes all of the eligible suppliers. Suppliers entering this database have to pass a formal evaluation process in which they demonstrate their compliance with the rules of the organisation. Criteria include geographical constraints (usually only suppliers belonging to the member states funding the organisation can be considered eligible), size (SMEs are often considered as high risk suppliers for larger contracts), and certifications, etc.
- **National research institutes** (e.g. Umea University, CNR, etc.) including large/medium and small-scale universities or research centers funded only by the member state in which they are located. These institutes must comply with national legislation and therefore legal implications on procurement procedures are simpler. A procurement office may be within the institution although it depends on the size of the organisation. In smaller institutes this role is often covered simply by a legal expert who together with the technical officer is in charge of the procurement action. As for inter-governmental organisations, each institute has its own procurement rules and procedures bounded by national legislation.

Besides these differences, a high-level general procurement process to procure ICT services can be identified²³.

In all public research organisations, guiding procurement principles are defined. They are aimed at providing overall guidance on how procurement should be conducted and values that must be maintained during the

¹⁸ home.web.cern.ch/

¹⁹ <http://www.ecmwf.int/>

²⁰ <http://www.embl.de/>

²¹ <http://www.esa.int/ESA>

²² Innovation and Public Procurement. Review of Issues at Stake. Study for the European Commission. Fraunhofer Institute Systems and Innovation Research, PREST, University of Manchester, Lund University, University of Athens and Center for Economic Research and Environmental Strategy, December 2005. The study analyses existing rules and current practices of public innovation procurement in a large set of countries and provide also examples of good practices for concrete procurement activities and the current legislations related to procurement.

D2.1. Legal implications on cloud computing, Cloud for Europe, May 2014

²³ The high-level procurement process identified in this section is the result of a first consultation with public research organisations and of the analysis of the reference documents reported in chapter 8.

process such as **transparency, fairness, efficiency, and equality**. This is entrenched in internal control measures. **These guiding principles are usually a fundamental part of a procurement process and are shared by public research organisations of all sizes.**

Public procurement is also usually structured operationally around a **categorization of procedures** based on the estimated cost of the goods or services, with a concomitant and increasing level of authorization and formality. Public procurement generally **involves competitive bidding procedures, to ensure that best quality, conditions and market prices are offered under equal and fair conditions**. Nonetheless, the higher the value or risk of the operation, the more formal the control measures are for competitive bidding procedures. This ensures proper risk management and control.

Procedures reflect the guiding principles applying to the different steps throughout the procurement process. There will hence be procedures for appropriate definition of specifications, receipt of offers, evaluation, etc. covering the complete procurement process operationalizing corresponding principles.

Guiding principles and procedures are usually supported by **best practice approaches**, based on benchmarking, analysis, experience and lessons learnt, which contribute to efficiency and effectiveness.

The figure below outlines the five steps that are part of the standard procurement process adopted by public research organisations to procure ICT services and goods:



Figure 1: The five steps of a procurement process

2.1 Planning & preparatory phase

The first step to initiate a procurement process for ICT goods or services is the identification of the ICT need.

In public research organisations this task is usually the responsibility of so-called “initiators”. They are nominated by the Director or the Head of Department or Head of Division, and have a technical background so that they can identify technical competences and manage the procurement budget. The initiator has a complete understanding of the ICT needed and of the users of the ICT solutions. Users in public research organisations are usually researchers, scientists or employees. The initiator is supported by technical, procurement, financial and legal experts (See Annex 1: Procurement actors). Before initiating the procurement process, the initiator is also in charge of verifying that there is a corresponding approved programme (the ICT strategy) and budget within its organisation. The major tasks of the preparatory phase are:

1. **Establishment of what has to be procured;**
2. **Definition of the technical, legal and procurement specifications:** the specification is the “heart” of all procurement transaction as it defines the user needs and requirements, what has to be procured and the legal, procurement and performance requirements that the organisation has;
3. **Definition of the budget:** It is important that during the ICT procurement planning phase a consideration of the business case around the new technology to procure is done. This includes the calculation of the Total Cost of Ownership.
4. **Pre-procurement market engagement:** It enables the procurer to consult the market and to examine alternative solutions in the market place by obtaining early feedback on the feasibility of the project. It serves to understand what the market can deliver now and in the future: if the gap between needs and capabilities is too great, the procurement action may encounter some issues. Transparent market engagement can encourage the participation of a wide range of firms, and can help the procurer develop options that are feasible and best meet the ICT need. In addition, market engagement coupled with research into the available standards is an important step in assessing which standards are the best to include in terms of their market support and quality. Successful procurement actions demonstrate that it is fundamental that the procuring organisation has a very good technological knowledge.

2.2 Selection of the most suitable procurement approaches and procedures

A public research organisation can select different procurement approaches involving different procurement procedures. This choice should be decided by the procurement officer with input from IT managers as the type of procurement approach could be influenced by the ICT need. The first question to answer before starting a procurement process of ICT solutions is: Are the cloud services you want to procure available on the market?

On the basis of the answer the following options are available:

Procurement Approach	Description	When is appropriate?
Commercial Procurement	The act of purchasing goods and services available on the market.	When procuring services and products off the shelf
Pre-commercial Procurement (PCP)²⁴	PCP is an approach for procuring R&D services, which enables public procurers to: <ul style="list-style-type: none"> • Share the risks and benefits of designing, prototyping and testing a limited volume of new products and services with the suppliers, without involving State aid; • Create the optimum conditions for wide commercialization and take-up of R&D results through standardization and/or publication. • Pool the efforts of several procurers. 	When procuring R&D services
Public Procurement of Innovation²⁵	Public Procurement of Innovative solutions (PPI) can be used when challenges can be addressed by innovative solutions that are nearly or already in small quantity on the market and don't need new R&D.	When procuring innovative solutions that are nearly or already in small quantity on the market

Table 1: Procurement approaches

For big and complex procurement initiatives, a best practice adopted by many public research organisations is joint procurement. Joint procurement means combining the procurement actions of two or more contracting authorities. The key-defining characteristic is that there should be only one tender published on behalf of all participating authorities. Usually, there are several very clear benefits for contracting authorities engaging in joint procurement arrangements:

- Lower prices – Combining purchasing activities leads to economies of scale. This is likely to lead to more attractive offers from suppliers. Particularly for small contracting authorities these advantages can be quite significant.
- Administrative cost savings – The total administrative work for the group of authorities involved in preparing and carrying out one rather than several tenders can be substantially reduced.
- Skills and expertise – Joining the procurement actions of several authorities also enables the pooling of different skills and expertise between the authorities.

Once the procurement approach has been identified, the procurers should decide the procurement procedure to adopt. This selection usually depends on a number of issues: the type and size of the procuring organisation; the value and complexity of the procurement action; the budget and the competences available to conduct the procurement; and the urgency of the need and the internal procurement rules. Procurers should also ensure that the procurement procedures conform to relevant national and EU laws, which

²⁴ <http://ec.europa.eu/digital-agenda/en/pre-commercial-procurement>

²⁵ <http://ec.europa.eu/digital-agenda/en/public-procurement-innovative-solutions>

constrain the extent to which procurers can restrict their engagement to small numbers of individuals or firms.

