

EUROPEAN DYNAMICS	REF : DG ENTR FS – FNR- 120
FINAL REPORT	VERSION: 1.21
CONTRACT NO. ENTR/01/058-IDA-2001/TOOLS Specific Agreement 6	PRIORITY : HIGH

EUROPEAN DYNAMICS	Issue Date: 03/09/2003	Version Number: 1.20
<p align="center">ePROCUREMENT FEASIBILITY STUDY</p> <p align="center">FINAL REPORT</p> <p align="center">DG ENTR</p>		

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Document History

Edi	Rev	Date	Confidentiality	Author	Reason for Modification	Pages
1.00	0	16/05/2003	High	EUROPEAN DYNAMICS	N/A	59
1.10	1	09/07/2003	High	EUROPEAN DYNAMICS	Accommodate comments received from DG ENTR	66
1.20	2	03/09/2003	High	EUROPEAN DYNAMICS	Accommodate new comments received from DG ENTR and DG INTERNAL MARKET	51
1.21	3	11/09/2003	Hight	European Commission	Final accomodations	49

Circulation List

Name	Organisation/Company
Mr. Serge NOVARETTI	DG ENTERPRISE
Mr. Byron Kabarakis	DG INTERNAL MARKET

References & Applicable Documents

Document Title	Reference	Date of Submission	Confidentiality
Contract ENTR/01/058-IDA-2001/TOOLS	CON	15/10/2002	High
Request for quotation from DG ENTR received by fax	REQ	24/6/2002	High
Quotation submitted by ED in response to REQ	QUO	28/06/02	High
Legislative Framework from the European Council on the “Proposal for a Directive of the European Parliament and of the Council on the coordination of procedures for the award of public supply contracts, public service contracts and public works contracts”	LFE	28/5/2002	-
eVergabe: the German eProcurement system offered to be generalised to create an “Open Procurement platform” (http://www.bescha.de).	eVergabe		High
Technical Annex for Specific Agreement No 6: Public eProcurement Feasibility Study	TA	30/09/2002	High
Project Management Plan	PMP	11/11/2002	High
Preliminary Report	PRE	03/03/2003	High
Feasibility Report	FEA	16/05/2003	High

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Abbreviations & Acronyms

Abbreviation	Term	URL Reference
BPR	Business Process Reengineering	
CA	Certification Authority	
CPV	Common Procurement Vocabulary	http://simap.eu.int/EN/pub/src/welcome.htm
DPS	Dynamic Purchasing System	
EC	European Commission	http://europa.eu.int/comm/
FA	Framework Agreement	
GUI	Graphical User Interface	
HTTP	HyperText Transfer Protocol	
HTML	Hyper Text Markup Language	
IDA	Interchange of Data between Administrations	http://europa.eu.int/ISPO/ida/
ITN	Invitation to Negotiate	
ITT	Invitation to Tender	
J2EE	Java 2 Enterprise Edition	http://java.sun.com/j2ee/
MEAT	Most Economically Advantageous Tender	
MS	Member States	
OJEC	Official Journal of the European Communities	http://publications.eu.int/general/en/oj_en.htm
OJS	Supplement to the Official Journal	
OS	Operating System	
OSS	Open Source Software	
PA	Public Administrations	
PKI	Public Key Infrastructure	
RUP	Rational Unified Process	
SIMAP	Système d'Information pour les Marchés Publics	http://simap.eu.int
SSL	Secure Socket Layer	
TED	Tenders Electronic Daily	http://ted.publications.eu.int/
TSA	Time Stamping Authority	
UML	Unified Modelling Language	http://www.omg.org/uml/
XML	eXtensible Markup Language	http://www.w3.org/XML/

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Glossary

Term	Description
Authentication	Proof of identity. To be able to access a website or resource authentication is required via a password or some combination of tokens, biometrics, and passwords.
Authorization	The act of granting approval. Authorization to resources or information within an application can be based on simple or complex access control methods.
Buyer Profile	The buyer profile is electronic information published on the Internet site of the contracting authority and contains data about forthcoming and past contract awards. Buyer profiles are optional and any information on them is published by the authority itself.
Central Purchasing Body	This is a central contracting authority that may acquire supplies and/or services intended for contracting authorities or award public contracts intended for contracting authorities.
Certificate	A digital “passport”. A certificate is a secure electronic identity conforming to the X.509 standard. Certificates typically contain a user’s name and public key. A CA authorizes certificates by signing the contents using its CA signing private key.
Certificate Validation	The process of checking the trustworthiness of a certificate. Certificate validation involves checking that the certificate has not been tampered with, has not expired, is not revoked, and was issued by a CA you trust.
Certification Authority (CA)	The accredited body responsible for issuing secure electronic identities to users in the form of digital certificates.
Certification Service Provider	See Certification Authority.
Contracting Authority	Procurement entities that encompass the state or are governed by public law.
Decryption	To decrypt a protected file is to restore it to its original, unprotected state.
Digital Signature	A digital signature is like a paper signature, except that it is fully electronic. A digital signature is impossible to forge, making it more secure than a paper signature. A digital signature provides verification to a recipient that the signed file came from the person who sent it, and that it was not altered since it was signed.
Dynamic Purchasing Systems (DPS)	DPS is a complete electronic system for making recurring purchases of common goods, the characteristics of which meet the requirements of the contracting authority. The main characteristics of a DPS are that is limited in duration (i.e. maximum 4 years) and that is open throughout its validity to any interested economic operator.
Electronic Auctions	Auctions are post-tendering negotiations for contract values and process. They are repetitive processes, throughout which bidders present new prices, revised downwards, or new values regarding aspects of their tenders.
Electronic Catalogues	Electronic representation of economic operator product catalogue containing descriptions of products, specification values and prices. Content may also include digital images and multimedia presentations.
Economic Operator	A private supplier from the business community competing in public procurement procedures
Encryption	To encrypt a file is to apply a mathematical function that transforms every character in the file into some other character. Encryption renders the file unreadable. This means no one, including you, can read the file until it is decrypted. Only you and the authorized recipients can decrypt the file.
Encryption Key Pair	This consists of the encryption public key and decryption private key. The public key portion of an encryption key pair is used to encrypt data which can be decrypted by the matching decryption private key.
Fingerprint	A unique value for every unique input message, which is provided by a hash function. Hash functions are used when digitally signing and time stamping.
Framework Agreements	Agreements between one or more contracting authorities and one or more economic operators, the purpose of which is to establish the terms governing contracts to be awarded during a given period, in particular with regard to price and, where appropriate, the quantity envisaged.

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Term	Description
Key and Certificate Management	Refers to generating keys for encryption and signing, storing the keys in certificates, and administering keys securely and transparently, so that they are provided to users where and when they are needed. Included in key and certificate management is key update. Keys should have limited lifetimes and be updated regularly in a secure, transparent manner.
Non repudiation	The inability to deny having signed a transaction or file. Transactions cannot be repudiated through notarization.
Time Stamping	The validity of binding business transactions provides that users actually signed the transaction at a specific time.
Public Key Infrastructure (PKI)	A system that provides the basis for establishing and maintaining a trustworthy networking environment through the generation and distribution of keys and certificates. This is also the foundation technology for providing enhanced Internet security.
Secure Sockets Layer (SSL)	A secure session protocol used to maintain data confidentiality only between Web browsers and Web servers. This is a fundamental component of basic Internet security.
Signing Key Pair	Consists of a privately held key for signing data and a key distributed publicly so others can verify the signature.
Verification	The act of providing an auditable record of a transaction. This can be in the form of a digital signature. This binds each party to a transaction such that they cannot repudiate participating in it.
Web Portal	A Web portal is a single doorway for employees, customers and partners to access an organization's content, data and services online. Also known as Enterprise portals, Web portals make it possible to establish online relationships by providing personalized content to different individuals and entities. Organizations are building portals not only to increase loyalty, but also to create competitive advantage, strengthen relationships, speed access to services and satisfy regulatory requirements. Portals also make it possible to increase revenue, efficiencies and cost savings by moving business processes online.
XML	XML is the standard messaging format for business communication, allowing companies to connect their business systems with those of customers and partners using the existing Internet infrastructure. Similar to HTML, XML uses tags (words bracketed by '<' and '>') and attributes (of the form name="value") to help place structured data into text files. XML is different from HTML in that it is a meta-language (a language for describing languages) and, therefore, does not define specific tags and attributes; it just tells you how to define those tags and attributes.
Browser Based	This term describes software that does not require any client software to be installed or configured on users' systems, except of the commercially supported web browsers (IE, NS, Mozilla, and Opera). Unlike a browser plug-in, browser based applications does not require manual download and execution of an installation program prior to Web site access; Unlike an ActiveX control or some Java applets, browser based does not force the user to agree to potentially confusing security warning dialogs. Unlike other client applications, browser based applications does not have a noticeable download time. In fact, download is transparent to the end-user.

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Executive Summary

Study Scope

IDA Workprogramme (WP) 2002 primarily addresses the issue of interoperability with actions of development of a common interoperability framework for pan-European e-services. The current Study constitutes the first phase of the IDA eProcurement actions, as foreseen in the WP 2002, aiming at facilitating electronic public procurement in Europe and achieving interoperability of electronic solutions developed by public administrations and awarding authorities.

In particular, the current study analyses the feasibility to develop eProcurement pilots on the basis of an existing eProcurement system by:

- Analysing the compliance of such eProcurement system with legislative requirements on electronic procurement imposed by the forthcoming legislative package
- Identifying critical areas for action to ensure such compliance
- Assessing the possibility to generalise an existing eProcurement system
- Suggesting, in the case of positive outcome, pilots that could be undertaken whereas in case of negative outcome, steps and recommendations to move forward

Analysis of the forthcoming legislation & Analysis of eVergabe

Initially, the goal of the Study was to analyse the forthcoming legislation on eProcurement and to examine the feasibility of implementing generalised eProcurement tools and specifications, considering the generalisation of an existing eProcurement system developed by the German Ministry of Interior (e-Vergabe). The related analysis identified the rules and procedures stemming out from the forthcoming legislation and extracted functional specifications for the development of systems compliant with such legislation and rules. Additionally, a set of evaluation criteria was elaborated for assessing the generalisation potential of existing systems and the eVergabe components were examined and assessed in detail by applying such criteria.

Conclusion

Evaluation of eVergabe concluded that generalisation and reusability of existing systems, built prior to the creation of the new legislative framework, implies considerable effort for eliminating barriers and re-engineering supported functionality, in order to accommodate for the new procurement types and procedures. Furthermore, adoption of such solutions based on proprietary software would impose considerable licence costs for public administrations. Existing best-practice systems such as eVergabe cannot be generalised to provide legislation compliant eProcurement tools; however, they can be further analysed to provide experiences and insight information concerning the requirements of the public administrations operating them.

Recommendations

Drawing on the analysis of the new legislation and the experiences from existing implementations, as well as, on the requirements of participating administrations collected through meetings at their premises, a new course is proposed in full coherence with the IDA WP 2003. The new goal is to produce common specifications in line with the forthcoming legislation reusing state-of-the-art, based on Member State

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experiences. Such common specifications will be assessed and disseminated using e-learning demonstrators and workshops for public administrations throughout Europe.

To this extent, the Study recommended the implementation of a demonstrator scenario - incorporating best practices - that will provide a complete set of prototypes, for the EC and administrations experimenting with eProcurement functionality prescribed in the legislation, and more importantly assessing and improving common specifications. The latter will considerably assist in the implementation of their own interoperable eProcurement platforms. Moreover, the demonstrator will be capable of adapting to the specific needs of participating administrations, thus simulating connections with existing legacy systems.

In fact, the demonstrator will contribute in achieving the new goal and will influence public authorities at a larger scale, to optimise and standardise their processes. The demonstrators could be set up in a laboratory environment where interested partners (e.g. Member States and Community Institutions) may conduct studies and investigations of desired solutions. This will allow the validation of common specifications, guidelines, technical components, new business processes or technical functionalities of interoperable eProcurement systems used by administrations, compliant with the actual and the new legislative framework on public procurements.

Common specifications and tools derived from demonstrators and other complementary activities will be based on open standards and open source software principles and libraries that minimize the development period and costs, thus leading to rapid implementation of eProcurement systems. This work aims at contributing in the overall effort to avoid the development of several non-interoperable solutions across Europe, which could fragment the Internal Market and would be serious obstacles to the take off of e-technologies within the time framework set for administrations supporting electronic procurements with international suppliers.

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1 Introduction

1.1 Background

The European Commission, the European Council and the European Parliament are completing the EU legislative framework, prescribing common rules for electronic procurement, while several Member States are building or consider developing their own eProcurement systems, raising the demand for increasing cross-border co-operation. In particular, the new legislative framework for electronic public procurement procedures should be adopted in 2003 and will enter into force in early 2005. By this date, procurement entities in Europe should be ready to perform procurement procedures electronically. To this extent, strong co-ordination between eProcurement policy makers and technology experts is necessary in order to achieve this goal, and a set of horizontal and complementary actions is instigated, closely managed and monitored.

