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THE DEVELOPMENT OF AN ELECTRONIC SYSTEM FOR CONTRACTS AND THE EXECUTION OF BUILDING WORK IN GERMANY

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Abstract: Public administrations are banking on electronic media to improve their processes, particularly in the field of construction due to the potential savings that are expected. With the project e-system for the award of public contracts the federal government is pursuing the aim of handling public procurement entirely over the internet. The legal requirements have been created in the form of the Digital Signature Act [*Signaturgesetz*] and the corresponding changes in the Regulations on Provisions for the Award of Public Contracts and the Official Contracting Terms for the Award of Contracts. The focus is on making legally binding declarations on intent. This is made possible by the advanced electronic signature with a qualified certificate. In technical terms the concept is realised through the use of a public key concept. In Germany, the electronic system for the award of public contracts has been implemented in the context of three pilot projects which are explained in the study.

Keywords: Electronic system for the award of public contracts, digital signature, e-Government, certified electronic signature, award platform, award law, work-flow, codification, public key process.

1. Introduction

The basic idea of the European Union is that by forming a common market and an economic and currency union in the long-term a unified Europe may also be achieved. For the promotion of the European internal market, the following essential basic principles apply: the free trade of goods and services, prohibition of discrimination on grounds of nationality, restriction of the right of establishment, prohibition of the grant of unauthorized subsidies as well as uniform trade practice rules. To help get the idea of the European Community accepted also by the contracting authorities the European Union has regulated by coordination directives on what criteria public contracts may be awarded.

Under the term electronic government, government departments are using electronic media to an ever greater extent, both at the interface to citizens and enterprises, as well as internally. A precise estimation of the potential benefits of the use of new technologies is, however, very difficult to carry out. It may be assumed, however, that in the course of the realization of comprehensive e-Government, considerable importance is attached to the organization of the workflow management [1]. Already the experience in e-business has shown that the implementation of sophisticated technology-based solutions is no guarantee of business success. For the benefit of citizens and the economy, reliable and integrated services must be provided. The government department at the same time is given the chance to develop into a service provider which with the help of lean processes acts flexibly and economically to the satisfaction of its customers [2].

Deutschland Online is the joint E-Government strategy of the Federal and *Laender* governments and local authorities. Federal Chancellor Gerhard Schröder and the heads of government of the *Laender* decided during their conference on 26 June, 2003 on a joint strategy for integrated e-Government – DeutschlandOnline in order to create a cohesive e-Government landscape in Germany. On the basis of this strategy the heads of government agreed on 18 December, 2003 on 20 joint projects with which administrative services will in future be rendered via the internet. According to the basic principle “some for all”, the Federal and some *Laender* governments or local authorities are proceeding with model solutions. The other

partners are meant to profit from this, through coordinated procedures, but without central bureaucracy, by being able to use the solutions worked out for themselves. An essential element here is the optimization of public procurement. Thus, according to the Federal Minister of the Interior Otto Schily, all federal authorities should convert their procurement to electronic system for the award of public projects procedures up to the end of 2005.

With the strategic project e-system for the award of public contracts the Federal Government is pursuing the aim of handling public procurement entirely over the internet. With the e-system for the award of public contracts, due to the market transparency, completely new possibilities to obtain public contracts now exist. The project thus satisfies the requirements of the EC Treaty as well as the above-mentioned basic principles for the promotion of the European internal market.

The contract volume of the Federal and *Laender* governments and local authorities is considerable: in the year 2002, this amounted to 260bn. euros – i.e. 25 % of government spending and 13 % of the gross domestic product [3]. A significant role here is played by contracts for the execution of building work.

2. Electronic contracts for the execution of building work

The traditional invitation to tender and award of contracts for the execution of building work is today characterized by numerous media disruptions from paper to digital form and vice versa. The aim of the electronic solutions is to simplify and curtail the process flows in the award procedure.