Different procurement procedures for public sector exist²⁶:

1. **The open procedure:** In an open procedure any interested service provider may submit an offer in response to the publication of the contract notice; it is the preferred competitive public procurement procedure used for acquiring goods and services. It is executed in accordance with established procedures set out in the procurement guidelines and detailed in the standard bidding documents. The fundamental requirements of open tendering are:
 - i. openness to all qualified and interested bidders,
 - ii. local advertising (and internationally, when required),
 - iii. Neutral and clear technical specifications,
 - iv. Clear and objective evaluation criteria, and
 - v. Award to the provider offering the lowest costs, without contract negotiations.

Some disadvantages of the open procedure are lengthy timeframes for completion of the procurement process, strict adherence to procedures and competences are required, focusing on the least-cost solution.
2. **The restricted procedure:** In a restricted procedure there are two stages. In the first stage any interested service provider may submit a request to participate in response to the publication of the contract notice. Such service provider is called a "candidate". In the second stage the contracting authority invites the submission of tenders from selected candidates. A restricted procedure may be accelerated when urgency renders it impracticable to respect the normal deadlines for restricted procedures. Since this is an exception which may limit competition, it must be interpreted restrictively and limited to those cases where the contracting authority can prove the existence of objective circumstances giving rise to urgency and an impossibility of respecting the normal deadlines for restricted procedures. The reasons justifying recourse to the accelerated procedure must be set out in the contract notice published in the Official Journal.
3. **The negotiated procedure:** Negotiated procedures are those procedures whereby contracting authorities consult the service providers of their choice and negotiate with one or more of them the contract conditions, for example, the technical, administrative or financial conditions. In the negotiated procedure the contracting authority has the possibility of acting as a free economic operator not only in the award of the contract, but in the preliminary discussions. However, this procedure cannot be assimilated to one of complete freedom of contract. The contracting authority must respect certain rules of good administration when:
 - a. setting the contractual conditions, notably as to price, deadlines and technical characteristics;
 - b. comparing the offers and their respective advantages;
 - c. applying the principle of equality of treatment among the candidates.

All the above described procurement procedures require the capacity to write clear and precise requirements that should fit in a Request for Quotation (RFQ)²⁷ or an Invitation to Tender (ITT).

RFQ is a procurement method that is used for small value procurements of readily available off-the-shelf goods and services. This procurement procedure does not require the preparation of tender documents. The invitations are not complex and this method is considered non-competitive because the procuring entity determines which contractors, suppliers or service providers, to request quotations from as long as a

²⁶ See http://ec.europa.eu/internal_market/publicprocurement/docs/guidelines/services_en.pdf

²⁷ Also known as invitation to quote

minimum of three are invited. Quotations received in response to a request for quotation should be first evaluated to determine compliance with the technical specifications or scope of work of the requirement and also for compliance with administrative requirements of the request for quotations. Only after the administrative and technical compliance determination, can a price comparison be made between firms found to be compliant. Following this, a purchase order is signed with the bidder submitting the lowest price quotation within the stipulated delivery or completion date.

ITTs are mandatory for contracts above a certain threshold for which public research organisations have to set up a tender procedure. The threshold is usually defined by the members of the council governing the public research organisation²⁸. This is included in the internal procurement procedures of each public research organisation.

Writing of tenders/requests for quotations is a collaborative effort involving different actors at different stages. IT managers should be in charge of technical specifications; procurement officers are responsible for completing the general aspects of the tender documents and of contractual specific requests and legal experts should be involved in providing indications related to the legal framework. Some ITTs/RFQs, especially in the ICT field, usually mention an amount which corresponds either to a guideline for the preparation of the price submission, or to an absolute budgetary limit of the funding available. This latter element represents a substantive requirement of the ITT/RFQ, and tenderers should never exceed it if they do not want to see their offer rejected ab initio. It is also a good practice to provide a draft contract that enables tenderers to know the 'rules of the game' when they prepare their offers, and minimizes or avoids the subsequent effort of negotiation of the contract terms. Procurement documents should also include the list of evaluation criteria and the list of eligibility criteria for suppliers. Eligibility criteria can include the geographical location of the supplier, the supplier company size, the compliance with certifications required by the procuring organisation, the belonging to the supplier database of the organisation, etc. Management of risk is another important piece of information to be included in the tender.

All these rules are detailed in the procurement rules of the procuring organisation.

Once the procurement documents are ready, the procurers publish them invite suppliers to submit their offers.

2.3 Tender/ Request evaluation

Tender/Request evaluation has to be fair, impartial and in accordance with the evaluation criteria defined in the tender documentation. During this phase the procuring organisation has to exploit all the market knowledge acquired during the pre-procurement market engagement. The evaluators need competences in evaluating the technical, operational and economic requirements defined in the evaluation criteria. The general good practice is to have expert committees with multidisciplinary skills and representing all the stakeholders.

²⁸ Usually public research organisations are governed by a council. Member states are usually part of the council. As funders they have decisional power.

Usually evaluation criteria are based on the following:

- Background and experience of the company and staff (general and related to the ICT field)
- Understanding of the technical requirements
- Quality of the technical proposal
- Adequacy of the management approach
- Compliance with the tender requirements, in particular costing and planning (and acceptance of contracts conditions where specified in the tendering phase).

2.4 Contract award and negotiation

Usually contracts and purchase orders are awarded to the supplier **which meets a set of criteria such as reliability, quality, value for money and financial security. The lowest price is not always the best value for money.**

This was found by the PAPIRUS PPI project²⁹. The overall objective of the international PAPIRUS project was to promote, implement and validate innovative solutions enabling the European community to achieve sustainable construction. In the report “How to implement Public Procurement of Innovation: Lessons learned from the PAPIRUS project”³⁰, the project explains the **importance of taking into account both cost and quality in the award of contracts**: “In the PAPIRUS procurements the contract was awarded on the basis of the most economically advantageous tender, based on the price and the quality of the bid.” [. . .] “The new Directive moves away from contract award based on ‘lowest price’ only, towards **award to the most economically advantageous tender’ based on both quality and price criteria. It includes a definite shift towards quality in the award process - not only for services, but also for works and supplies.**”

The evaluation of tender on both quality and price criteria is also documented in the SIGMA Public Procurement Briefs guidelines on public procurement³¹ published by the OECD. SIGMA Brief 8, in the “Setting the award criteria” paragraph, identifies the advantages of taking a most economically advantageous tender (MEAT) rather than lowest-price approach³². The purpose of the MEAT criterion is to identify the tender that offers best value-for-money.