In full coherence with these developments, IDA aims at facilitating eProcurement in Europe and takes necessary actions (IDA Workprogram 2002) to achieve a high degree of interoperability for the systems developed by awarding authorities in different Member States.

The objective of the IDA actions for eProcurement is threefold:

- Improving effectiveness in public procurement
- Assisting interoperability between enterprises and administrations
- Allowing enterprises to submit offers across borders, while reducing as much as possible the administrative burden

1.2 Feasibility Study

The current Feasibility Study constitutes the first phase of the IDA eProcurement actions, as foreseen in the WP 2002, and was carried out, between October 2002 and April 2003, under the contract ENTR/01/058-IDA-2001/TOOLS. The Feasibility Study considered as first option the possibility to generalise an existing solution on the basis of non-discriminatory, generally available and commonplace tools. In particular, the possibility of re-using components from the German solution (e-Vergabe) was examined.

However, since evaluation of eVergabe concluded that generalisation and reusability is not feasible, a new course was proposed to produce common specifications in line with the forthcoming legislation reusing state-of-the-art based on Member State experiences. Such common specifications will be assessed and disseminated using e-learning demonstrators and workshops respectively for public administrations throughout Europe.

So, the Study further examined the implementation of best practices and a demonstrator that will provide a complete set of prototypes, for the EC and administrations experimenting with eProcurement functionality prescribed in the legislation, as well as, will be used to assess common specifications and will provide expandable tools for the implementation of their own interoperable eProcurement platforms in the future.

In summary, the following work carried-out is consolidated in this Final Report:

- **Generalization of an existing e-Procurement system:** The compliance of the e-Vergabe system with

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the forthcoming legislation is assessed, leading to the identification of barriers, risks and critical areas, while the corresponding actions for generalisations are proposed; in order to come up with a complete open platform, satisfying the legal, functional and technical requirements that are imposed by the forthcoming legislative framework.

- **E-Procurement Pilots/Demonstrators:** Analysis of the feasibility to develop e-Procurement pilots/demonstrators to provide a simulation of the generalised e-Procurement system. Administrations in the participating Member States have been contacted in order to identify the potential scenarios. The demonstrators/pilots have been derived by an analysis of the administrations' particular requirements leading to general specification requirements for developing common tools and standards on public electronic procurement. In particular, two different approaches are analysed, demonstrator and best practices, aiming at the creation of common specifications and tools to be utilised by administrations at pan-European level, in order to assist them to develop their e-procurement systems, in compliance with the forthcoming legislation.
- **Step Forward:** Providing recommendations and guidelines for future work and actions in coherence with the overall IDA objectives. The software tools resulting from demonstrators will contribute to the derivation and assessment of common specifications, as well as, serve the e-learning needs of the administrations, helping them to educate all their staff (technical, managerial, etc.) and suppliers, in the new procedures and practices prescribed in the forthcoming legislation. The resulting demonstration platform will be presented in workshops (laboratories), organised by the European Commission, thus motivating discussions and constructive exchanges of views. Relevant discussions will help to properly address and handle delicate issues arising from the new legislative framework and allow administrations to reach a common understanding on its optimum implementation concepts.

1.3 Work Tasks

The following sequence of tasks has been completed throughout the elaboration of the Study.

1. **Analysis of the Legislative Framework:** The forthcoming legislative framework has been thoroughly examined and systematically analysed, in order to identify both legal and technical requirements imposed by the forthcoming legislative framework. Functional specifications were extracted from general principles of public procurement, as well as, from specific provisions of electronic procurement.
2. **Definition of Evaluation Criteria:** The legal and technical requirements have been consolidated and categorised into a set of evaluation criteria, which can be used for assessing the compliance of an existing eProcurement system to the forthcoming legislation.
3. **Evaluation of eVergabe System:** An existing eProcurement system, eVergabe, has been examined in detail and the evaluation criteria have been applied in order to assess the feasibility of generalising its components. The generalisation of the system was not considered feasible, taking into account the high licensing costs resulting from the use of proprietary software, as well as, the effort for eliminating barriers and re-engineering their current functionality, in order to support the new procurement types and procedures prescribed by the forthcoming legislation.
4. **Identification of Barriers & Solutions:** The evaluation of the German system resulted in the identification of common generalisation barriers, due to incompliance with legal and/or technical requirements. Alternatives to overcome such barriers have been proposed, as well as, risks to be considered in generalising any existing eProcurement system.

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5. **Collection of Member State Requirements:** Electronic procurement requirements of public administrations have been collected from questionnaires and face to face interviews.
6. **Identification of Specification Guidelines:** The analysis of collected requirements allowed identifying a set of common specification guidelines for the development of an eProcurement demonstrator, which will further evolve during its actual implementation steps. Furthermore, the need to implement a demonstrator to validate common specifications in-line with the forthcoming legislation and re-using state-of-the-art has been identified
7. **Short-listing of Demonstrator Scenarios:** Since re-usability of eVergabe components to run pilots was not recommended, alternatively, several different demonstrator scenarios are identified and thoroughly examined. The functionality of each scenario was prescribed and documented, in order to reflect to the specification guidelines and rules of the forthcoming legislation. Furthermore, a Best Practice scenario was elaborated to reflect the needs of participating administrations.
8. **Evaluation of Demonstrator and Best Practices scenarios:** A cost benefit analysis and feasibility assessment was carried out for the two final scenarios.
9. **Recommendations for Future Work:** The prevailing demonstrator scenario has been further assessed, incorporating a State-of-the-Art work-package as a downsized version of Best Practices scenario. Moreover, future actions and recommendations for the implementation of the demonstrator have been prescribed. The main goal of such demonstrator will be the elaboration of common technical specifications.

1.4 Report Structure

The structure of the Final Report describing the work carried out in the context of the Feasibility Study is summarised below:

- (1) **eVergabe Analysis:** Assessment of compliance of existing eProcurement systems (eVergabe) with the forthcoming legislation, leading to the identification of critical areas for future actions, in order to ensure such compliance (Chapter 2).
- (2) **User Requirements:** Collection of eProcurement requirements of participating public administrations from questionnaires and face to face interviews led to the definition of specification guidelines for internal and external systems (Chapter 3).
- (3) **eProcurement Demonstrator & Best Practices:** Analysis of the feasibility to alternatively develop an eProcurement demonstrator, for simulating the operation of a generalised eProcurement system (Chapter 4).
- (4) **Conclusion:** Conclusions and results drawn from the Feasibility Study (Chapter 5).
- (5) **Step Forward:** Recommendations, actions and plans on how to proceed in the future based on the results drawn from the Feasibility Study (Chapter 6).

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2 eVergabe Analysis

The compliance of the e-Vergabe system with the forthcoming legislation is assessed, leading to the identification of barriers, risks and critical areas, while corresponding actions for generalisations are proposed; in order to come up with a complete open platform, satisfying the legal, functional and technical requirements that are imposed by the forthcoming legislative framework.

2.1 Overview

In the context of the feasibility study, the possibility to generalise existing electronic procurement systems on the basis of non-discriminatory, generally available and commonplace tools is considered. In particular, the possibility of re-using components from the German solution (e-Vergabe) is examined.

Assessment of the German system (e-Vergabe) has indicated that generalization of electronic procurement platforms designed prior to publication of the new legislative framework appears to be costly and inefficient. Additionally, several technical and legal barriers have been identified, resulting from the requirements imposed by the new legislative environment. Therefore, reusability of proprietary eProcurement solutions is not recommended, taking into account the licensing costs resulting from the use of software, the effort for eliminating barriers and re-engineering of existing systems, in order to support new procurement types and procedures, as prescribed by the forthcoming legislation.

Although the outcome was negative eVergabe assessment has generated very useful results, comprising:

- (1) **Evaluation Criteria:** The criteria used to assess the e-Vergabe system may be applied to any existing electronic procurement system to evaluate compliance with the legislative framework (Section 2.2)
- (2) **eVergabe Assessment:** The results of the eVergabe evaluation identified several incompliances and technical barriers due to the requirements of the forthcoming legislative framework (Section 2.3)
- (3) **Identification of Generic Barriers:** Identified barriers were generalised and several technical solutions and alternatives of overcoming such barriers were proposed (Section 2.5)
- (4) **Identification of Risks:** Potential risks were detected, in the attempt to describe the generalisation of eProcurement systems compliant with the forthcoming legislative framework (Section 2.6)

2.2 Evaluation Criteria

The consideration of the legal, operational, organizational and technical requirements for the realization of an electronic public procurement environment with reusable common tools imposed directly by the forthcoming legislation, as well as the functionality and the tools that must be supported based on the available technological options, resulted to the definition of certain legal and technical criteria that were used for the evaluation existing eProcurement systems. Furthermore, heuristic weighting factors are introduced for defining (measuring) the relative impact for each one of the different criteria.

2.2.1 Legal Criteria

All Legal criteria that emerge from the legal requirements of the forthcoming EC legislative framework are provided in the table below:

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	Evaluation criteria	Description	Weighting factor
1	Confidentiality	The requirement of preservation of confidentiality entails the obligation for contracting authorities not to examine the content of requests for participation and tenders before the deadline for their submission has expired. If that access prohibition is infringed, then the electronic device for the receipt of tenders or requests for participation should detect the infringement.	High
2	Integrity	Integrity of data means that the property of data or information submitted by bidders as part of the procurement process must not be modified or altered in an unauthorised manner. This is practically ensured by requiring that the data is signed and that it is only made accessible to authorised personnel of the awarding authority.	High
3	Equal Treatment	In the specific context of electronic procurement the principle requires that the tools to be used for communicating by electronic means, as well as their technical characteristics, must not result in a discrimination of bidders. They must also be generally available and interoperable with the information and communication technology products in general use.	High
4	Transparency	Aims to ensure undistorted Community-wide competitive conditions between the operators in the market and allows them to monitor compliance with the procurement rules. A non-distorted system of competition can only be guaranteed if the various economic players have equal chances in transparent procurement procedures.	High
5	Interoperability	A standardized electronic system must provide easy access to suppliers through a user-friendly interface without using country-specific or otherwise discriminatory technologies capable of restricting economic operators' access to the tendering procedure. An interoperable electronic procurement system in principle guarantees that the various economic players have equal chances in participating in the procurement procedure.	High
6	Data Protection	The obligations imposed regarding general data protection are: for economic operators to require that data is treated confidentially, to preserve the integrity and confidentiality of all data and require that the electronic devices used ensure, through technical means, that data sent electronically preserve their integrity and that no unauthorised access to or tampering with data is possible or is at least detectable	High
7	Authentication & Anonymity	Authentication of suppliers is required, if validation of their identity is necessary for accessing the supporting documents. Therefore, this is necessary when a preliminary selection of suppliers has already taken place (e.g. restricted procedure). Additionally, the anonymity of the user must be ensured by the system. This is particularly important during electronic auctions, where auction bids must not be directly associated with bidders.	High

Table 2-1 : Legal evaluation criteria

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2.2.2 Technical Criteria

All the technical criteria which derive from technical requirements taking into consideration the need to support specific functionalities, as well as, the available technological options are provided in the following table.