2.1. Legal and technical standards

The Unfair Trade Practices Act (*Gesetz gegen Wettbewerbsbeschränkungen* (GWB)) provides that contracting authorities, when awarding a contract in accordance with the terms of the Public Procurement Regulations (*Vergabeverordnung* (VgV)), must apply the provisions of the contracting regulations. These provisions must be applied if a contract for building work, deliveries or services is awarded by one of the contracting authorities stated in section 98 and a certain threshold value is reached or exceeded.

The object of the building contracts is the execution and accordingly planning of building projects as well as the execution of building work. Supply contracts are contracts for the procurement of goods that in particular relate to purchase or hire-purchase, leasing, rent or lease with or without a purchase option. Contracts for carrying out services are contracts that relate to services and are neither building work nor delivery services. For the award of the diverse contracting parties, the following contracting regulations apply:

– The Regulations for Contracts and the Execution of Construction Work [*Vergabe-und Vertragsordnung für Bauleistungen* (VOB)], Part A, for the award of building contracts.
– The Regulations on Tender Procedures for Supplies and Services (*Vergabe- und Vertragsordnung für Leistungen* (VOL)), Part A, for supply contracts.
– The Professional Services Contracting Regulations (*Vergabe -und Vertragsordnung für freiberufliche Leistungen* (VOF)), for service providers that cannot be described unequivocally and exhaustively in advance.

With the Digital Signatures Act (*Signaturgesetz*) and the amendment of the VOB in June 2000, the legal foundations for the digital award were laid. Through the new Regulation on Provisions for the Award of Public Contracts (*Vergabeverordung* (VgV)) that came into force on 1 February, 2001 a legal framework was created. Paragraph 15 VgV stipulates that insofar as the individual contracting regulations contain no provisions regarding the submitting of tenders electronically, in the case of public invitations to tender, contract awarding authorities may permit the submitting of tenders in forms other than the paper form. An essential precondition for the validity of the procedure is that the confidentiality of the tenders is guaranteed. For this, digital tenders must be encrypted within the meaning of the Digital Signatures Act. The encryption must be maintained until the end of the deadline for submitting tenders. This legal regulation is based on the implementation of the corresponding EC Directives. It obliges the Member States to implement the electronic system for the award of public projects into national law. In Germany, this occurred through section 15 VgV and section 21 no. 1 (1) VOB/A.

In the event of an electronic system for the award of public projects, it must be guaranteed that each tenderer can be clearly identified and its tender is kept in safe custody unchanged and unopened until the deadline for submitting tenders. The decisive factor here is the Digital Signatures Act (SigG), which entered into force on 16 May, 2001. Under section 2 SigG, electronic signatures are "..data in electronic form, which is enclosed with other electronic data or logically linked with this, so that it serves the purpose of authenticating this". Making legally binding declarations is possible with the advanced electronic signature. These are based on a qualified electronic certificate. Such a certificate is provided by a registered or voluntarily accredited provider of certification services and is created utilizing a secure signature creation unit. This includes a personal chipcard as well as a card-reading device and the corresponding certified software for each person signing.

The digital signature is realized technically by applying the public key concept [4]. In this, two keys, one open, available to everyone (public key) and one private (private key) are used. One also refers to this type of encryption as an asymmetric procedure.

The principle of asymmetric encryption consists in data made illegible with the help of a public key only being made legible again with the corresponding key. So-called providers of certification services are responsible for the authentication and the integrity of the keys. They check the identity of the participants, create the public and private key, certify these and keep a list of all participants. The private key is saved on a chipcard with a PIN number: the public key in a directory available to everybody in the internet. Thus, the public key is accessible without any problems and signatures can be checked for authenticity. If the person signing wishes, in addition, a time stamp may be created by the provider of certification services. This has the advantage that it can be reconstructed subsequently when exactly a document was signed. Just as simple as the creation of the digital signature is also the check by the recipient. The signature software also required by the recipient downloads the public key from the public directory in the internet. The legal and technical framework for the award by digital means is thus provided.