When the MEAT criterion is used, a contracting authority can take into account other criteria in addition to –or other than –the price, such as the quality, delivery time, and after-sales services. Each chosen criterion is given a relative weighting by the contracting authority, which reflects the

²⁹ <http://www.papirus-project.eu/>

³⁰ http://www.papirus-project.eu/publications/PAPIRUS_D2_5_Training_material_development.pdf

³¹ *SIGMA Public Procurement Briefs* provide input for training systems that are in compliance with EU public procurement legislation and practices and with related national legislations. They contribute to the improvement of professional skills of procurement officers and managers – both in the public sector (contracting authorities) and the private sector (economic operators). http://www.oecd-ilibrary.org/governance/sigma-public-procurement-briefs_23109246

³² http://www.oecd-ilibrary.org/governance/setting-the-award-criteria_5js4wzvcz69q-en;jsessionid=16kmf9wyiquq6.x-oecd-live-03

relative importance that it has. Any criteria used must be linked to the subject-matter of the contract in question. As the requirements are advertised in the OJEU, the criteria have to be published and advised to the potential tenderers. The relative weighting of each criterion used to assess the submissions must be stated or, where this is not possible for objective reasons, they should be stated in descending order of importance. Quite often the award criteria stated in the contract notice and/or the tender documentation will be made up of a number of sub-criteria. The contract notice must indicate that the MEAT criterion will be used to award the contract. Once stated, the criteria must be applied as stated and cannot be changed at a later date, particularly not after the tender return deadline.

Advantages of the MEAT approach:

- It allows contracting authorities to take into account qualitative considerations. The MEAT criterion is typically used when quality is important for the contracting authority.
- It allows contracting authorities to take into account innovation or innovative solutions. This is particularly important for Pre-Commercial Procurement and Public Procurement of Innovation actions.
- For those requirements with a long operating life, it allows the contracting authority to take into account the life cycle costs of the requirement purchased and not only the direct cost of the purchase or initial purchase price within the set specifications.

Once the supplier has been selected it is notified of the successful outcome, the contract is compiled.

2.5 Contract & performance management/monitoring

The purpose of contract management & monitoring phase is to ensure the contractor is adhering to the terms and conditions of the contract and providing the required services/products that meet the expectations of the purchase. Contract management & monitoring begin when a signed contract is received and the project negotiates a start date with the contractor. Contract management & monitoring end when all contracted services & products have been delivered, accepted and paid for; and all associated contract paperwork and files have been archived. Managing contract delivery also provides important opportunities for gathering information and conducting appraisal analysis to draw lessons for future projects.

3 Main challenges in procuring cloud services

The dynamic nature of cloud computing often presents a **challenge for procurement and purchasing officials**, whose practices and contracting vehicles were designed to help managers provision hardware and software, not on-demand services like cloud computing. The main challenges to be addressed in a procurement process of cloud services can be summarized as follows³³:

- As with all the purchases of new innovative technologies, procuring innovative services requires new skills and competences. IT managers within public research organisations should have a clear understanding of the new technology being purchased. However, they are not the only ones who need to know about the new technology. The procurement initiator should also understand how cloud will impact the organisation, and the benefits and the costs. Financial officers must have a complete understanding of how to allocate costs. Procures should be aware of the ways of contracting cloud services and of how to evaluate suppliers' Terms of Service. And finally, the legal officer should be much more involved in all the steps of the procurement process to ensure that legal implications comply with the organisation's requirements.
- Organisational/cultural barriers to cloud adoption are very important and should be taken in consideration especially when the organisation is purchasing cloud for the first time. Change management strategies and the set-up of new governance mechanisms should be taken into account already at the time of procurement, as they may incur additional costs.
- Financial issues associated with the new way of cost evaluation in moving to the cloud may arise. It is both important and also challenging to carry out a business case in order to understand how cloud computing can best serve the strategic goals of the organisation. Short-, medium- and long-term costs savings and efficiency gains should be considered.
- Legal/organisational³⁴ issues may appear due to the cloud service deployments particularities:
 - Applicable law
 - Data location restrictions refer to explicit or legal requirements to keep data on site or within national borders (this is particularly relevant in case of cross-border procurement);
 - Data protection is the major barrier when processing personal data;
 - Lawful access has two dimensions – ensuring that data is accessible on court order, at the same time not having data seized by foreign authorities on the grounds of physical location of data.
 - Procurement issues arise from the current procurement law not matching “take-it” or “leave-it” paradigm of cloud contracts (i.e. no scope for negotiations of terms of service delivery).
- Security, including network security, data protection, privacy, data and service portability, interoperability are all elements to be considered when identifying cloud solutions to purchase.

³³ The list of challenges has been put together by analyzing all the sources mentioned in Chapter 8. This chapter will be integrated with the outcomes on the survey of the procurement barriers. D3.1 Procurement Barriers Report (M6). It has to be noted that challenges may vary depending on the cloud services that the user wants to purchase. Specific challenges related to the cloud services that the user is purchasing will be defined in the final release of the procurement model.

³⁴ D4.1 Services Catalogue, Cloud for Europe, 28/03/2014

<http://www.cloudforeurope.eu/documents/10179/15444/D4.1+Services+Catalogue.pdf/8080a024-5770-4d32-b77f-7f54c517f797>

- Vendor lock-in (dependency on the vendor) and vendor viability are aspects that have to be considered.
- Dynamic and changing cloud services must be monitored to ensure proper performance and benefit realization. Service level agreements (SLAs) must be drafted and managed properly.
- Vendor contract negotiation is complicated and critical, and there are no standard contracts for cloud. Therefore legal issues, combined with compliance and regulation requirements, compound the challenges of cloud computing.
- Contract termination conditions need to be carefully evaluated: porting data to another cloud or non cloud solution may involve high costs. Cloud escrow is also missing.

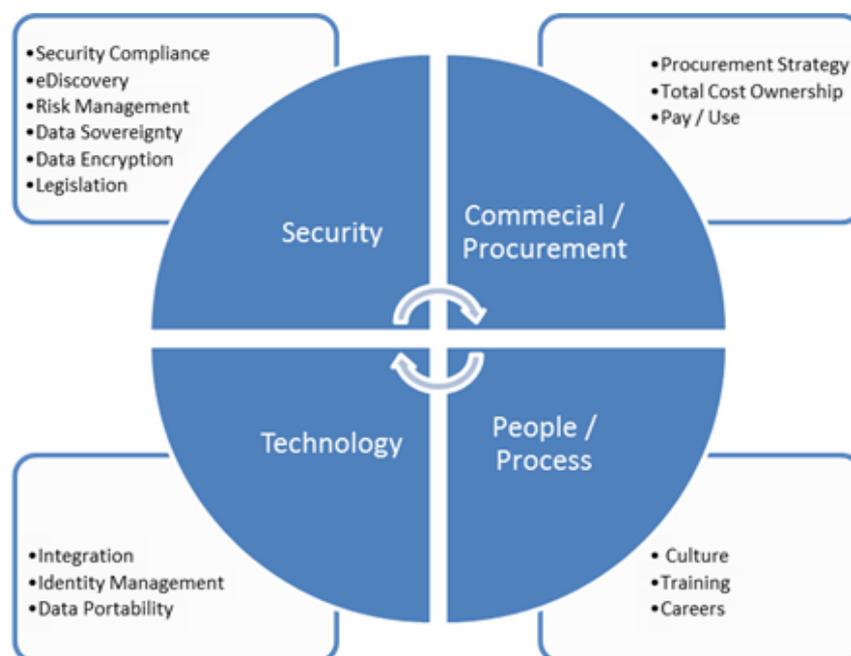


Figure 2: Cloud Transformation Framework - Procurement

The procurement team should carefully assess all the challenges mentioned above.