#	Evaluation criteria	Description	Weighting factor
1	Security	Security is the ability of a system to protect information and system resources with respect to confidentiality and integrity. The scope of this definition includes system resources, which include hardware, storage, and application software, in addition to information.	High
2	Registration/ Authentication	It is required to identify each user that operates on the platform and confirm his credentials in a manner beyond repudiation. User's privileges and the usage of the platforms assets are controlled from the platform that properly identifies and authenticates each user.	High
3	Liability	Use of the platform under specific conditions may imply potential risks. Assessment of risks and the extent of liability for each user group must be clearly understood and several precautions should be taken accordingly.	Medium
4	Internal Workflow	Guidance of the users for all involved parties through interactive system actions and messages in order to help on decision making and ensure correct application of rules and regulations.	Medium
5	Portability	The best implementation of the system will be a platform independent solution, so that all system components, both on client and server side, are portable to other environments with minimal effort and enhancements.	Medium
6	Parameterisation of Processes	The electronic procurement processes should be parameterised and their attributes should be modified easily with minimal effort in terms of system administrative work.	Low
7	Audit trail	All electronic procurement actions and system events should be logged and monitored continuously in order to keep track of changes, in terms of security and in order to provide statistical reports for all involved parties.	Medium
8	Open Architecture	The system should provide an architecture whose specifications are public, so that anyone can design add-on products for it. This includes officially approved standards as well as privately designed architectures whose specifications are made public by the designers. In a different case, the architecture will be considered closed and proprietary.	High
9	Compatibility	The ability of systems to provide services to and accept services from other systems	High
10	Network Security	The security of the platform must be extended into the security of the existing network and more precisely into local and Internet network implementation, which must allow the secure exchange (sending/receipt) of encrypted data	High
11	Scalability	The system must be able to meet future requirements, so in terms of hardware and software should be able to adapt to increased demands. Scalability is a very important feature because it protects the initial investment.	Medium
12	Modularity	The design of the electronic procurement system is modular if it is composed of separate components, both hardware and software, that can be connected together. The benefit of modularity is that any component may be replaced or added without affecting the rest of the system.	High
13	Reliability / Availability	The ability of a system to respond gracefully to an unexpected hardware or software failure. The underlined technologies may be redundant in order to ensure continuous availability of the system.	High
14	Multilingual	Support of several different languages as far as GUI and other location oriented	High

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#	Evaluation criteria	Description	Weighting factor
	Support	attributes of the system are concerned.	
15	Standardisation	A definition or format that has been approved by a recognized standards organization or is accepted as a de facto standard by the industry. Standards exist for programming languages, operating systems, data formats, communications protocols, and electrical interfaces.	High
16	Total Cost of ownership (TCO)	The TCO incurs all costs that are involved in installing and operating the system. TCO in the electronic procurement system includes: original cost of the system hardware and software, platform licensing costs, hardware and software upgrades, maintenance costs, technical support costs and training costs.	High
17	Open Source	The application which has the source code available to the general public for use and/or modification from its original design free of charge. Open source code is typically created as a collaborative effort in which programmers improve upon the code and share the changes within the community.	High
18	Support for e-Catalogues	Support of electronic catalogues or provisions for later development and integration of electronic catalogues into the electronic procurement system	High
19	Support for e-Auctions	Support of electronic auctions or provisions for later development and integration of electronic auctions into the electronic procurement system	High

Table 2-2 : Technical evaluation criteria

2.3 eVergabe Description

The e-Vergabe platform was developed in order to comply with the German legislative framework (e.g. public procurement and digital signatures laws). The German Federal Government launched the German legal framework on March 2001, with the adoption of a law dictating the use of digital signatures in public administration and private commerce. The remaining obstacles for conducting electronic tendering were removed in September 2002, under an appropriate amendment of the German Civil Code. The e-Vergabe system is fully compliant with the existing German security regulation and signature law, with all offers being encoded and signed using electronic signatures. The procurement procedures that are currently supported by the e-Vergabe are based on fixed guidelines that arise from the German legal framework.

The e-Vergabe system constitutes an electronic procurement platform capable of supporting the communication interface and interaction (e.g. exchange of documents and messages) between the contracting authorities (purchasers) and the economic operators (suppliers). The platform is providing the underlined infrastructure and functionality for supporting the exchange of contract related documents (e.g. contract notices, contract supporting documents, notifications etc.) between the participating contracting authorities and their economic operators. Furthermore, it makes available to involved parties functionality supporting the procurement phases (e.g. notification, tendering, and awarding) for each one of the supported procurement procedures.

The platform provides a client and a server side environment that utilizes a Public Key Infrastructure (PKI) with asymmetric encryption for supporting the secure communication between the involved parties (contracting authorities and economic operators), as well as the storage of sensitive and confidential data (e.g. tender related documents). The realization of the platform involves the acquiring and distribution of digital signatures from certified certificate service providers, the utilization of smart cards and smart card readers for storing and retrieving the digital signatures.

The technological infrastructure used to facilitate the development and deployment of the platform, as well as, the exchange of the information is utilizing the Java 2 Enterprise Edition (J2EE) development

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framework in conjunction with Java Web Start. The Intellectual Property Rights (IPR) of the e-Vergabe source code is shared between the CSC Ploenzke and the German Procurement Agency of the Ministry of the Interior. At the time the e-Vergabe project was initiated, there were no available vendors offering a full open-source solution. Additionally, uncertainty due to the lack of support for several open source tools and application software, further directed to the selection of a proprietary implementation

Overall, the e-Vergabe system can be characterized as an *electronic procurement platform* based on *proprietary architecture*, providing to registered user parties (contracting authorities and economic operators) electronic procurement functionality – currently compliant with the German laws - through the use of a *client and server side environment*.

2.4 eVergabe Assessment

The current section summarises the assessment of the German eVergabe system. Compliance with EU legislation aimed at open and competitive procurement markets is examined and activities as well as effort needed to generalize e-Vergabe system, so that compliant components can be used by other Member States and European Institutions, are identified. The predefined legal and technical criteria have been applied in order to evaluate the system.

The existing system is proprietary and is not based on OSS because third party vendors did not offer sufficient support for open source developments at the time it was implemented. Additionally, the system has not incorporated any e-procurement standards, for similar reasons, since at that time there were no relevant standards and specifications (such as e-notices). Furthermore, during the early design and development stages, development of the platform focused on supporting the needs of the German administration, and not to provide a generalized environment re-usable by other Member States. Although there are some barriers that limit the interoperability of the e-Vergabe system and its integration with other external systems, the future versions of e-Vergabe will accommodate new electronic procurement functionality and provide connections with TTPs of other Member States, in order to support multi-national suppliers.

The following table summarises the evaluation results:

#	Legal Evaluation criteria	Description	Generalisation Effort
1	Confidentiality	Most of the system components preserve the principle of confidentiality	No
2	Integrity	Integrity is preserved in most of the system components	No
3	Equal Treatment	This principle is violated in all three phases of the electronic tendering evaluation because of several EC legislative framework peculiarities	Notice Publication, Contract Locking, Access to Contracts, Four Eyes Principle
4	Transparency	This principle is not preserved throughout the phases of the electronic tendering evaluation	User Registration
5	Interoperability	Due to the proprietary nature of components and since e-procurement standards are not accommodated in the current system, the principle of interoperability is not preserved in all cases throughout the system	Notice Standardisation, Transforms & GUI, Signature Devices
6	Data Protection	The system is mostly compliant with the data protection directive	No
7	Authentication & Anonymity	User Anonymity is not currently preserved	User Registration
#	Technical Evaluation criteria	Description	

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1	System Security	Security is the strong point of the platform and despite some insignificant issues, overall can be considered more than adequate	No
2	Registration/ Authentication	Registration/Authentication in technical terms is sufficient for most of the users that participate in the system	No
3	Liability	Risks are involved which arise from requirements of individual MS national legislations. It is highly recommended that these risks will be considered to make the system fully liable	See Section 2.6
4	Internal Workflow	The lack of workflow is a potential barrier to the correct decision making and action taking throughout all stages of electronic procurement	Procurement process capture & automation
5	Portability	The pilot implementation of the platform is not portable since there exist localisation and migration barriers	Yes
6	Parameterisation of Processes	The business logic and internal workflows are fixed without parameterisation for the system components	Dynamic Procurement Processes
7	Audit trail	The system in most of the cases offers adequate logging throughout the electronic procurement stages	No
8	Open Architecture	System components are implemented using the J2EE architecture and therefore the architecture can be considered as open architecture.	No
9	Compatibility	Compatibility issues arise on several components and the operating systems as well as software versions supported are limited for trans-border procurement	Support Multiple OS, Contract drafting applications
10	Network Security	Network security is advanced and sufficient, using several secure protocols and firewalls	No
11	Scalability	The system can not be scalable since under the current implementation where load balancing and clustering is not permitted.	Yes
12	Modularity	The system components, both for the client and server side, are modularized and can be independently distributed to different systems	No
13	Reliability / Availability	The system architecture is currently imposing several constraints to redundancy. It is highly recommended to expand the system to support availability and reliability.	Yes
14	Multilingual Support	There is neither multilingual support for the current implementation nor any localisation parameters. Customisations should be provided for every Member State in order to support local language.	Multilingual GUI, multilingual templates
15	Standardisation	The system needs to incorporate new XML or open source standards that exist in the industry	Common eProcurement Schemas, Industry standards (e.g. ebXML)
16	Total Cost of ownership (TCO)	The total cost for installing, owning and operating the system components is high for both the contracting authorities and the suppliers	Use Open Source Technologies and OSS
17	Open Source	The system is not open source, and its use requires licensing from the rights owners	Yes
18	Support for e-Catalogues	Electronic catalogues are currently not supported by the system software or hardware	Yes
19	Support for e-Auctions	Electronic auctions are currently not supported by the system software or hardware	Yes

Table 2-3 : Overall assessment of the e-Vergabe system

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Although, assessment of e-Vergabe has indicated that generalization of electronic procurement platforms designed prior to publication of the new legislative framework appears to be costly and inefficient, the e-Vergabe evaluation has identified barriers, risks and provided very useful generalisations, as will be described in detail in the sections to follow.

2.5 Barriers and Solutions

In this section several system incompatibilities are presented that were primarily identified during the examination and assessment of eVergabe. Such incompatibilities and their related technical aspects are generalised and presented as potential barriers that may challenge any electronic procurement system due to the requirements imposed by the forthcoming legislative framework. In parallel, possible solutions and alternatives to overcome such barriers are proposed and elaborated.

2.5.1 Contract Drafting

Contract drafting comprises a sequence of manuals and automated procedures, which are used for the preparation, and generation of a contract notice. The attributes to set-up the electronic procedures are extracted from these documents and a basic XML structure is created. This is actually the file that contains all necessary information to initiate the procedure.

Barriers:

- Limited format support for contract notices and supporting documentation (XML, HTML and PDF).
- Limited operating systems support (e.g. Microsoft Windows operating system along with the utilization of Microsoft word templates and macros).
- Drafting based on proprietary software. The currently supported document formats of a contract must be based on commonly used generally available tools, in order to preserve the principles of equal treatment and interoperability.
- Information not based on any kind of standardisation and/or eProcurement standards.
- Lack of validation of the contract notice information and more specifically of the mandatory fields that define the structure and the execution plan of a contract.
- Document templates and contract related documentation can support only a single language.

Solutions:

- Open drafting standards (e.g. XML e-notices) must be used and enforced by the platform, in order to provide equal treatment to all contracting authorities. The standards will eliminate any trans-border discriminatory issues related with the generation of contract notices and comply with the principles of transparency and equal treatment.
- Compatibility among different systems should be ensured. The system should be implemented to support many document formats in more than one operating system.
- Localisation of all forms should take place and have to be translated to the official language of each Member State administration. This is very important in order to eliminate discriminatory effects since suppliers from any Member State must be given equal opportunity to participate.

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- Internal notification workflow should be incorporated into the system. The system may be provided with an internal workflow tool in order to facilitate decision making and ensure that regulations and rules are correctly followed. Common specifications of a collaboration platform with a hierarchical schema (utilizing the already defined user roles and rights) must be implemented for ensuring the integrity of data that compromise the generation of a tendering notice and its supporting documents. Also, validation on both the client and server side will further ensure the liability of the platform.

2.5.2 Contract Publication

The contract publication comprises of a sequence of manual and automated procedures, which are used for the publication of a contract notice and supporting documents to the platform.

Barriers:

- Restrict access to supporting documents through registration or authentication mechanisms.
- Provide unreferenced contract supporting documents. This may happen due to the fact that the system provides to contracting authorities the ability to initiate and complete the publishing process of a contract notice without providing any references to its supporting documents
- Possible modification on the content of the contract notice, as well as, of the supporting documents may provide inconsistency in the information that is available to individual suppliers. In case of modification of the contract supporting documents, the procurement procedure has to be re-launched as prescribed on the forthcoming legislation, in order to preserve transparency and integrity.
- Publication of a contract notice to national bid boards and third party portals

Solutions:

- Common specifications should be defined for an open interoperable interface that will be able to convey publishing and acknowledgment of information in a standardize structure between the existing platform and the available publishing authorities.
- Access to supporting documents should be publicly available especially in case of an open procurement procedure. This will ensure transparency since all the facts of the tender will be publicly available.
- Validation of publication procedures. It should be mandatory for the system to validate that supporting documents coexist with the contract notice from the point of the initiation of the publication till the end of the tender submission period.
- Versioning of contract documents should explicitly be forbidden on the platform. Safeguards must be added to the existing platform for handling the supporting documents after the publication of the contract notice.
- Integration to collaboration functionality. It is recommended that common specifications of a collaboration platform with a hierarchical schema (utilizing the already defined user roles and rights) be implemented – although they are not enforced by the legislative framework - for ensuring the integrity of data that are incorporated in the publishing of a contract notice and its supporting documents.

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2.5.3 Contract Visualization

This functionality describes the access and display of the content of each contract notice to all potential economic operators. It commences immediately after the completion of the contract notice publication, and comprises of the platform tools available mainly to the economic operators.

Barriers:

- The visual representation of the document may not be identical to the original document. In any case the system should supports a “What You See Is What You Get” (WYSIWYG) functionality concerning contract notices and documents.

Solutions:

- Enhanced security. For increasing security that arise from the display of contract documentation, either the user authentication procedures must be extended for accessing the local file system (not compliant with the J2EE architecture), or the application must be configured in such a way that all information related with the required files (contract notices and supporting documents) will be saved during the publication stage into the database dynamically, and during the advertisement stage will be generated dynamically by the system, based on a list of publicly accepted templates.
- Standardised transformation. If XML files are implemented in order to represent contract documents great care has to be taken in order to use standardised transforms (XSLT templates) so that the final contract document is identical to the original one.