2.2. Current practice in the award process

Independently of the project circumstances, current practice in the award process takes the following form:

In large-scale projects, the project planning is frequently not only carried out by one planner, but broken down into planning and invitation to tender. In this case, the planning must be handed over to the planner putting out to tender. The project planner draws up the plans by means of CAD, lets them be plotted out and sends them by messenger or a similar service to the planner putting out to tender. In part, plans are also sent per e-mail or on data carrier. If the list of services is compiled, this must be sent for reading to all project coordinators. After a correction following this, the list of services, including all required plans, is finally forwarded to the tenderers. These now draw up their tender for the project phase that is being put to tender, in most cases per EDP. At the same time, however, this means that the data printed out on paper beforehand must be reintegrated into the corresponding software. Once the tenderer has calculated its tender, it prints this out again and returns it with a legally valid signature to the authority awarding the contract. The tenders are kept there closed and in safe custody up to the opening date. Only tenders submitted in good time prior to the deadline for the submission of tenders are admitted. During the opening, a first, unevaluated result is read out; subsequently, all tenders must be checked as regards their contents and calculations; from this, a final price comparison list is drawn up. This makes a high expenditure in manpower necessary. The tenderers are mostly also supplied with a version of the list of services on floppy disk, including the necessary software in order to be able to open this. They are, however, not forced also to submit a quote regarding their prices again on floppy disk in addition to the signed paper form. In larger companies, while the return of the filled-in tenderer's floppy disk is in the meantime the norm, many smaller enterprises still balk at it. A list of services has thus changed its medium from paper to file and vice versa several times up to the time of the award. Associated with this is a higher expenditure of time and personnel for the activities of copying onto paper, forwarding and the respective duration of sending by post.

2.3. The principle of the electronic system for the award of public projects

The digital award pursues the objective to simplify the award process, thus making it more efficient. If the list of services, as previously, is compiled with AVA software suitable for this, the supporting documents are no longer printed out and copied after completion, but transferred to the internet platform. The tenderers with access authorization have access to it and can retrieve the entire award documents digitally and upload the lists of services onto the platform again after compiling the tender. The media disruptions of the traditional procedure are thus completely eliminated. The standardized file format of the lists of services is the GAEB format. GAEB is the abbreviation for the joint committee for electronics in building industry [*Gemeinsamer Ausschuss Electronik im Bauwesen*]. Via the GAEB interface as provided by the regulations of 1990 (GAEB 90) and GAEB Da of 2000, the contents of a list of services as well as the corresponding key of the standard construction services manual can be exchanged.

The procedure described above is comparable for most public awards. In the digital award processes it is now a matter of illustrating all steps technically, so that a handling free of media disruptions by the contracting authority as well the tenderers becomes possible. How the requirements for the processes under procurement law have already been implemented technically will be explained in greater detail by the following example. Three projects are presented therefore: the e-Award Project of the Federal Government, the Electronic System for the Award of Public Contracts of the German Federal State of Bavaria and the Electronic System for the Award of Public Contracts of the City of Berlin.

3. Projects for the implementation of the electronic system for contracts and the execution of building work in Germany

3.1. The e-system for the award of public contracts project of the federal government

In 1998, the federal government started the e-system for the award of public contracts project. At the beginning of March 2003, the Federal Office of Construction and Regional Planning cleared the first public invitation to

tender in the public-sector building industry – the construction of a low-voltage current network for a Bonn office building via the award platform of the federal government. With the goal to be able to carry out public contracts more quickly while avoiding the traditional administrative costs for the paper award, the federal government initiated the pilot project "Electronic award of federal government contracts", in which the first building contracts have now also been awarded. Thus, a platform was created, with which the electronic system for the award of public projects of contracts of a very wide range of different services is to be handled by the federal government department in the future. The goal is the development and proving of the electronic system for the award of public projects in the internet.

When designing the e-system for the award of public contracts, three principles stood in the foreground:

– The creation of extensive legal conformity,
– Guarantee of a sufficiently secure infrastructure,
– Guarantee of the sustainability of the system.