4 How cloud is impacting the standard procurement procedures

The basic value proposition of cloud computing is that resources (e.g., virtual CPUs, storage, network, services, applications, etc.) can be purchased when they are required (pay-per-use model).

Current procurement procedures for ICT services need to be changed for the procurement of cloud services. Traditional procurement policies foresee the purchasing of facilities, hardware and software, at a precise and easily estimable cost. However, procurement procedures for on-demand services are less clear, with costs on consumption. In addition, when procuring cloud services it is vital that Terms of Service (ToS) are considered rather than simple Service Level Agreements (SLAs) when the evaluation of suppliers and performance measurement is carried out. Current procurement policies do not foresee procedures for this.

Changes are required in all five steps of procurement of ICT Services as the table below shows. Some changes are related to the need for new skills and competences, which impact all procurement steps, from the definition of objectives and specifications, to the evaluation of the suppliers. Others have direct impact on the procurement process.

The 5 steps of the procurement process of ICT services	What's different when procuring cloud?	
	Impact on skills & knowledge required (See paragraph 4.1)	Impact on the procurement process (See paragraph 4.2)
1. Planning & Preparatory Phase	<ul style="list-style-type: none"> ✓ Identification of the procurement objective ✓ Definition of the services that have to be procured ✓ Definition of technical requirements ✓ Definition of legal requirements ✓ More complex cost benefits analysis ✓ New ways to evaluate the budget (pay-as-you-go model with minimal or no upfront cost) 	<ul style="list-style-type: none"> ✓ Different skills involved at different times (legal experts contribute even at an early stage) ✓ Moving from a detailed requirements gathering phase to a service requirements matching phase
2. Selection of the most suitable procurement process	<ul style="list-style-type: none"> ✓ Preparation of the tender / request documentation ✓ Definition of the evaluation / suppliers' eligibility criteria 	<ul style="list-style-type: none"> ✓ Considering the need of a pilot phase ✓ Cloud services evolve rapidly. Shorter procurement cycles are envisaged. ✓ Considering procurement frameworks
3. Tender/Request Evaluation	<ul style="list-style-type: none"> ✓ Suppliers' selection & evaluation based on comparison of Terms of Service that don't have a standard format and include parameters different from those that appear in the traditional ICT services purchases (lock-in, data privacy). 	

<p>4. Contract Award & Negotiation</p>		<ul style="list-style-type: none"> ✓ <i>New types of contracts oriented to service and performance</i> ✓ <i>New ways of purchasing</i>
<p>5. Contract & performance management/monitoring</p>	<ul style="list-style-type: none"> ✓ <i>Different performance monitoring systems</i> 	<ul style="list-style-type: none"> ✓ <i>Service billing and metering</i> ✓ <i>Cloud providers regularly revise their service offerings, and the changes automatically flow to all customers</i> ✓ <i>Data Retention</i>

4.1 Impact on skills & knowledge required

As explained in chapter 2, before starting any procurement action it is fundamental to identify **what is driving the purchase**. This is particularly true in the case of cloud computing. When considering a move to cloud computing, public research organisations need to carefully identify the most suitable cloud solution to meet their needs. The type of application will dictate the cloud deployment model that is used (private, public, and hybrid³⁵), addressing specific security, privacy and availability requirements for that application. Public research organisations must also consider the cloud service model³⁶ (IaaS, PaaS, SaaS or XaaS) that best addresses their business requirements. In many cases, SaaS, with its pay-per-use business model will be the most attractive economic option, especially for small organisations, since the need for full-time IT personnel is eliminated along with capital expenses associated with system hardware, operating systems and software. PaaS is a viable option for larger institutions that have the resources to develop their own cloud based solutions. For research organisations seeking a more scalable infrastructure, IaaS offers a cost-effective solution that provides scalability with security, flexibility, defined SLAs, built-in backup and data protection.

The use of cloud services requires the adoption of new skills

All these considerations can only be addressed by skilled and competent IT managers that have a clear understanding of the new technology being purchased. But it doesn't stop there. IT managers are not the only ones who need to master the new technology. The procurement initiator should understand what it means to adopt cloud services, how to identify the benefits and evaluate the costs, the impact on the organisation; ways of contracting cloud services and of how to evaluate suppliers' Terms of Service. Financial officers must have a complete understanding of how to allocate costs. And finally, the legal officer should be much more involved in all steps of the procurement process to ensure that legal implications are in line with the organisation's requirements.

The table below identifies additional competences that the actors described in chapter two require to successfully complete a procurement of cloud services. It is the responsibility of the organisation to properly train the actors involved in the procurement process of cloud services.

³⁵ See Annex 2: Cloud deployment models

³⁶ See Annex 3: Cloud service models

Role	Additional skills
Procurement initiator	As overall coordinator of the whole procurement process and main strategic leader of the procurement action, the initiator should be well aware of what it means to adopt cloud services including how to identify the benefits and evaluate the costs and impact on the organisation. It is suggested that the initiator establishes a change management strategy.
Technical Officer	The technical officer is responsible for defining technical specifications and having a clear view of services available on the market. They should have a complete understanding of the new platform, how services are deployed and managed, how they are patched and how they are monitored. There may also be a need to learn new provisioning and orchestration tools to successfully manage the new cloud services. Finally, to enable granular control, monitoring and integration with existing administration tools, developers and administrators should learn how to use the new cloud provider's Application Programming Interfaces (API). Finally, the technical officer is responsible for evaluating suppliers and the SLA items related to technical performance.
Procurer	The procurer is responsible for the identification of potential suppliers and the procurement process. They should be aware of the different ways of contracting cloud services, how to estimate the economic benefits and how to evaluate a supplier and items related to contract, pricing and payments that are included in the SLA.
Financial Officer	The Financial Officer must have a complete understanding on how to allocate the cloud costs.
Legal Officer	The Legal Officer should be updated with the legal implications brought by cloud computing.
ICT vendor	The ICT vendor is the cloud service provider (CSP).

Table 2: Additional skills required for a successful procurement of cloud services.

New skills and competences play a pivotal role in the following steps:

- ✓ Identification of the procurement objectives
- ✓ Definition of the services that have to be procured
- ✓ Definition of technical requirements
- ✓ Definition of legal requirements
- ✓ Perform more complex cost benefits analysis
- ✓ New ways to evaluate the budget (pay-as-you-go model with minimal or no upfront cost)
- ✓ Preparation of the tender / request documentation
- ✓ Definition of the evaluation / suppliers' eligibility criteria
- ✓ Supplier selection based on SLAs comparison
- ✓ Different performance monitoring systems

4.2 Impact on the procurement process

Procuring cloud services also has a direct impact on traditional steps of the procurement process:

- ✓ **Current procurement policies.** In some public research organisations there are policies that are not aligned with the procurement of cloud based services. This is especially true for purchasing of SaaS. These policies allow public research organisations to only purchase hardware and software or anything which has upfront cost. The policies do not foresee procedures for procuring an on-demand service, with costs allocated on consumption.
- ✓ **Different skills involved at different times (relevant role of the legal experts, even at an early stage).** When procuring cloud services there should be closer collaboration with the initiator, the IT manager,

the procurers, the financial officer and the legal officers. If in traditional purchases of ICT services the process was more sequential (the IT manager defines the technical specifications which are then revised by the procurers and the financial officers, and the legal expert then evaluates the contract). Cloud services require immediate collaboration between all actors. This is partially due to the fact that no standard frameworks are in place, and also to the fact that the definition of the service is mainly a check of what different providers propose. The role of the legal expert becomes prominent right from the start. A preliminary assessment to understand technical, legal and procurement needs and restrictions, limitations or regulatory requirements, which may shape the type of service required is a fundamental factor. The requirements often include features of the cloud service; performance and service levels; data security; data location; service provider support; and end of contract data transition. Each requirement will differ according to the nature of the data, the industry and any regulation and purpose for using the service. In addition, cloud services entail issues on data ownership, intellectual property (IP) and data location.