2.5.4 Tender Key Management

Contracting authority need to generate, store, and distribute the private and public keys that are utilized for each one of the tenders. In the implementation of an eProcurement system management of tender keys is a functionality which cannot be omitted from the rest of the system and should be equally considered with the transmission and storage of sensitive data, documents and tender responses.

Barriers:

- No traceable logs available in the system that define the distribution of tender private keys to the appropriate user who will be responsible for opening the tender.
- In case where smart card readers are used, a possible failure is the inability to recover a key of a tender mainly because of a smart card malfunction.

Solutions:

- For the storage and distribution of the tender’s private key the module must retain traceable logs in order to be able to identify the owner of the key that will open the tender, and thus provide adequate security to the system.
- Back up mechanism procedures must be defined for the recovery of the tender encryption keys

2.5.5 Enterprise Information Services

The server side environment is providing to the platform the required application functions for supporting the execution of the client requests. It comprises of back office applications that define the core electronic procurement platform.

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Barriers:

- Inability of the system to scaled up across multiple servers that offer exactly the same functionality. From the technical point of view a system lacks scalability, if it does not have the ability to support load balancing and clustering.
- Lack of reliability and availability of the system if the system is unable to respond to an unexpected hardware or software failure. This introduces interoperability issues in the system since it may be restricting economic operators' access to the tendering procedures.
- Lack of availability of the system near deadlines due to increased demand in bandwidth

Solutions:

- The time stamping functionality should be extended to the client side, in order to provide a valid time-stamp (fingerprint) to the documents before their actual transmission to the platform. Such time stamp will be send as a legal proof from the economic operators to justify the exact time of the document dispatch.
- To provide reliability and availability all components that constitute the business logic of the system as well as the enterprise systems should be made redundant. Furthermore, clustering and load-balancing mechanisms should be used at the server side environment. This will provide scalability to the platform, as well as, the necessary fail-over functionality to the system. A scalable environment can easily adapt to the future increasing demands for system resources while the fail-over mechanism will ensure continuous availability of the system to the end users, procurement and supplier officers.

2.5.6 Certification Service Providers

It defines the components that are currently involved with the procedures that validate the trust of a digital signature, which is related either with the users of the system (e.g. Procurement officer, economic operators) or with the time stamp server. Certification service providers are utilized by the platform during the registration and authentication process. The users' digital signature is verified by the platform against their credentials, and by the revocation list of the corresponding certification service provider.

Barriers:

- Use of a proprietary digital signature devices (e.g. smart cards and readers) utilized by the system are distributed by a single certification service provider
- Use of proprietary software plug-ins for interfacing to proprietary digital signature devices. Such system authentication realization is clearly not interoperable with the infrastructure supported by other EU member states and thus violating equal treatment and the transparency of the tender by refusing access to publicly available information.
- Registration requests information from suppliers and this may violate the principles of equal treatment and transparency, since the use of such information to discriminate suppliers is prohibited.

Solutions:

- The interface between the eProcurement system and Trust Centres must be standardized in order to provide an open API, which will be utilized from each EU member states for interfacing with one or more qualified Trust Centres across Europe.

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- Back up solutions must be implemented for the uninterrupted operation of the system in case that the communication channel between the system and the Trust Centres will be accidentally disconnected.
- The user registration processes should be limited to collecting and storing very simple information related with the profile of each user.
- Smart card readers should be based on open standards and support common card frameworks or an alternative authentication mechanism should be incorporated. For example, this alternative may be based on a plain software solution using a log-in name and associated password should be considered.

2.5.7 Procurement Officers and Suppliers Client Software

Procurement and supplier client software comprises of a set of proprietary client side applications, which are used by the contracting authorities and their economic operators respectively for using the electronic procurement platform.

Barriers:

- The Graphical User Interface (GUI) supporting only one language without considering native translations, terminologies, linguistics, and support for multiple languages at the same time. This is not preserving equal treatment and raise important interoperability issues.
- Proprietary technical implementation of client side components (digital certificates, authentication and connection devices, etc) may raise interoperability issues, as well as, require the installation proprietary hardware and software (incurring additional cost to suppliers).
- Highly skilled personnel may be required for the proper installation of each one of these additional software components and hardware devices on the supplier personal computer.
- Procurement procedures are specific to national legislation and deviations may exist from the ones imposed by the EC legislative framework.
- Client software does not support newly introduced features such as framework agreements, dynamic purchasing system, and electronic auctions since it was implemented prior to the forthcoming legislative framework.
- The data protection directive is not taken into account during the registration process, and the user data that are securely transmitted to the platform are stored in an unencrypted form on the central repository.

Solutions:

- For the resolution of multilingual issues the system graphical and communication interface must be enhanced in order to be able to represent the contract notice, as well as, to receive and transmit contract supporting documents in different languages. Furthermore, the platform should be standardized to resolve issues related to customization and localization, and therefore preserve equal treatment and interoperability.
- It is highly recommended that all proprietary components involved in the current implementation of the eProcurement system should be replaced by standardised and/or open source components. Thus, the client applications should provide cross platform utilization, without any software and hardware dependencies.

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- The requirement of custom client-installed software to access the offers by the platform services should be avoided. In addition, the set-up procedure should be simplified in order to be performed with minimal effort by the average user.
- The system must be adapted to the new features of the forthcoming legislation and in particular support for framework contracts under framework agreements or dynamic purchasing systems. The implementation of such functionality may optionally be realised by using electronic catalogues within all stages of electronic procurement.

2.5.8 Tender Opening Client Software

The scope of the tender opening client software is to provide to awarding authorities and central purchasing bodies the functionality to perform the opening of a tender and proceed with the evaluation and awarding of a particular tender.

Barriers:

- It is not sufficient for the four eyes principle and corresponding access requirements to apply only to tender opening.
- The award notice is not published according to the forthcoming legislation. Award notices have similar requirements as the contract notices that are already described. Furthermore, the system does not track the activities throughout the procurement procedure.

Solutions:

- The four eyes principle and corresponding access requirements should be adapted to apply to tender opening, as well as, to participation requests' opening and processing.
- The system must provide the ability each awarding authority to define quantifiable criteria on the basis of either the lowest price or the most economically advantageous tender.
- A contract award notice should be published to OJEC in SIMAP format. Award notices should include information on the successful tenderer, as well as, the awarding criteria. Furthermore, tenderers should be informed without undue delay if they have been unsuccessful.
- Electronic reports should be generated for the EC containing information regarding the electronic procurement (participants, justification of procedure selection, winners etc).
- The electronic auctions functionality should be provided as part of the electronic awarding stage. Electronic auctions may be embedded into any electronic procurement procedure in order to allow economic operators to perform post tendering negotiations.

2.6 Risks

In this section, risks that may exist in a generalised electronic procurement system are identified and analysed. These risks are analysed and assessed taking into consideration the legal requirements that arise from the forthcoming legislation. Moreover, possible solutions to minimise such risks are elaborated.

The following potential risks have been identified:

- **Transformation between paper forms and electronic bids:** Electronic representation of documents may involve conversion of electronic forms to documents, as well as, scanning of paper based

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documents in order to produce digital equivalent files. Furthermore, electronic files will be encrypted, decrypted, transformed between several different electronic formats etc. The risk of undermining the quality and presentation of the original document clearly exists and has to be taken into great consideration when implementing and testing a generalised electronic public procurement system. The principle of integrity may be jeopardised in case of any undetected alteration of the digital content of documents. In order to avoid such situation electronic conversions should be tested and result in faithful representation of the original documents. This can be guaranteed by applying standardised electronic transforms (e.g. standardised XSLT in case of XML files), as well as, standardised and exhaustively tested electronic conversion tools.

- **Introduction of modern bureaucratic dependencies:** Transformation of traditional procurement procedures to electronic procurement systems aims at reducing excessive paperwork and unnecessary internal procedures within public administrations. However, if such procedures are replaced by automated systems a sophisticated technical infrastructure will be required, as well as, highly skilled personnel. A potential risk is therefore introduced in creating modern bureaucratic dependencies. Such dependencies on one hand may eliminate traditional administrative problems, but on the other hand will introduce new ones undermining the effort of electronic procurement implementations to address the practical dimension of public procurement. In order to eliminate such risk, public administrations should focus in re-engineering their procurement processes to use and benefit from electronic procurement systems. The resulting systems should primarily address the practical feasibility of public electronic procurement and concentrate towards implementation of systems that are highly parametric, user friendly and that can be easily customised and maintained.
- **Viruses in electronic tenders:** Suppliers who submit electronic tender documents to a generalised system may introduce viruses through their electronic documentation files. However, the cleaning of a virus infected file involves the risk of deteriorating the original content, and thus a much better approach is to completely eliminate the file and request resubmission. Elimination or scanning for viruses is a process that may come in conflict with confidentiality and the actual technical security implementation. This happens because scanning for viruses requires a decoded file at the server side, so such an action is questionable if it can be implemented at the point where the tenders are submitted. It is most likely to occur when bids are open after the tender deadline has passed. So, suppliers should be responsible for cleaning their documents before submission and if checking takes place after opening, a possible request for resubmission and corresponding functionality may resolve the issue of potential deterioration. Finally, it should be noted that the principles of integrity and confidentiality are directly involved and threatened in such kind of risk.
- **Use of smart cards & smart card readers:** A smart card reader may be used by the system in order to store the user digital signature. The technical specifications of the smart card reader and corresponding software that interconnects the reader with the main system are varying between different readers and cards provided by different CAs. Since a top level European CAs does not exist at the moment there are no standardisations that may be applied in order to make a reader/card a generally available technology. Also, in terms of administrative burden it is not practical for a multi-national supplier to maintain different devices for different eProcurement systems. Therefore their use is risky and may lead to discriminatory exclusion of some bidders from awards. An alternative implementation could be entirely software based eliminating the need to use the devices. Such approach is based on pragmatic technical and economic choices. Technically speaking, a "good enough" rather than "best" practice should be adopted. Software-based digital signature is not the most secure form available but offers a fully flexible solution enabling users to communicate securely by downloading and installing a

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decentralised certificate on their own workstation. For the user, the signature will be therefore nothing more than a highly secured computer application, easy to install and to use. Furthermore, this will ultimately lead to adopting a solution based on open standards, thus ensuring the development of interoperable digital signatures and time-stamping services working over different platforms.

- **Non-electronic material accompanying bids:** Paper based material that is accompanying tender documents (samples, prospectus, and certificates) may exist and should be included in the electronic bid. A possible solution could be for the supplier to scan the required documentation and then submit its digital equivalent. However, in case where such a digital representation is not possible, for example in case where samples of material are required, or when paper based prospectus needs to be sent, then the electronic procurement system should provide a parallel submission route by normal post, keeping reference to the digital equivalent documents. Nevertheless, there is a potential risk of undermining the equal treatment and integrity principles if a robust and integrated solution for electronic and non-electronic material is not provided in the electronic procurement system.
- **Multiple submissions near deadline:** When the deadline of submissions is close, the risk of overloading the system with excessive submissions is high. In such cases a possible solution could be the use of redundant servers for the application and the database, in order to provide load balancing and fail-over capabilities to the system. Alternatively, the fingerprint of the tender may be requested to be submitted instead, at times near the actual submission deadline. The benefit of this functionality is that a file fingerprint requires only a tiny amount of bandwidth and therefore may be quickly and reliably submitted onto the overloaded system. In effect, this will virtually extend the submission period; during this extension period, the supplier may easily submit the actual tender documents. A fingerprint is unique for a document (similar to a one-time signature) and guarantees that the document has not been altered since the fingerprint submission.
- **Availability of service:** As an extension of the previous case and as a stand alone scenario as well, there is an additional risk that exists regarding the availability of the submission service. A supplier may not be backed-up or provided an alternative means, in case that he is not capable to connect to the platform due to technical reasons that are beyond his control. If fail-over and high availability mechanisms do not cater to protect such unfortunate and extreme cases, a significant risk may exist that equal treatment and interoperability principles are not preserved. Internet connections through multiple internet providers should eliminate the case where there is no accessibility to certain member states, and therefore preserving the equal treatment and interoperability principles. Additionally, redundancy in network equipment, network routes, software and hardware equipment, as well as, disaster recovery mechanisms and clustering will considerably reduce such risk and increase the availability of service.
- **Opening of different sections of the bids:** Tender documents should be opened by simultaneous actions of multiple users according to the forthcoming legislation. However, an electronic opening may decode all data at the same time. Such an action can clearly introduce a small risk to the transparency of the process in case for example the supplier is requested to re-submit some certificates or relevant documents. His financial offer will have already been revealed and thus if there is no mechanism for locking the rest of the submitted documents the whole procedure needs to be re-launched in order to be compliant with the legislation. A better approach would be to decrypt with simultaneous actions of multiple users the documents in two separate serial steps e.g. first decrypting the certificates and relative documents and then the financial offer. This approach can be effectively realised by using

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different key pairs for “wrapping” the individual technical and financial offer, as well as, an additional key pair for “binding” the two individual offers into a single consolidated offer.