The rules stipulated in the guidelines for the award for the various areas (VOL/VOF and VOB) and the various award types (from open procedure to a single tender action) must be reflected in the hardware and software. A direct consideration of current court rulings regarding awards was a further requirement with regard to the technical system.

Procedure and project coordinators:

The e-system for the award of public contracts project was lead-managed by the Federal Ministry of the Economy and Work in the development and pilot phase and developed in close consultation with the Federal Ministry of the Interior and the Federal Ministry for Transport, Construction and Housing. In this, in two federal authorities – the Procurement Office of the Federal Ministry of the Interior and the Federal Office of Construction and Regional Planning (BBR) –the foundations were laid for putting the electronic system for the award of public projects to the test in a pilot study. Both of these offices were selected in order to be able to test the electronic procurement for the various award areas: The VOL (The Regulations on Tender Procedures for Supplies and Services), the VOF (The Professional Services Contracting Regulations) and the VOB (The Regulations for Contracts and Execution of Construction Work).

Accompanying scientific research analysed and bundled the various experiences during the pilot phase, guaranteed the transferability of the results and administered their circulation.

A series of federal government departments, research institutes and enterprises are working on the e-system for the award of public contracts project. Besides the federal government offices, CSC Ploentzke AG, the Fraunhofer-Institut für Arbeitswirtschaft and Organisation (IAO) and Wegweiser GmbH in Berlin were also active. CSC Ploentzke AG, as the subsidiary of a worldwide active IT consultancy and service company, has realized a solution for the electronic illustration of the public award process in conformity with procurement law. Key elements of the solution are a highly confidential and highly available communication platform with the possibility to exchange documents as well as the use of the qualified electronic signature and the legally compliant implementation of the procedure. Fraunhofer Institut and Wegweiser GmbH Berlin cooperated in the accompanying research and the communication of the project results to the general public.

In the e-system for the award of public contracts project the following process steps were implemented technically [5]:

1. Official announcement

Besides the well-established publication possibilities, official announcements are additionally published on the website.

2. Search for invitations to tender

Enterprises search electronically for public invitations to tender. In this, the electronic search function of this system is available to them free of charge. By using specifically programmed agents this search can be automated.

3. Requirement of tendering documents

Enterprises may be registered online and after a successful application for registration request the tendering documents via the internet.

The identification and authentication of the enterprise takes place via the electronic signature; a check of the suitability takes place during the first registration.

4. Application for participation

An application for participation is filed by analogy to the requirement of the tendering documents as well as the subsequent submission of a tender electronically.

5. Making available tendering documents

Tendering documents must be downloaded via the internet, after the enterprise has been authenticated with the help of the electronic signature. The tendering documents sent by the procurement office must be furnished with the electronic signature of the competent clerk in the public authority.

6. Compiling the tender and forwarding

The tendering form is available in electronic form as a pdf-document. With the help of Adobe Approval the tenderers can fill in, save and sign the tendering form. The tendering form and any additional documents such as for example auxiliary tenders are forwarded electronically. Through a qualified electronic signature the tender becomes legally valid.

7. Submission and handling of the tender

The electronic handling of the tender provides an addi-

tional degree of process safety. The e-system for the award of public contracts project approves tenders only on the appointed date; until then, the tenders remain encrypted. The editorial principle according to which texts are proofread by a "second set of eyes" is satisfied by two employees of the authority awarding the contract being authenticated at the computer for the tenders by means of their signature card in order to then open the tenders. The list of tenderers and price comparison list are drawn up automatically and can be supplemented by tenders received conventionally.

8. The acceptance of the tender and notification to the tenderer

The e-system for the award of public contracts project notifies the result of the invitation to tenders electronically to the participants. The decision is given its legal validity by the electronic signature. An electronic time stamp serves to control set dates and deadlines.