- ✓ ***Moving from a detailed requirements gathering phase to a service requirement matching phase.*** Typically, a software development lifecycle (SDLC) starts with a detailed requirements gathering phase, followed by the design of the solution architecture. The solution is then built and tested, and finally delivered into production where it is operated and maintained. Since many types of cloud services, such as Software as a Service (SaaS), are already pre-built, the classic SDLC approach may not be suitable when procuring cloud services.
- ✓ ***Considering the need for a pilot phase.*** Moving traditional ICT to the provision of cloud computing will involve significant uncertainties. The change of platform and provision will affect efficiency, and hence the amount of resources required, and cost. However, before the tasks are run it is impossible to predict the performance implications. Running benchmarks on cloud systems also has a cost implication itself. Starting small is one of the key success factors of a procurement action of cloud services. The inclusion of a pilot phase in the procurement action is something that has to be considered in an agile procurement model of cloud services.
- ✓ ***As cloud services evolve rapidly, shorter procurement cycles are envisaged.*** The evolution of cloud services and the cloud services market is very dynamic. Shorter procurement cycles allow organisations to profit from such advances.
- ✓ ***Suppliers' selection & evaluation is based on comparison of Terms of Service that don't have a standard format and include parameters different from those that appear in the traditional ICT services purchases (lock-in, data privacy).*** The greater flexibility of a cloud computing service as compared with a traditional ICT contract is balanced by less certainty for the customer in terms of the location of data placed into the Cloud and the legal foundations of any contract with the provider. All these aspects need to be carefully evaluated during the suppliers' selection and evaluation phase.

Considering procurement frameworks. A procurement framework is an agreement put in place with a provider or range of providers that enables buyers to place orders for services without running lengthy full tendering exercises. Usually frameworks are based on large volume buying. Aggregating different buyer's potential needs means individual buyers can source services at lower prices, or with special added benefits

and/or more advantageous conditions. Procurement framework agreements are OJEU compliant, removing the need to independently undertake a full European Union (OJEU) procurement process, as this has already been done as part of setting up the framework.

One of the leading examples in Europe of a procurement framework for cloud services at a national level is the UK **G-Cloud framework**³⁷. G-Cloud³⁸ has made multiple iterations of a collection of framework agreements that allows UK government departments and public sector organisations to buy off-the-shelf, pay-as-you-go cloud solutions from a list of pre-approved vendors through an online store (the **Digital Marketplace**³⁹) without needing to run a full tender or competitive procurement process. No OJEU (Official Journal of the European Union), Invitation to Tender (ITT), Request for price (RFP), request for quote (RFQ), request for information (RFI) or negotiation necessary. This approach has brought agile, iterative techniques into procurement with regular refreshes and updates and a maximum contract duration of 24 months. A new iteration of the G-Cloud framework is released approximately every 6 months. This allows the regular inclusion of new suppliers who are OJEU (Official Journal of the European Union) compliant. The G-Cloud aims to promote transparency and make it easy to introduce new suppliers to the UK public sector market which can compare all supplier products and companies listed side by side in an on-screen catalogue. The catalogue showcases supplier's service information, including service definitions, pricing and supplier's terms and conditions.

As of spring 2016 G-Cloud provides access to over 21,000 services. It has achieved cumulative sales of £1bn (€1.3bn) of commoditised cloud based services predominantly SaaS, some 75% to central government, and more than half coming from SMEs. Potential suppliers can apply to sell services when a new version of a framework is published on the OJEU. On average, an OJEU will be open for 6 weeks, every 6 to 9 months. The information required includes a short service description, key product features and benefits and pricing details which remain fixed for the duration of the iteration.

Suppliers using G-Cloud do not need to be based in the UK to apply, but need to agree to the terms of the framework agreement and call-off contract, which are governed by English law. Scaling up this approach for use across the EU would require harmonisation of those agreements.

Another example, also in the UK, is Janet⁴⁰: the cloud framework for UK education & research. Janet is a government funded organisation, with the primary aim of managing the operation and development of the Janet network, on behalf of Jisc⁴¹ (the Joint Information Systems Committee) to meet the needs of its research and education communities. Jisc is the UK's expert on digital technology for education and research, its work is guided by its funders, owners (AoC, GuildHE and UUK) and trustees.

Janet has set up a framework agreement to facilitate the purchase of cloud and data centre services through organisations connected to Janet. This framework was procured in accordance with the EU procurement legislation, and ran until 6 February 2016. The templates for the legal contracts were available for use by eligible organisations (Janet, Janet connected organisations, Regional Network Operators, members of the

³⁷ <https://www.gov.uk/digital-marketplace>

³⁸ <https://www.gov.uk/digital-marketplace>

³⁹ Previously "CloudStore" <https://www.gov.uk/how-to-use-cloudstore>

⁴⁰ <https://www.ja.net/>

⁴¹ <http://www.jisc.ac.uk/>

Purchasing Consortia and the Regional Broadband Consortia). Through the framework it was possible to buy a broad range IaaS and PaaS services.

The UK experiences proved that framework agreements are a very good approach for procuring cloud services. Recently GÉANT, the Europe's leading collaboration on e-infrastructure and services for research and education, has made use of a framework agreement approach for its tender for IaaS⁴². The tender is being run by GÉANT on behalf of 36 NRENs and aims to establish a service delivery chain, to enable Research and Education institutes in Europe to adopt and use a portfolio of IaaS cloud solutions, in an easy, safe, predictable and controlled manner. The frameworks will provide standardized contract terms for use by the NRENs to bring to their client institutions, without the need to run a tender themselves.

New types of contracts oriented towards service and performance. Procuring ICT services traditionally involves one-off purchases of hardware or software with additional support and maintenance costs. Cloud service models avoid up-front costs in exchange for recurring and often variable service charges. Cloud and other 'as-a-service' offerings combine many indirect costs into a single service payment based on use. This means that there may be a wide range of financial implications that need to be considered when comparing on-premises solutions with cloud services. These include energy consumption, resourcing needs, data centre resources, capital costs for infrastructure and asset maintenance. The organisation's financial procedures and funding arrangements must be able to address the on-demand model, which often involves a move of funds from CapEx⁴³ to OpEx. Moving from CapEx to OpEx is a change in the basis of capital investment usage as upfront and ongoing costs are changed by the cloud computing business model. Moving from a [CapEx](#) to an [OpEx](#) model develops the use of operational expenses rather than capital assets and the treatment of operating statements rather than balance sheet management. Adopting the cloud computing paradigm seeks to make more money (increase revenues) while driving capital costs down through greater efficiencies of working capital and OPEX changes. While moving away from investments in long-term assets may be seen as context of cloud computing, this implies a move towards long-term OpEx-style service where Quality of Service (QoS) and costs are still equally relevant regardless of asset ownership. The common factor is the business performance and SLA requirements. Using an OpEx model can potentially remove and release capital that would otherwise be used for initial investment and ownership of IT assets. Please note that investment in a cloud computing platform may require also capital investment and changes to the payment and funding of the service.