- Validation, triggers and warnings for system users:** If a validation mechanism as well as warning messages and triggers are not provided by the system there is a risk that the users will not comply with the rules and regulations of the electronic procurement system. Of course the responsibility of compliance with such rules is for the user and not for the system itself. Nevertheless, lack of such interaction may be considered in any case a risk that may lead to undermining the transparency of the system for the side of the suppliers and undermining equal treatment for the side of the contracting authority concerning the actions they invoke on the electronic procurement system. Therefore, the system should be implemented to validate all information that is submitted and actions that are taken by the user. The former should be achieved by exhaustively checking all submission forms and while triggering warning events, as well as, executing corrective actions. The latter should be achieved by introducing a workflow mechanism into the system which will control the flow of the procurement procedures and ensure that the process conforms to the rules and regulations of public procurement.
- Increased participation of bids in the process:** There is a potential risk that the introduction of an electronic procurement system, which will provide a more convenient, reliable and easily accessible communication channel may increase dramatically the tender participations. Nevertheless, this will create competition among suppliers and enforce the principles of public procurement. On the other hand, may introduce additional administrative work and increase the costs incurred at the public administration side. It is important that public administrations implementing their electronic procurement system seriously consider this situation. Public administrations should act and plan proactively their systems and ensure that the electronic procurement system will address their actual problems and the practical dimension of public procurement. Therefore, administrations should re-engineer their organisational, operational and procedural mechanisms in order to be able to cope with the new requirements that will be incurred from the application of electronic public procurement (e.g. increased demand, additional services, etc).
- Presentation of electronic catalogues:** Information in electronic catalogues should be presented very carefully in order preserve the principles of equal treatment and transparency. For example, it should be avoided to promote information, prices and values of products in such a way as to favour specific suppliers, as well as, it should be avoided to offer visual comparisons between different catalogues which in most practical cases do not have identical specifications. In effect, the e-catalogue content should be arranged and visually presented to the end user in the same way for all products/services, making information equally accessible, thus promoting healthy competition among all tender participations.
- Private channels of communication:** The system must ensure that, with the exception of the negotiated procedure, private communication between the contracting authority and a supplier is limited, in order not to facilitate negotiations or other non-legitimate arrangements which may undermine the principles of non-discrimination and transparency underlying the procurement rules. On-line forums for questions and answers, as well as, private messages between participants should only be implemented in the system where this is permissible under forthcoming the legislative framework or for contracts not covered by the European procurement rules.

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3 User Requirements

Collection of eProcurement requirements of participating public administrations from questionnaires and face to face interviews led to the definition of specification guidelines for internal and external eProcurement systems and modules.

3.1 Overview

The analysis of administration requirements was based on material collected from filled questionnaires, as well as, visits and interviews with the administration eProcurement personnel. In particular the following public administrations, pioneering in the area of electronic procurement, participated in the experimentation:

- French Prime Minister Services (DSAF)
- French Ministry of Finance (MINEFI/DPMA/SDI)
- French Union of the National Funds of Social Security (UCANSS)
- German Logistic Centre of Police (LzP), State of Baden-Wuerttemberg
- Swedish, Agency for Public Management (APM)
- Slovenian Ministry of Information Society (MIS)

Collected Member State requirements were systematically examined leading to guidelines of common specifications and standards. These guidelines are described in detail and provide the ground for the resulting demonstrator scenarios and the corresponding adaptations by administrations.

From this experimentation, the following interoperability categories were identified:

- **Internal Systems:** Identification and analysis of requirements for internal eProcurement modules.
- **External Frameworks:** Identification and analysis of interoperability issues concerning the interconnection of eProcurement systems with external systems (e.g. certification authorities, legacy systems of suppliers for automatic uploading of the updated electronic catalogues, etc).

3.2 Internal Systems

Specifications and standardisation guidelines related to internal eProcurement systems and modules are identified from the analysis of MS administration requirements. These may be further elaborated and analysed in detail through the design and implementation of the demonstrator. Such specifications and standards might contribute to a common interoperability framework for pan-European e-government services. The main issues to be examined comprise the following:

- **Multilingual support:** Every service and GUI will support multiple languages
- **Localisation:** Different application components, scripts, and database elements will support easy localisation.
- **Personalisation:** User groups and user profiles will be parametric and may be customised by the user.
- **Standardisation of Notices:** Electronic notices will support the new SIMAP XML formats.
- **Standardisation of documents:** Documents will be standardised providing associated DTDs, XML Schemas, and XSLT transforms.
- **Compatibility Support:** Different document formats will be supported (PDF, HTML, XML, DOC).
- **Communication:** Interfacing protocols and communication messaging will be established using

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HHTP, SMTP, EJB, open APIs, XML/SOAP messaging, etc.

- **Publication places:** Integration with external systems for electronic notification will be defined (e.g. OJEC, National Bulletin Boards, National Official Gazette, Buyer Profile, Third Party Portals, etc).
- **Security Specifications:** Registration & Authentication specifications will be derived, as well as, interaction with approved certification service providers
- **Public Key Infrastructure:** Specifications regarding the security framework (Open PKI, encryption Specifications, digital signature devices standardisation, certification standards) will be defined.
- **Standardisation of e-catalogues:** XML schemas and unification of existing standards (e.g. ebXML) will be examined, including functionalities for storage, maintenance and catalogue manipulation.
- **Auctioning:** Providing standards for ranking information, auction bids, auctioning evaluation.
- **Legacy Systems:** Common formats for external legacy systems (ERP, collaboration modules, financial systems, expert systems) will be provided.
- **Bid Opening:** Preserve the ‘4 eyes principle’ with respect to EC legislation.
- **Evaluation:** Standards for the extraction of quantifiable criteria and application of awarding criteria.

3.3 External Frameworks

Candidate external frameworks, systems and modules that have been identified and can be examined in order to address interoperability problems, difficulties and barriers comprise the following:

- **Security Framework:** Existing PKI implementations can be analysed for interfacing with the electronic procurement services supported by the demonstrator. Security framework specifications should consider the following:
 - The data protection of all tender related documents and especially the tender response from different bidders.
 - The date-locking mechanism that prevents the opening of the tender before the deadline for opening the tenders is reached.
 - Security in communication with users (especially for the document exchange over the Internet).
 - The use of electronic signatures through the utilization of digital certificates for signing all classified and sensitive documents. Software and Hardware solutions (e.g. smart cards and smart card readers) will be evaluated and integrated.
 - The required logging activities for providing and audit trail for all the activities, processes and procedures that are performed during the complete eProcurement cycle of a tender.
- **Collaboration Module:** It will be examined how to integrate demonstrator services with external collaboration modules/services. Such modules will provide the necessary hierarchical structure into the simulated electronic procurement system. Document management, knowledge management and advanced collaboration tools and services will capture and enhance the MS administrations internal processes. Within the demonstrator, public administrations will have the opportunity to derive specification guidelines for integrating with several commercial proprietary solutions such as Lotus Notes, Microsoft Exchange, Microsoft Sharepoint Server, Livelink™, as well as, with open source community tools such as the CIRCA, the Collaborative Software for Public Administrations. CIRCA is a web-based collaborative environment that is providing on-line-services for workgroups and committees and it facilitates the effective and secure sharing of resources and documents.

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- **OJEC e-Notification System:** The demonstrator will consider interfacing with the e-notification services of SIMAP, in order to publish electronic notices to OJS. This integration will provide vital specifications and schemas for the seamless integration of electronic notification with any eProcurement system and complete another important milestone towards a common pan-European interoperability framework.
- **ERP & Financial Systems:** It will be examined how other external systems such as Enterprise Resource Systems and financial systems will be interfaced to the demonstrator services. More specifically, electronic catalogues, inventory management information and budget information are usually provided by such legacy systems. Specifications for integration with these systems can be derived in the context of the demonstrator, provided that administrations or their suppliers will offer all necessary technical information for their particular systems and integration requirements

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4 eProcurement Demonstrator & Best Practices

In this section two alternative solutions are identified and thoroughly examined. More specifically, a Demonstrator and a Best Practice approach are elaborated in detail reflecting the collected user requirements, as well as, the rules of the forthcoming legislation.

4.1 Overview

Following the negative outcome of eVergabe assessment, the Study has taken a new direction and sought an alternative approach. Visits and surveys to pioneering Member State administrations revealed that the most important obstacle that current implementations encounter is the lack of common specifications and standards in public electronic procurement. In fact, derivation of common specifications appears to be a critical milestone in the implementation of pan-European eProcurement systems. As mentioned before, these constitute of specifications for interoperability and interconnectivity of both internal and external eProcurement systems. In the course of this direction, it was therefore proposed to implement common tools and practices that will assist Member States to derive and assess such common specifications. In particular, it was suggested to short-list and examine in detail two prevailing options:

- (1) Further study and benchmark of existing experiences and platforms implemented in Member State administrations, in order to consider the state of the art and identify best practices (described in detail in Section 4.2)
- (2) Development of a demonstrator simulating the legal functionality prescribed by the forthcoming e-Procurement legislation (described in detail in Section 4.3)

In order to focus on such alternatives, Member State administration requirements were analysed, thus leading to the identification of common eProcurement specification guidelines for internal systems and external frameworks (as already described in Chapter 3). Based on such guidelines, several implementation scenarios were identified. The prescribed prevailing options were derived after a close examination and assessment of several alternative scenarios, as well as, after frequent meetings with the European Commission.

4.2 Best Practices

In this section, the first option is described, of studying and benchmarking existing experiences and platforms implemented in Member State administrations, in order to consider state of the art and identify best practices.

4.2.1 Description

The aim of the best practices option will be to systematically organise and disseminate the results of successful e-procurement projects carried out by public sector, at pan-European level. The systematic examination of such results will provide **state-of-the-art presentations** of selected best practice systems. In effect, the best practice approach will offer guidelines for the design of common electronic procurement architecture, as well as possible technical solutions. The administrations may re-use such common tools and specifications, enhancing them in order to suit their specific requirements and promoting at the same time e-procurement interoperability at pan-European level.

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In this context, existing e-procurement environments will be surveyed in Europe, listing and analysing the most advanced e-procurement projects and determining priorities and criteria for assessing best practices on public e-Procurement. Based on pre-defined criteria, an assessment of different systems with respect to the forthcoming legislative framework will be carried out, revealing common barriers, as well as, necessary customisations and modifications. A selection of best practices will be analysed, documented, and disseminated within the public administrations community. Furthermore, different elements of best practice will be systematically organised in a pan-European e-procurement knowledge base. This knowledge base will provide general information, technical specifications, manuals and common interfaces to public administrations and recommendations or guidelines for all stages of e-procurement. All elements will focus on lessons learned and experience gained from previous implementations of such systems, with special emphasis given on interoperability issues.

It is expected that promotion of best practices, can **raise awareness** on e-Procurement systems, technologies and barriers, and facilitate the adoption and further enhancement of existing demonstrators, prototypes and systems by other administrations, with the necessary improvements and generalisations to become compliant with the forthcoming legislation. In this respect, specific awareness and training campaigns will be launched for providing information and guidance to public administrations.

4.2.2 Objectives

In more detail, the main objectives of the best practice scenario are to:

- Develop a specification framework to be used in the development of e-procurement systems
- Prepare PAs throughout Europe to use this specification framework in preparing their call for tenders for such systems
- Demonstrate to all participating PAs, the best practices in the field, through practical and realistic scenarios under use
- Select and present best examples of how PAs can transform best practices into tender specifications, according to their local legislations
- Select and present best examples of how BPR may be used for implementing processes that abide to the forthcoming EU legislation

4.2.3 Benefits

In the following, we outline the benefits of the administrations from the dissemination of best practices.

- **Hands-on Experience of eProcurement Best Practices:** European administrations will gain valuable experience from other operating systems and onsite/online demos they will attend and experiment with. More specifically, experience will concern public administration processes, peculiarities, existing e-procurement standards and interfacing standards of different e-procurement implementations in Europe, etc. Material to be collected comprises among others presentations, functional and technical specifications, prototypes, demonstrations, manuals, etc.
- **Gain experiences in Business Process Re-engineering (BPR):** European administrations will gain experiences on BPR and the administrative effort that is required for implementing e-procurement systems. This experience will be communicated to suppliers of administrations, in order to prepare for utilising new technologies in e-procurement.
- **Exposure to new technologies and standards:** Administrations will become familiar with alternative technologies, standards and vendor products utilised for implementing e-procurement platforms. Furthermore, they will become aware of the technical problems that pioneering administrations have

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to cope with and the solutions that were provided. Integration issues between heterogeneous platforms will also be addressed and elaborated.