- ✓ ***New ways of purchasing.*** Cloud services are usually available via online catalogues. PaaS or SaaS can be set up in minutes via an online sign-up process. The simplicity and apparent lack of formality of cloud procurement can lull customers into treating cloud contracting as just another 'click-through' exercise to which very little attention is paid.
- ✓ ***Service billing and metering.*** As cloud services are billed regularly based on usage, the user should establish processes review and approve the billing and metering of cloud services. This will ensure that billed items and usage are directly matched. Some cloud services providers offer cost forecasting

⁴² <http://services.geant.net/clouds/Activities/Pages/IaaS-delivery-and-adoption.aspx>

⁴³ CapEx are expenditures creating future benefits, such as acquiring or upgrading assets, while OpEx are ongoing costs related to the production of an organization's goods or services.

tools or usage notification services. The user should take advantage of such services if they are available.

- ✓ **Cloud providers regularly revise their service offerings, and the changes automatically flow to all customers.** Cloud providers regularly revise their service offerings, and the changes automatically flow to all customers, whether they are requested or not. This makes procurement uncomfortable because there is uncertainty over whether services will always be available. For example, in an IaaS context, a change such as an upgrade of operating system, the service provider should inform users of the changes and provide an environment for the affected users to test whether there are adverse impacts brought by the change.
- ✓ **Data Retention.** When terminating cloud services, the user has to decide how the data stored in a cloud platform should be handled. Options include deleting the data, migrating the data to another provider or archiving data with the original CSP. Before terminating the contract, the user should ensure all data are deleted.

5 PICSE Procurement model

The PICSE procurement model is designed to be used as a template by the initiator of the procurement action and/or the IT manager and/or the procurer operating in a public research organisation.

The procurement model is conceived as a guide for public sector procurement teams to procure cloud services. It is not designed for use by individual researchers wishing to purchase small-scale cloud services.

The model provides a set of checklists describing the procurement steps specifically for procuring cloud services.

PICSE has defined six main procurement checklists based on:

- Market availability of cloud services. This includes commercial products/services available on the market; innovative products/services with very low market adoption; products/services that require further research & development before being made available on the market.
- Running a joint procurement action

The **six procurement checklists** are described in the following table:

Procurement Checklist	Description
Commercial procurement	The act of purchasing goods and services available on the market.
Pre-commercial procurement (PCP)	<p>Pre-commercial procurement⁴⁴ is an approach to procure research and development services, up to the prototyping or first test production stages. PCPs may include the acquisition of the limited prototypes and/or test products developed but do not include the acquisition of larger volumes of resulting products on a commercial scale and must not constitute state aid. PCP involves different suppliers competing through different phases of development.</p> <p>Pre-commercial procurement is driven by the demand of public research organisations, and targets the development of concrete solutions to meet these needs. PCP can provide an early 'reality check', helping cloud service providers to better anticipate demand for new solutions and shorten the time to bring them to market. Procurers can compare competing solutions and get the best price for an innovative solution that is fit-for-purpose.</p> <p>The new framework programme for EU support to research and innovation for 2014-2021, Horizon 2020, foresees the co-finance of the costs for consortia of public procurers to undertake PCP. Horizon 2020 officially introduces pre-commercial procurement (PCP) as a new funding instrument to be used across all areas of research and innovation supported by the Commission.</p>
Public procurement of innovation (PPI)	<p>Public Procurement of Innovative solutions⁴⁵ is an approach to procure solutions which are almost market-ready or already on the market in a limited quantity but do not yet meet public sector requirements for large scale deployment. No R&D is involved (R&D already done, or R&D not required to solve the problem)</p>

⁴⁴ <http://ec.europa.eu/digital-agenda/en/pre-commercial-procurement>

⁴⁵ <http://ec.europa.eu/digital-agenda/en/public-procurement-innovative-solutions>

	<p>PPI can stimulate innovation by bringing innovative commercial end-solutions to the market early. Public research organisations can act as a launch customer for the innovative products/services. This usually occurs after a Pre-Commercial Procurement is finalized.</p> <p>Under Horizon 2020, the Commission will co-fund groups of procurers to undertake joint PPI procurements in order to have a single joint PPI call for tender and a single joint evaluation of offers. This can speed up the development of innovative solutions by encouraging cooperation between procurers from across Europe, either by supporting networks of procurers (to prepare joint PPis) or by co-funding the initial call for tender, the related coordination, and the networking activities.</p>
Joint commercial procurement	Joint commercial procurement ⁴⁶ means combining the procurement actions of two or more contracting authorities to procure cloud services. The key defining characteristic is that there should be only one tender published on behalf of all participating authorities.
Joint Pre-commercial procurement	Joint pre-commercial procurement is an approach to procure research and development services, up to the prototyping or first test production stages, which are run by two or more contracting authorities.
Joint Public procurement of innovation	Joint public procurement of innovative solutions is an approach to procure solutions which are almost on the market or already on the market in a limited quantity but do not yet meet public sector requirements for large scale deployment. It is run by two or more contracting authorities.

Each checklist includes a set of actions and recommendations for each procurement step related to the cloud environment. The table below reports all the actions of each checklist.

Procurement Steps	Procurement Checklist	Commercial Procurement	PCP	PPI	Joint Commercial Procurement	Joint PCP	Joint PPI
Planning & preparatory phase	Make sure you are procuring what you need						
	Once this is done you can identify the most suitable cloud service model for your needs (Infrastructure as a Service, Platform as a Service, Software as a Service)						
	Now you've defined your service model, it's time to define your cloud deployment model (Private, Public, Community, Hybrid)						
	Lower organisational/cultural barriers in your organisation and put in place change management strategies						
	Run a preliminary needs assessment and disseminate a "Call for Interest"						

⁴⁶ http://ec.europa.eu/environment/gpp/pdf/toolkit/module1_factsheet_joint_procurement.pdf

	Make sure that technical, legal and financial competences related to cloud computing are covered by your procurement team								
	Run a preliminary needs assessment to establish the state-of-the-art in the field and identify the active parties								
	Draft a Procurers' Agreement								
	Identify requirements clearly, review and agree internally. Defining technical requirements is not enough!								
	Define your procurement budget / Double check that your procurement budget suits your requirements								
	Consider the need for a pilot phase								
	Carry out pre-procurement market consultation & engagement								
Selection of the most suitable procurement procedure	Select the most suitable procurement procedure that best fits your procurement & organisational needs								
	Identify the most suitable joint procurement model								
Tender request/evaluation	Write clear tenders/RFQs								
	Prepare tender documents								
	Technical, legal & financial aspects to consider in writing a tender for cloud services								
	IPRs aspects to consider								
	Consider the approach to risk and benefit sharing to be taken and develop terms and conditions to cover the services to be carried out								
	Make your needs public								
	Define objective evaluation criteria & relevant eligibility criteria for cloud service providers								
	Publish the call for tender & invite cloud providers to submit their offers in an effective way								
	Evaluate the tender objectively								
Contract Award & negotiation	Assess cloud offers: <ul style="list-style-type: none"> • Pricing • Infrastructure security/Right to audit and inspect • Data assurances • Service Level Agreements (SLAs) • Disaster recovery/ Business continuity • Outsourced services and mergers & acquisitions 								

	<ul style="list-style-type: none"> • Compliance with laws and regulations • Terms & conditions and functionality modification • Contract renewal and termination 								
	Contract award								
	Notify bidders of the contract award								
	Negotiate the contract								
Contract & performance management/monitoring	Put in place appropriate terms of service & performance management/monitoring procedures								
	Put in place appropriate payments & billing management/monitoring procedures								
	Write up case studies of procurement exercises to share best practices and barriers encountered								

In order to provide a user-friendly service for procurers, PICSE have used the checklists to design a user-friendly web-based application called the **PICSE Wizard** (wiz.picse.eu). The service lets users identify **the most suitable model for procuring cloud services and self-assess their procurement procedures**.

The PICSE Wizard is available at wiz.picse.eu and will be launched in July 2015. The information included in the tool will be validated by the PICSE Task Force experts and by all the public research organisations which contributed to the PICSE use cases. In addition, the tool will also be further tested by the organisations taking part to the Helix Nebula initiative.

By providing this user-friendly online tool, **PICSE is contributing to simplifying procurement of cloud services by publicly funded research organisations**. It also contributes to **the definition of research sector needs in terms of cloud service certification and contracts** as envisaged by the fourth pillar of the **Digital Single Market strategy** “Maximising the growth potential of the digital economy”.

Cloud service procurement made easy

Are you a Procurement official, IT manager or procurement initiator? Then, complete the PICSE wizard easy-to-use services to help you make informed decisions about how to procure cloud services

To find the best cloud procurement model for you Start Now

Answer just 8 questions and find out which cloud service procurement model is most suitable for you. Be it pre-commercial, commercial or public procurement of innovation, the PICSE wizard will equip you with the right information to make the best choices.

To assess how suitable your current procurement process is for procuring cloud services Start Now

Use our tool to identify gaps and ways to improve your organisation's cloud procurement process.

The tools have been developed by the PICSE consortium (www.picse.eu). The tools include references to consolidated literature documents and existing tools. The results of the tool have to be considered as guidelines in the procurement process of cloud services for public research organisations and libraries.

The information, views and tips set out in the PICSE Wizard are those of the PICSE Consortium and its experts and cannot be considered to reflect the views of the European Commission. These guidelines are not meant to be exhaustive and cannot replace the legal & procurement advice provided by experts.

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Figure 3: PICSE Wizard Home Page

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7 Annex 1: Procurement actors

It has to be said that not all public research organisations have procurement offices in place. This usually depends on the size of the public research organisations, on the overall procurement strategy of the organisation, on the in-house competences and on the needs encountered so far by the organisations.

The table below gives an overall understanding of the actors that usually take part in a procurement process of ICT services.

Role	Description	Relevance in the procurement process
Procurement initiator	A person nominated by the Director or the Head of Department or Head of Division, usually with a technical background that has the <i>responsibility, the technical competences and the budget</i> , to start and handle one (or more) procurement(s). He/she is the coordinator of the whole procurement process and responsible for achieving the support and buy-in of all stakeholders for the procurement process. He/she usually works in close collaboration with technical officers, procurement, contracts, and legal experts. He is charged with verifying that there is a corresponding approved programme and budget within its organisation, before starting the procurement action. He/she should have a strategic overview of the needs and of the procurement action.	Full cycle (Steps 1-6)
Technical Officer	He/she is the person who has the ICT background to understand the needs and the different solutions available. He/she usually has also a good understanding of the market and usually plays a role in the suppliers' identification.	<ol style="list-style-type: none"> 1. Technical Specs definition 1. Suppliers selection 3. Evaluation & supplier selection 5. Contract & Performance Management/Monitoring
Procurement Officer	He/she is the person who has a complete understanding of the procurement strategy and procedures of the organisation. He/she is responsible for the identification of potential suppliers, the procurement process (tender, price enquiry, etc.), the selection of a preferred supplier, the contract negotiation, the management of a contract, and purchasing processes	<ol style="list-style-type: none"> 1. Procurement Specs definition 2. Selection of the most suitable procurement process 3. Evaluation & supplier selection 4. Contract award & negotiation 5. Contract & Performance Management/Monitoring 6. Exit and renewal
Financial Officer	The Financial Officer is responsible for preparing financial statements, maintaining cash controls and purchasing. He is fundamental to approve the budget of the procurement action and proceed with the purchase once the contract is awarded.	<ol style="list-style-type: none"> 1. Budget definition 4. Contract award
Legal Officer	The Legal Officer usually provides its legal expertise to the procurement process. His/her legal competences are key in the definition of the specifications, especially when the organisation	<ol style="list-style-type: none"> 1. Legal constraints identification 4. Contract award

	has to respond to a particular legal framework and when the products or services purchased foresee the sharing of IPRs or data with the vendor.	6. Exit and renewal
ICT vendor	The ICT vendor is the provider of goods and services	1. Pre-procurement market engagement 4. Contract award & negotiation 5. Contract & Performance Management/Monitoring 6. Exit and renewal
Users	Users in public research organisations are usually researchers, scientists, students or employees.	1. Technical Specs definition

8 Annex 2: Cloud deployment models

The number of users and their location can influence the cloud deployment model and the legal aspects to be considered in SLA with the vendor. Each deployment model differs in terms of who has access to information and resources. These models are essential to understand, in that they dictate who and how people will access cloud resources.

- **Private cloud.** The cloud infrastructure is provisioned for exclusive use by a single organisation comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organisation, a third party, or some combination of them, and it may exist on or off premises.
- **Community cloud.** The cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organisations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be owned, managed, and operated by one or more of the organisations in the community, a third party, or some combination of them, and it may exist on or off premises.
- **Public cloud.** The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organisation, or some combination of them. It exists on the premises of the cloud provider.
- **Hybrid cloud.** The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

From the initial analysis of the case studies to be reported in *D2.2: Research Procurement Case Studies*, it appears that the most suitable model for public research organisations seems to be hybrid cloud because it provides the flexibility of multiple models and provides more customized cloud solutions.