- **Participation in comprehensive training and workshops:** During these workshops, the participating administrations will have the opportunity to try different pilot scenarios with the systems and analyse their supported functionality and capabilities, the technologies utilised, and their potential for generalisation to support the needs prescribed by the forthcoming legislation. Emphasis will be given to experiment with functionality compliant with the forthcoming legislation, while possible generalisations of the systems will be thoroughly presented and discussed.
- **Enforce cooperation and collaboration:** Collaboration and cooperation between European administrations participating in the Best Practices scenario will be promoted, thus allowing them to examine issues related with multi-lingual aspects, support of multinational TTPs, and operation of trans-border e-procurement systems. Furthermore, synergies might be established by administrations for the joint development or extension of a well-qualified module/component or for copying or even for administrations purchasing modules and components that satisfy their requirements.

4.2.4 Methodology

In order to produce the afore-mentioned Best Practice guidelines, the following tasks will be carried out:

- Identification of existing e-procurement systems throughout Europe;
- Short-listing of these systems according to a predefined set of basic criteria;
- Identification and formalization of detailed criteria for the benchmarking of the short-listed e-procurement systems;
- Benchmarking of the short-listed systems according to set of detailed criteria;
- Documentation, promotion and dissemination of the best practices encountered, including whole systems, modules, policies, techniques, implementation strategies, etc.

4.3 Demonstrator

In this section, the second option of development of a demonstrator simulating the legal functionality prescribed by the forthcoming e- Procurement legislation is analysed in detail.

4.3.1 Description

The demonstrator will be a prototype application developed for experimentation, validation, demonstration and learning purposes. It involves the design and development of the Graphical User Interface (GUI), as well as, the simulation of the functionality prescribed by the forthcoming legislation. The resulting GUI will provide an obvious and intuitive navigation through the supported functionality of each demonstrator. Public administrations will be provided with the opportunity to view and validate all the different electronic procurement scenarios. The technical and functional know-how resulting from their operation will provide the necessary ground for Member States designing and deploying their full-scale electronic procurement applications.

The demonstrator will be properly aligned to the specific needs of each participating member state, including multi-lingual support, as well as, connections with existing legacy systems, thus simulating at a certain level the associated functionality. Each participating member state will be able to utilize the resulting common environment, to experiment with it, and to benefit by the immediate adoption of common specifications and standards on public electronic procurement.

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4.3.2 Objectives

The key objectives that will define the architectural design and implementation of the demonstrator are summarized below:

- **Dissemination of Legal/Technical Requirements:** Public administrations will be provided with an e-learning tool on eProcurement to experiment with the procurement procedures as prescribed by the forthcoming legislative framework.
- **Establishment of common Interoperability Framework:** The demonstrators will provide common specifications for interfacing of eProcurement environments with other eProcurement modules and external legacy systems.
- **Functionality Standardization:** Components and common functions that are needed for supporting public administrations in different Member States will be identified. Also, reusable standardized components for demonstrating a particular functionality will be implemented in compliance with the forthcoming legislation.
- **Technology Investment:** Focus will be given on the reusability of open source technologies emerging from the Internet, which are capable of providing the maximum flexibility for the creation and usage of public procurement services.
- **Establishment of a Security Framework:** The demonstrators will provide the requirements for establishing a trusted network that will make available information access only to authorized users. Requirements imposed by the forthcoming legislation will be considered and analyzed for identifying privacy sensitive data elements and provide consistent, as well as, effective safeguards in accordance with the applicable regulations.
- **Establishment of Collaborative Environment:** The distinct user roles and rights will be analysed for every group category (economic operators, contracting authorities). Information and content will be categorised according to different profiles, allowing or restricting access to information. User roles and access rights will be defined in compliance with the hierarchical collaboration model that will be applied, supporting delegation and escalation of authority within the system.

4.3.3 Benefits

Implementation of the demonstrators will provide benefits to Public Administrations and business community across Europe, as described below:

- **Derive Common Specifications:** The demonstrators will provide open specifications and guidelines for interfacing e-procurement environments with other modules and legacy systems. Interoperability issues will be addressed through the use of non-proprietary solutions and technologies, thus eliminating the existence of proprietary technical dependencies. Focus will be given in the direction of interoperability provided by the Internet and the Web standards. The use of XML, portals, digital signatures, new integration models, such as Message Brokers and XML Web Services, as well as, the involvement of Central Purchasing bodies operating as Application Service Providers will be analyzed and evaluated.
- **Improve Awareness:** The awareness of Public Administration will increase towards the electronic procurement functionality and the legislative framework on public procurement. Since demonstrator scenarios will be parametric and flexible, they will allow administrations to experiment with them and to simulate different cases of public procurement. Also, the demonstrators will incorporate simulation of the different procurement roles (awarding authorities, suppliers), as well as, different hierarchical

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structures within organizations. In conclusion, the demonstrators will contribute to the comprehensive illustration of the forthcoming regulation and improve the awareness to the public administrations and businesses across Europe.

- **On-line Learning:** Public administrations will be provided with a state of the art e-learning tool. Using the interactive demonstrator tool through an online environment, the administrations and business communities across Europe will receive on-line tutorials about the forthcoming legislative framework. Through the online access to demonstrators provided for public administrations and suppliers, no time and travel barriers will prohibit their personnel from getting training on any time, using the manuals created and any recording any workflows to create multimedia presentations and tutorials. This will considerably reduce costs in terms of employee downtime and travel.
- **Identification of Barriers:** The administrations can benefit from the detailed experimentation and visualisation of the demonstrator for the identification of possible barriers or constraints imposed from current legacy systems or national legislative frameworks. Since the time-consuming analysis for identifying barriers and elaborating alternative solutions will be carried out in the demonstrator, the necessary effort in the development of the full-scale e-procurement systems by administrations will be minimised.
- **Evolution to Full-Scale Implementations:** Reusability of the demonstrator due to its open source technologies is a very important benefit for public administrations. OSS provides the maximum flexibility for future localization and adaptation to take place. In this context, demonstrators can be used as the basis and be further enhanced and expanded, through the development of new modules, in order to evolve to full-scale re-usable e-procurement systems. For this, all appropriate documentation of specifications and manuals will be prepared and properly organised, thus allowing administrations to entirely base their future developments on the grounds of the demonstrator, using its specification guidelines and re-usable software components.
- **Technical Know-How Transfer:** The demonstrator will provide to public administrations and the business community, all necessary functional/technical requirements for the development of their full-scale e-procurement systems, as imposed by the forthcoming legislation. All technical knowledge will be gathered and assimilated, so as to reach a sufficient level of understanding. Exposure of administrations to all the functional and technical problems related to e-Procurement will allow them to deeply understand the prescribed procedures and proceed fast to the implementation of their full-scale systems.

4.3.4 Methodology

The approach to be followed for the design and implementation of the proposed e-procurement demonstrator will be based on the Rational Unified Process (RUP) methodology, which will provide the guidelines for effectively planning, organizing, designing, testing, and executing iterative development.

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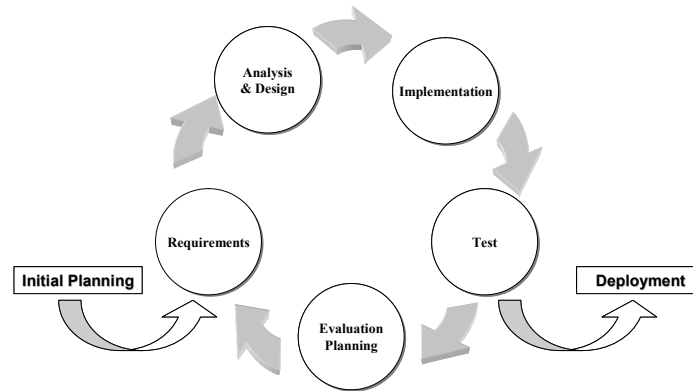


Figure 4-1: Methodology

Five phases of development will be established (as depicted in Figure 4-1) and organized into a number of separate iterations that must satisfy certain defined criteria, before the next phase is undertaken.

4.3.5 Structure

The demonstrator will allow simulating common procurement procedures (open, restricted and negotiated) for awarding individual contracts. Additionally, the Dynamic Purchasing System (DPS) will be simulated, in order for the public administrations to familiarise and experiment with the new procedures imposed, which are entirely based on electronic means. DPS is an open purchasing system where specific contracts are awarded and the demonstrator will be easily expanded to simulate framework agreements, considered as closed DPS with similar functionality. Electronic auctions will be also included as an option, for awarding both individual and framework contracts. The following diagram depicts the structure of the demonstrator.

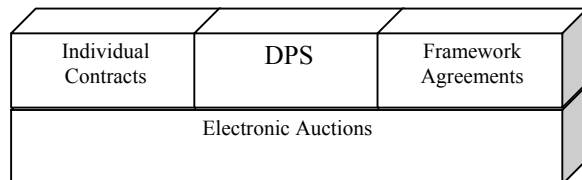


Figure 4-2: Structure of eProcurement demonstrator

The demonstrator will be developed in three complementary phases (as shown in Figure 4-3):

- *Phase I:* Static Demonstrator, comprising of the technical design, specifications and GUI, and implementing some basic web presentation functionality
- *Phase II:* Dynamic Demonstrator, comprising of all necessary eProcurement business logic, and back office support
- *Phase III:* Adaptations for Administrations, comprising of optional customisations and localisation for individual MS public administrations.

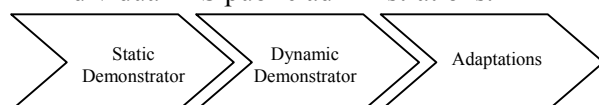


Figure 4-3: Phases of eProcurement demonstrator

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4.3.6 Functionality

In this section, the functionality captured by the demonstrator will be described in detail. In particular, the demonstrator will involve a full implementation of individual contracts and dynamic purchasing systems (DPS). The former are the basic building blocks of public procurement, while the latter are new purchasing mechanisms introduced by the forthcoming legislative framework on public procurement. Additionally, the functionality of framework agreements is described - which adhere to the basic building blocks in order to award specific contracts within their established systems, as well as, the possibility to extend all common procurement procedures to incorporate electronic auction functionality.

4.3.6.1 Individual Contracts

The following common procurement procedures, awarding individual contracts, will be simulated by the demonstrator:

- **Open:** All interested economic operators will be invited to express their interest and submit a tender
- **Restricted:** Only economic operators invited by the contracting authority will be allowed to submit their tenders
- **Negotiated:** The contracting authority will be allowed to consult the suppliers of their choice and negotiate the contract terms with one or more of them

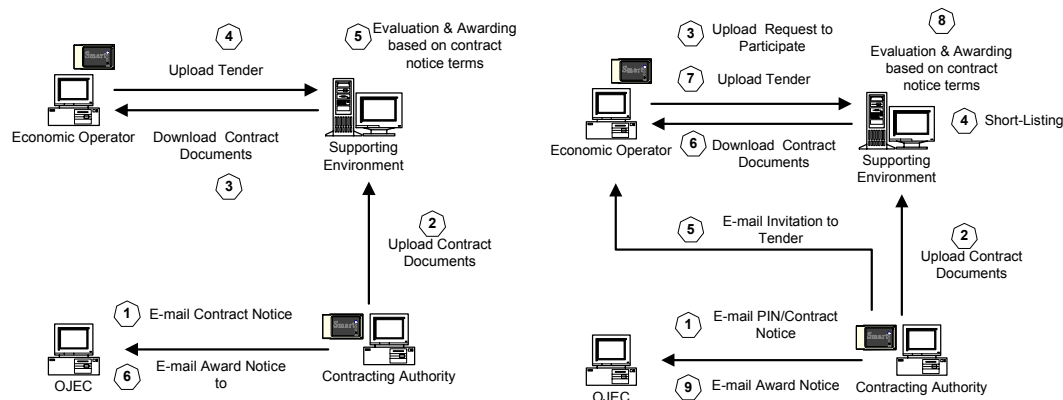


Figure 4-4: Individual Contracts Demonstrator (left: Open, right: Restricted/Negotiated Procedures)

A description of the main stages of common procedures (open, restricted and negotiated) are illustrated in Figure 4-4.

The following sub-sections describe the individual contract awarding functionality to be simulated for contracting authorities and economic operators respectively.

Contracting Authority Functionality (MS public administrations):

- System administrators will create certificates, passwords and assign quotas for using system resources. All necessary subscription information will be forwarded to member administrations (public procurement officials) through a secure route.
- Public administrations will register/subscribe to the demonstrator and organise their electronic

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tendering environment.

- Contract notices (XML) will be imported in order to:
 - Identify to the system the type and characteristics of tenders supported.
 - Assign user profiles and associated access levels to staff members of the contracting authority.
 - Assign user profiles and access levels to bidders subscribing to the services, according to pre-set criteria they satisfy.
 - Simulate Questions and Answers for the tenders.
 - Activate a search-engine facilitating users to carry out searching of tenders by keywords (product, supplier, date of tender, company name, etc).
- Log reports will be created and track mechanisms activated at certain time intervals, to monitor usage of resources.
- Time-stamping of all the documents submitted during the tendering period will be supported.
- Date locking of all tender documents will apply, in compliance with the four eye principle, after the submission deadline.
- Opening of submitted electronic tenders will be facilitated, preserving the four eyes principle.
- Quantifiable criteria will be extracted from electronic tenders submitted as standardised XML documents, e-catalogues, etc.
- Evaluation and awarding of contracts will be simulated, based on predefined criteria and automated scoring (ranking).
- Contracting of agreements between contracting authorities and suppliers will be supported.
- Reporting for contracting authorities, suppliers and the EC will be provided.