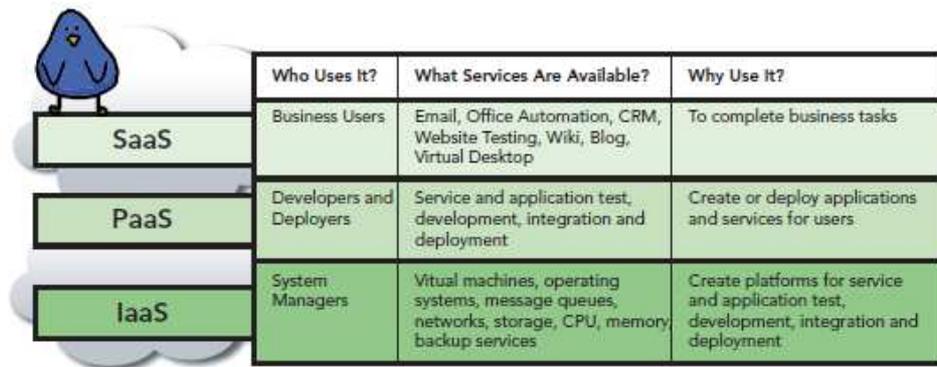
A comparison table for the four deployment models is given below.

Aspects	Public Cloud	Private Cloud	Community Cloud	Hybrid Cloud
Provisioning Model	Provisioned for open use by general public	Provisioned for exclusive use by a single organisation	Shared use by a specific community of organisations	Combination of two or more distinct cloud infrastructures
Costing / mode of payment	Utility pricing (“pay-per-use”), no upfront capital costs	Capital investments required for initial setup	Cost contributed by individual organisations	Mix of private and public cloud pricing
Service Level Agreement (SLA)	SLA defined by service provider	SLA defined by the organisation	Shared SLA by participating organisations	Mix of different SLA’s
Possible Use	Handling open / non-sensitive data with large variations in demands	Mission critical systems / handling sensitive data	Community of organisations with shared business needs	Mixed business needs

Figure 4: Comparison table for the four deployment models. Source: Practice Guide for Procuring Cloud Services, Published by the Office of the Government Chief Information Officer, UK Gov (November 2013)

9 Annex 3: Cloud service models

Cloud services are provided according to three different service models: Infrastructure as a Service, Platform as a Service, and Software as a Service.



	Who Uses It?	What Services Are Available?	Why Use It?
SaaS	Business Users	Email, Office Automation, CRM, Website Testing, Wiki, Blog, Virtual Desktop	To complete business tasks
PaaS	Developers and Deployers	Service and application test, development, integration and deployment	Create or deploy applications and services for users
IaaS	System Managers	Virtual machines, operating systems, message queues, networks, storage, CPU, memory, backup services	Create platforms for service and application test, development, integration and deployment

Figure 5: Cloud Service Models - Typical Case Uses⁴⁷

NIST, the National Institute of Standards and Technology, in its special publication 800-145, “The NIST definition of Cloud Computing”⁴⁸ defines the cloud service models as follows:

- ✓ **Infrastructure as a Service:** The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, and deployed applications; and possibly limited control of select networking components (e.g., host firewalls)⁴⁹.
- ✓ **Platform as a Service (PaaS):** The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or acquired applications created using programming languages, libraries, services, and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly configuration settings for the application-hosting environment.
- ✓ **Software as a Service (SaaS):** The capability provided to the consumer is to use the provider’s applications running on a cloud infrastructure. The applications are accessible from various client devices through either a thin client interface, such as a web browser (e.g., web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure

⁴⁷ Source: CloudComputing for Govies, DLT Solutions, David Blankenhorn, Van Ristau and Caron Beesley.

⁴⁸ <http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf>

⁴⁹Cloud providers typically bill IaaS services on a utility computing basis: cost reflects the amount of resources allocated and consumed.

including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings⁵⁰.

The latest trends see the rise of a fourth model, Everything-as-a-service. Nearly anything that you would use a traditional computer for – such as e-mail, web browsing or word processing – will be done via the cloud at a lower cost and with increased reliability and productivity.

The service models do not all work the same way. As a result, the three model Terms and Conditions share many common clauses, but those dealing with operational responsibilities (e.g. data protection, security incident or breach notification, breach responsibilities, access to security logs and reports, and encryption of data at rest) vary. For example, a SaaS service provider is responsible for most of the technology stack and for those clauses. The service provider has a bigger and broader responsibility for protecting data and reporting. However, the IaaS service provider is essentially leasing the infrastructure to the public organisation, requiring the public organisation to be responsible for its own data protection, encryption and reporting. Additionally, termination and suspension of service is managed differently for SaaS contracts than for PaaS and IaaS. SaaS contracts specifically require a service provider to maintain data for up to 10 days after a contract expires in accordance with the termination timelines. Finally, clauses dealing with compliance for application accessibility standards and requiring Web services are simply not applicable to IaaS contracts. The picture below gives an overview of the responsibilities associated with the different service models.

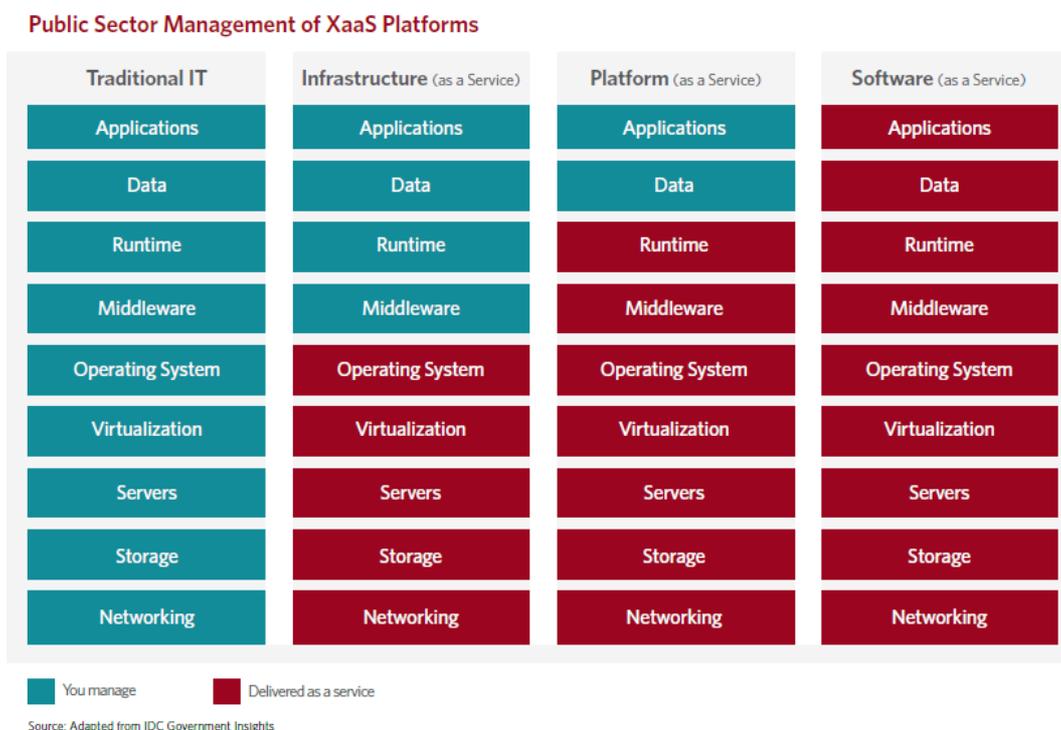


Figure 6: Public Sector Management of XaaS Platforms.

⁵⁰ The pricing model for SaaS applications is typically a monthly or yearly flat fee per user, so price is scalable and adjustable if users are added or removed at any point.