Economic Operators Functionality (Suppliers)

- Bidders use the service and are automatically identified by the certificate they own. However, in case bidders use the service for the first time, the registration procedure will be followed before they are allowed to proceed further.
- Bidders may participate in Q&A sessions in a tender specific forum.
- Candidates may utilise search mechanisms to locate the appropriate call.
- Candidates can download the supporting documents for a contract and proceed to their further processing.
- Bidder requests in advance a one-off company certificate (as the sole representative and holder of the certificate). This is a certificate that will be used only for the particular tender submission, in order to sign and encrypt the tender.
- Bidder digitally signs, encrypts and submits tender to the service (Provide and utilise XML digital signatures and XML encryption schemas for XML tender files and/or e-catalogues).
- In case of heavy traffic anticipated during the date of submission and depending on the size of their proposals, bidders can request a certificate denoting date and time (timestamp), in order to submit their proposal later (e.g. within the next 48 hours). This will assure the integrity of the data, prohibiting the bidders to alter the content of their full tenders afterwards.
- After receiving the tender, the service returns acknowledgment of file transfer, whereas within 24

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hours an (encrypted) acknowledgement of receipt is sent.

- Only authorised public servants and members of the receiving and evaluation committees will be able to access the system and open the tender by simultaneous actions (four eyes principle). Since the tender will be securely encrypted, the responsible persons will be allowed to assign different access rights to different groups of users handling the different parts of a tender. Each evaluator or evaluating committee will have their own user name and passwords, which will correspond to their access level, as set by the administrator.

4.3.6.2 Dynamic Purchasing Systems

A dynamic purchasing system (DPS) comprises new innovative electronic purchasing mechanisms introduced by the forthcoming EC legislative framework. The main characteristics of a DPS is that it is limited in duration (i.e. maximum 4 years validity) and open to any economic operator that is interested to be admitted into the system.

The DPS demonstrator aims at testing the DPS functionality, which is introduced by the forthcoming legislative framework. The demonstrator will execute the full cycle of a DPS, establishing the system and awarding specific agreements. Emphasis will be given on the forthcoming legislation of electronic public procurement, as well as, on the existing needs of the administrations that will participate in the demonstrators.

The electronic procurement activities that will take place in the DPS demonstrator are the following:

- Electronic notification and uploading of electronic catalogues
- Electronic tendering by continuous updating of e-catalogues and automated evaluation
- Electronic awarding of several specific agreements (indicative tenders) in the form of e-catalogues within the DPS
- Integration with external e-ordering systems for automated ordering of products, services and/or works of the awarded specific agreements

The functionality displayed by the DPS demonstrator will follow the two phase approach prescribed by the forthcoming EC legislative framework:

Phase I: The system will invite all interested suppliers that are already admitted to the DPS to update their electronic catalogues. Suppliers that are not part of the system are given the opportunity to submit their electronic catalogues in order to be admitted to the system. A simplified contract notice should be completed by the contracting authority administration, in order to notify suppliers for the individual contract within the dynamic purchasing system (specific agreement). After its completion, the form will be sent by e-mail OJEC in order to be posted to the Official Journal of the European Communities. Suppliers will then update the tender documents, which may be in the form of electronic catalogues. At this stage, the contracting authority will evaluate the indicative tenders introduced by new suppliers, for getting admittance into the system. Also, any indicative tenders updated by suppliers already admitted to the system will be re-evaluated. The functionality to be simulated in the 1st phase of DPS is displayed in Figure 4-5.

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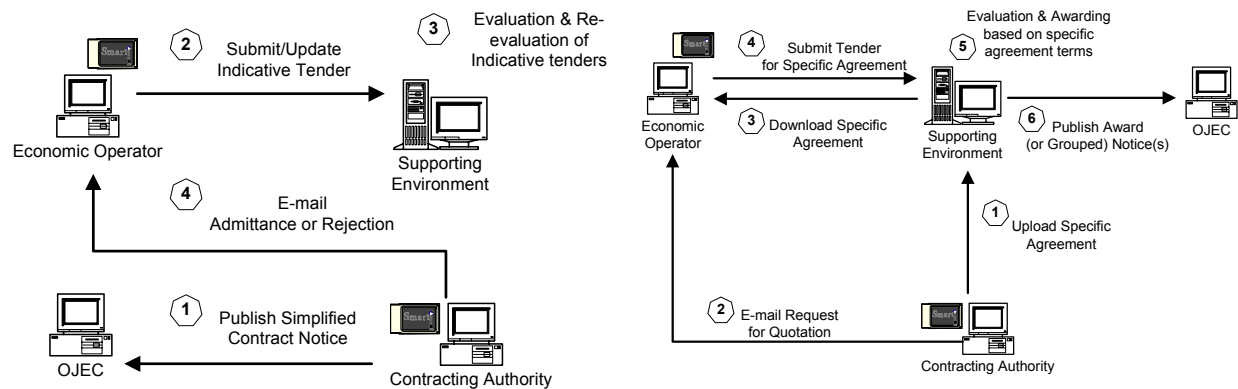


Figure 4-5: Pilot of Dynamic Purchasing System (left: Phase I, right: Phase II)

Phase II: At this stage the contracting authority is uploading the specific contract documents on the dynamic purchasing systems environment. The contracting authority is also e-mailing a request for quotation to the suppliers that are finally admitted in the system. All suppliers that participate in the dynamic purchasing system shall download the specific agreement documents and tender for the specific agreement. Moreover, the contracting authority is evaluating the tender documents for the specific contract. Finally, the contract is awarded to the tenderer which submitted the best tender on the basis of the award criteria set out in the contract notice for the establishment of the dynamic purchasing system. Those criteria may, if appropriate, be formulated more precisely in the invitation to tender for the specific agreement. The functionality to be simulated in the 2nd phase of DPS is depicted in Figure 4-5.

4.3.6.3 Framework Agreements

A framework agreement is an agreement between one or more contracting authorities and one or more economic operators. Awarding of the framework agreement is the procedure that is followed in order to set-up the general terms and conditions under which all the subsequent individual contracts will be awarded within the particular agreement. Framework agreements are mainly used when there is a recurring need to purchase the same products or maintenance services (e.g. office consumables, information technology supplies, etc). Any of the common public procurement procedures (open, restricted and negotiated) may be used within a framework agreement to award and establish the agreement.

In contrast to DPS, a contract notice is not required to be published for each specific contract. Framework agreements may be considered as “closed” systems because throughout their validity period only the economic operators that were awarded the agreement (i.e. set-up the system) may participate in the system. Due to similarities, the framework agreements demonstrator may be produced from an extrapolation of the DPS demonstrator component.

When a framework agreement is concluded with a single economic operator, contracts based on that agreement shall be awarded within the limits of the terms laid down in the agreement. For the award of those contracts, contracting authorities may consult the operator party to the framework agreement in writing (electronic request), requesting it to supplement its tender as necessary. In order for a framework agreement to be concluded with several economic operators, there must be at least three in number, as imposed by the forthcoming legislation. The system will award the contract by applying the terms of the framework agreement to the original tenders. However, if there are new terms that need to be included in the contract, then competition should be re-opened:

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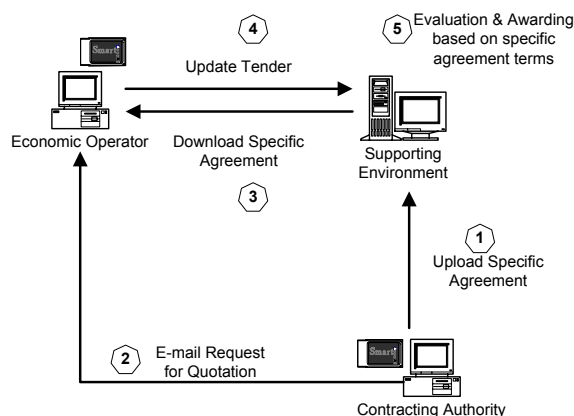


Figure 4-6: Demonstrator of Framework Agreements

The contracting authority will first upload the individual contract documents of the specific agreement on the system. The contracting authority will then send a request for quotation by email to all the suppliers participating in the framework agreement, to submit a tender for the specific contract. The request for quotation will be digitally signed in order to preserve authentication and integrity. A time limit should be provided in the request for quotation sent to suppliers, which will provide sufficient time for all suppliers to prepare their tenders. Suppliers will then download the individual contract documents that exist on the framework agreement closed system. The suppliers will update and upload their tender. On-line electronic catalogues may be used instead, in order to simplify the updating procedure. The documents or catalogues will be digitally signed and encrypted by the suppliers before being sent, in order to preserve authentication, integrity and confidentiality. The system will award the contract to the best tender in accordance with the award criteria set out in the framework agreement. Finally, the award notice will be posted on the system and participants will be informed by email about the results. There is no need for the contracting authority to notify OJEC on the awarding results of a specific agreement (individual contract). The functionality to be simulated in the demonstrator of Framework Agreements is illustrated in Figure 4-6.

4.3.6.4 Electronic Catalogues

During each procurement process, the demonstrator will additionally simulate tenders in the form of electronic catalogues. The functionality to be displayed by the demonstrator tool is concentrated in the following points:

- Generation (loading) of a standardized electronic catalogue into a single commonly approved format.
- Communication between contracting authorities and economic operators, exchanging (e.g. uploading, downloading) qualified e-catalogues.
- Management of the catalogue products, prices and values, in real time (e-auction bidding).
- Aggregation and integration of the catalogue data into a central repository.
- Importing, exporting and transforming of catalogue information from the system's central repository to other external systems and vice-versa.

The demonstrator will be able to receive data from other systems using XML files, as the main communication mechanism (XML-to-XML transformation). The use of XML files to communicate data

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between systems provides the administrators with extra flexibility to reformat and reuse that information, as needed within their administration/organizations or within the larger information-supply chain outside their premises. Access right to particular catalogues, as well as, personalized catalogue management privileges, will be based on a collaborative platform that defines the users' roles and rights. Each user will have the ability to perform catalogue searches against the portion of the catalogue that has access rights. A simple search using a single criterion at a time (e.g. tender location, procedure type, CPV-code, etc.), as well as, an extensive search, using a combination of different criteria will be provided by the demonstrator.

4.3.6.5 Electronic Auctions

Electronic Auctions is a new mechanism that is introduced in the forthcoming legislation on public procurement and are the only way to perform post tendering negotiations on the price and values that were predefined in the contract notice. They can be invoked in the context of any procurement procedure, awarding individual contracts or contracts within framework agreements or dynamic purchasing systems.

The key features of electronic auctions to be displayed comprise:

- Prior to the e-Auction, a full evaluation of the most economically advantageous tenders should be undertaken.
- During the e-Auction:
 - Contracting authorities to use award criteria such as price, quantity, technical specifications for products, and any other relevant quantifiable factors.
 - Suppliers update their bids in respect of any factor requested, including price.

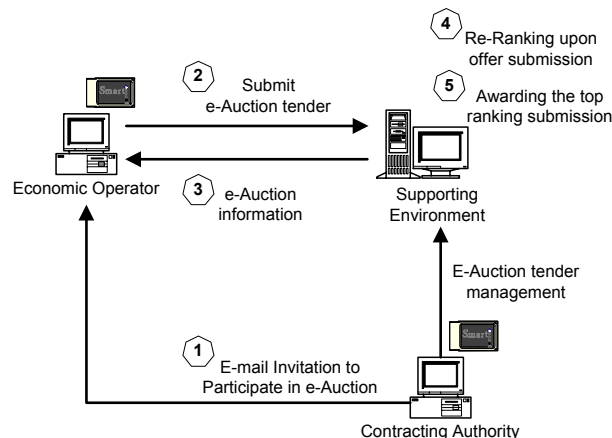


Figure 4-7: Demonstrator of e-Auctions

Electronic auctions will be set-up from the attributes (e.g. values, limits, minimum bid differences etc) that have to be predefined in the contract notice. Electronic auctions can be distinguished into two stages: the pre-evaluation stage and the auctioning stage.

The auctioning functionality to be supported in the demonstrator (Figure 4-7) is outlined in the following:

- **Pre-evaluation stage:** The system will initially evaluate the tenders based solely on price or on the most economically advantageous tender (quantifiable criteria defined by the tender's contract notice). In effect, this can be considered as a preliminary awarding stage that will form the basis for the auction

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to take place. This evaluation will derive a ranking of all the tenders and the relative ranking for each tenderer. The invitation to participate in an auction sent to qualified tenderers will lay down all the attributes of the auction, comprising dates, connection arrangements, electronic equipment, main mathematical formula, variant formulas, evaluation outcome, etc.

- **Auctioning stage:** Here, the actual electronic auction is executed. Invited suppliers will upload their tender with all necessary updated prices and/or values (depending on the predefined award criterion). Before their uploading, the offers will be digitally signed and encrypted by suppliers, in order to ensure integrity of the documents and authentication of the sender, while encryption will ensure confidentiality of the newly submitted prices and values. Using the new values and prices included in the tender, the suppliers will be automatically re-ranked by the system. Throughout an auction, suppliers will inquiry electronic auction information (relative ranking, current phase of the auction, number of participants and relevant information concerning other prices or values submitted). Notifications containing information about re-rankings and about other prices or values (if the latter is provided for in the specifications) will be sent to all bidders, whenever a new offer is submitted. When the deadline is reached or other predefined termination criteria are satisfied, the system will terminate an electronic auction and award the tender to the top ranking bidder.

4.4 Recommendation

Analysis has shown that the option of implementing a demonstrator is considered to be the most appropriate solution for IDA, since it will facilitate the development of common specifications for implementing the new legislative framework. On the other hand, it is not possible to rely solely on examination of best practices, since it will be very difficult for administrations to find the necessary resources and time for opening their systems online for executing benchmarking and supporting online demos. Moreover, it is expected that no existing e-Procurement systems are based on the forthcoming legislation. The analysis of the benefits and risks of each alternative option, as well as, the estimation of associated effort and costs has led to the conclusion that the optimal solution to follow in the context of IDA, is to combine the demonstrator with a downsized version of the best-practices option. The latter will be accommodated into the Demonstrator option as a State-of-the-Art review and assessment work-package, thus minimising any risks involved. The State-of-the-Art work-package will be mainly based on marketing material and user manuals that can be easily acquired by administrations.

More specifically, implementation of the demonstrator will result to a complete set of prototypes for administrations experimenting with eProcurement functionality, and more importantly, to guidelines and common specifications for creating their own systems. Additionally, the demonstrator may be used as an eLearning tool to allow public administrations familiarise with eProcurement types and procedures prescribed by the forthcoming legislation. The proposed demonstrator will examine a number of electronic procurement procedures, including Individual Contracts, Framework Agreements, Dynamic Purchasing Systems, as well as, electronic procurement tools such as Electronic Auctions and Electronic Catalogues.

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5 Conclusion

In summary, the Study analysed the feasibility to develop eProcurement pilots on the basis of an existing eProcurement system and in compliance with the forthcoming legislative framework on public procurement. Based on a negative evaluation outcome the examination of two options Demonstrators and Best Practices was further considered. Finally, it was recommended to focus more on common tools and specification issues rather than implementation of actual eProcurement systems.

The analysis of the new eProcurement legislation has indicated that electronic facilities, systems, and devices used in procurement procedures, should comply with the general public eProcurement principles and provisions. For this reason, legal and technical requirements have been identified and elaborated for the development of integral eProcurement systems, in line with the forthcoming legislative framework and capable of supporting all different procurement types.

The existing eProcurement system developed by the German Ministry of Interior (eVergabe) has been analysed and the feasibility of generalising its components to become compliant with the new legislation has been assessed. In the course of this work, it was realised that eVergabe is based on proprietary technologies and mainly supports the German laws on public procurement and digital signatures. The examined system proved to be incompliant with most of the principles of public procurement, such as transparency, equal treatment and interoperability. Elimination of such barriers is considered complex, since the business rules are hard coded within the system components, without any parameterization options. Nevertheless, the experimentation with the system was very useful and revealed barriers and risks to overcome in the development of the future eProcurement systems. Furthermore, its study helped to identify and elaborate alternative solutions and generalisations. The technical material, evaluation criteria and generalisations of the system provided helpful references for all public administrations involved.

Collection of eProcurement requirements of participating public administrations from questionnaires and face to face interviews have led to the definition of specification guidelines for internal and external systems. Interoperability is not a simple issue in the eProcurement world. Different initiatives at EU and national levels are already performing interesting work in this area but differences in practices and tools or concepts could raise barriers to conducting procurement electronically across Europe.

Furthermore, it has been deducted that eProcurement tools commonly available to European public administrations can act as catalysts for eProcurement in Europe by helping awarding authorities to develop eProcurement system for their own needs, in line with the forthcoming legislative framework. The availability of common tools or services customisable to meet specific project needs, would also be useful, especially for small awarding authorities which have not the skills or resources to put in place their own eProcurement systems.

To this extend a number of demonstrator scenarios were elaborated. Finally, an e-learning demonstrator was proposed incorporating State-of-the-Art review and assessment to allow public administrations familiarise with the eProcurement types and procedures, as prescribed in the forthcoming legislation. The demonstrator will simulate a number of electronic procurement procedures, including Individual Contracts, Framework Agreements, Dynamic Purchasing Systems, Electronic Auctions and Electronic Catalogues. Implementation of the demonstrator will result to a complete set of static and dynamic prototypes (common tools) for administrations experimenting with the eProcurement functionality.

The development of the demonstrator will address all possible barriers, risks or conflicts with current practices, ultimately leading to validation and definition of common specifications. Additionally, the

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demonstrator may be used as pedagogic and e-learning tool, allowing administrations to reach a thorough understanding of their eProcurement requirements. As a result, the demonstrator will be valuable for the administrations and the EC, in order to experiment and deeply understand the new legislation and the prescribed electronic procurement processes.

It is important to communicate of a clear EU transborder eProcurement strategy indicating the benefits, opportunities and value added to buyers and suppliers, as well as, explain the organisational change it imposes. Thus, workshops, eLearning demonstrators, dissemination of best practices, and collection of cost/benefit information of existing eProcurement systems should be part of the immediate actions to follow.

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6 Step Forward

It is suggested that the elaboration of common technical specifications and the implementation of the proposed demonstrator constitutes the most appropriate next step to follow and should greatly contribute to the development of common eProcurement tools and specifications, compliant with the new legislative framework and according to the principal objectives of the IDA Workprogramme 2003. A demonstrator may influence public authorities at a larger scale, in order to optimise and standardise their processes. The demonstrator should be closely integrated with other operational services, in particular SIMAP and TED. Therefore, the demonstrator may also form the basis for carrying out e-learning activities with public administrations on the new legislative framework, as well as, for the future evolution of software developments, either by European Commission or the public administrations.

Work on the demonstrator should be based on functional specifications extracted from the forthcoming directive on eProcurement, as well as, on detailed requirements to be identified and further analysed during the meetings with administrations and the European Commission. Optionally, based on the effort to be invested by participating administrations and building upon their requirements and the analysis of state-of-the-art systems, the proposed solution can result to customised on-line demonstrator tools and specification guidelines specific for particular administrations.

6.1 Integral Solution

The recommended demonstrator is modularised into three sub-components, namely individual contracts, dynamic purchasing systems and framework agreements. Sub-components should be complimented with e-auctions and e-catalogues support. A modular architecture should offer flexibility and scalability for further developments and future adaptations to the needs of the administrations.

The demonstrator should be designed to be portable and accessible from remote locations. This in effect should enable administrations to access and experiment with the demonstrator remotely (through Internet), with relatively low technical requirements, using their browsers and simulating different roles (public officer, supplier, etc). The demonstrator should allow the public administration officers to select the desired eProcurement scenario they want to simulate and define its attributes to the system (e.g. Open, Closed, for the procurement of products, services, etc). The value of attribute parameters should be requested by the system for each particular scenario and provided by the procurement officer. Such parameters should dictate the workflow of the demonstrator (e.g. nature of the procurement - product service or works), the type of procurement procedure type, the interaction with external legacy systems, etc. Navigation through demonstrator screens should follow a predefined sequence, which may dynamically change, depending on the different options and decisions made by the users throughout the simulation. Throughout the navigation, the administration should be allowed to select among different alternative actions, leading to different eProcurement outcome.

In particular, the building of the demonstrator is suggested to proceed in two phases:

- (1) The creation of a static demonstrator, consisting of GUIs and simulating basic functionality for individual contracts and DPS.
- (2) The creation of a dynamic demonstrator, further expanding the static one to incorporate the underlying business logic and support e-auctions and e-catalogues functionality.

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The dynamic demonstrator should be developed in Open Source Software and contain re-usable and expandable components, which can continuously evolve and be shared by different development teams and contractors of public administrations. Eventually, the use of OSS technologies should encourage administrations to develop inter-operable e-Government solutions.

6.2 Methodology

The static demonstrator should proceed first with the implementation of individual contracts scenario, in order to set the foundation of the demonstration process and facilitate rapid development and assessment of results by different user groups. Individual contracts are in effect the basic building blocks of the final proposal. Moreover, the DPS scenario of the static demonstrator should be developed to allow for further experimentation with innovative eProcurement procedures. Completion of the static demonstrator should allow the execution of workshops and e-training sessions, for receiving feedback from the administrations and the EC. Finally, it should result to common specifications for the evolvement of the demonstrator to the dynamic environment.

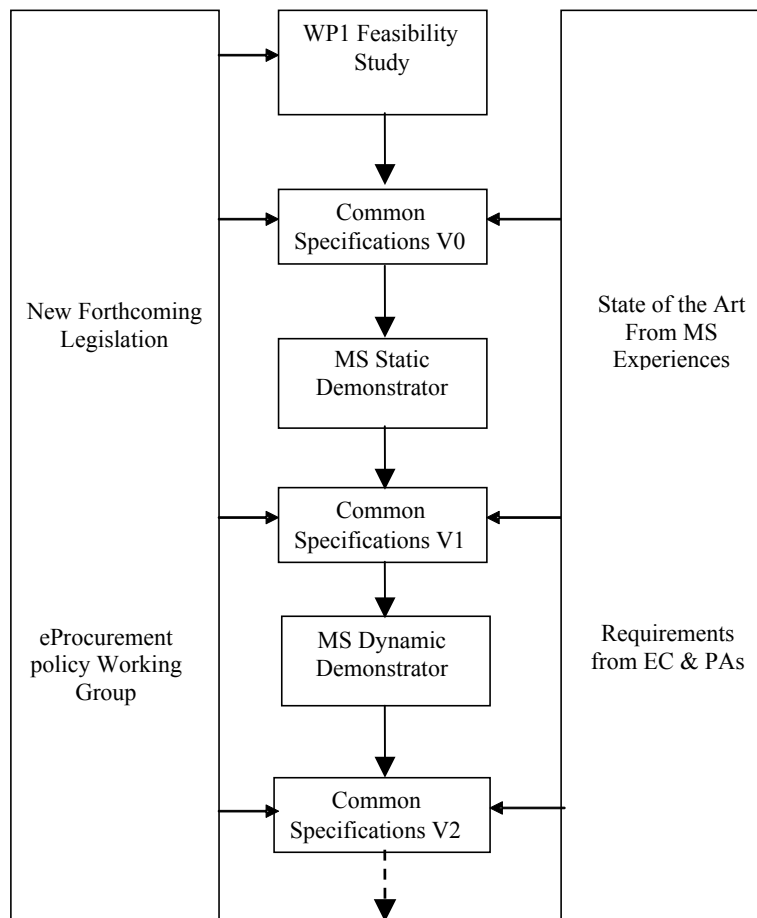


Figure 6-1: Demonstrator implementation methodology

The dynamic demonstrator should effectively constitute a generic eProcurement tool incorporating the underlying eProcurement business logic. Initially, it should implement both individual contracts and DPS

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functionality, and then it should be further extended to support framework agreements. At a later stage, adaptation of the dynamic demonstrator to the needs of the administrations might be implemented, as an optional feature.

The iteration process to be followed for the evolution of the specifications to the eProcurement demonstrator and finally to the complete e-tendering pilot is presented in Figure 6-1 and outlined below:

1. Specifications for the Demonstrator should be extracted directly from the forthcoming legislation (WP1 of the current Study) and should be combined with State-of-the-Art from existing Best Practice systems, the feedback received from eProcurement Working Group, and the user requirements collected from administrations and the European Commission. This should result to a first draft of specifications (V0).
2. Based on the above consolidated functional specifications, the static demonstrator for individual contracts and DPS should be technically designed and implemented. Following its completion, a validation process should be initiated, during which adjustments of the initial specifications should be carried out, resulting to the first version of specifications (V1).
3. Accommodation of resulting adjustments should lead to specifications for the dynamic demonstrator development, whereas validation of the developments and feedback from user groups might lead to new releases (V1.x), with minor modifications of the first version (V1). During this stage, DPS should be extended to support framework agreements.
4. With the finalisation of the demonstrator, its adaptations to user requirements and the implementation of Framework Agreements, new and more concrete specifications should result in a second version of specifications (V2), for the development of a full e-tendering pilot.
5. A similar iterative approach should be followed for the implementation and integration of e-catalogues and e-auctions.

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