Technical implementation:

The most important part of the e-system for the award of public contracts project is constituted by the e-system for the award of public contracts platform. Through this, authorities awarding contracts and parties tendering communicate with one another. The main elements of the platform are formed by a webserver for the presentation of web contents as well as an application server in which processes and processing logic are saved. The webserver receives the inquiries of the users and passes these on to the application server. The application server processes the inquiries and returns the answers to the webservers, which then pass these on again to the users. The system works browser-supported, in which Internet Explorer or Netscape Navigator may be used. For the platform, a safe transfer to the internet is created with the help of firewalls.

The communication of sensitive applications with the web server flows through the transfer protocol https, Hypertext Transfer Protocol Secure, which guarantees a high degree of transfer safety. On the part of the tenderers, the application program ANA is made available as a tendering assistant for the document exchange; on the part of the authorities awarding a contract, the online procurement assistant, OBA, and the opening assistant for tenders, ÖFA are also made available. For these applications, the secure socket layer, SSL, protocol is used, which allows a safe exchange of confidential information in the internet. SSL enables the authentication of the communication partners by using asymmetrical encryption procedures and certificates and thus makes possible the confidential data transfer.

In the e-system for the award of public contracts procedure the public key infrastructure explained under 2.1 is used. In this, for a particular award procedure, closed user groups are formed. In principle, the participants identify themselves both to the e-system for the award of public contracts platform as well as in the context of a specific award procedure via its encryption certificate and the corresponding pair of keys.

Project experience to date:

On 4 March, 2003, in the portfolio of the Federal Ministry for Transport, Construction and Housing the starting signal was given for a first complete award of contracts and the execution of building work. The Federal Office of Construction and Regional Planning released the first invitation to tender in the public-sector building industry – the construction of a low-current network for a Bonn office building via the award platform of the federal government.

With the e-system for the award of public contracts project, for the first time a public invitation to tender was handled completely electronically in a federal government department. The electronic procedure in practice has demonstrated that all process steps can be illustrated and handled continuously with legal certainty. The project experience has shown that the e-system for the award of public contracts could be accessed at any time without difficulties and its availability in the operation was stable. To date, however, acceptance by the tenderers has been marginal. One of the reasons for the relatively small participation by the participants in the electronic procedure lies in the consistent use of the qualified electronic signature. In this, a less significant role has been played by the costs for the signature and the reading devices than by complications during the procurement of the signature cards. First of all, such cards could only be sourced through the party tendering Telekom. In the meantime, however, there are various other parties tendering, such as DATEV and the savings banks so that here the service has improved. Even if further hurdles have to be removed, on the part of the enterprises great interest in participation exists.

3.2. E-system projects for the award of public contracts on the part of the Laender, the example of Bavaria

The Bavarian Public Authority for Building Construction works on approx. 20,000 lists of services annually in collaboration with the invitation to tender and award of building projects of the Free State of Bavaria. These are often several hundred pages thick. With the now current project "digital award" the highest building authority is now promoting innovative applications and technologies with the objective to create benefit for the potential public-sector customers and private parties tendering through a digital procedure in conformity with VOB.

Procedure and project contributor:

For this, a competition was initiated in order to use the innovative force of the market. In a closed procedure with competition between the participants in accordance with the Regulations on Tender Procedures for Supplies and Services (VOL) approx. 30 companies applied; eight applicants fulfilled the preconditions for a participation in the procedure.

The decision was made for T-Systems with the subcontractor Ventasoft. The task was on the one hand to illustrate technically the process described already under Point 2.2, and on the other hand to make available and operate a highly secure platform. T-Systems operates the integrated solution for the digital award system and provides the software solution in the computer centre. The computer centre is protected by extensive safety measures. Besides separate safety standards, a two-stage firewall concept, special data backup, monitoring and the digital signature ensure the safe operation. Ventasoft GmbH introduces the software "AVA-Online", trains the users and provides support.

Technical implementation:

For the initial supply with a signature card and reading devices for the use of qualified digital signature, T-Systems provides corresponding product bundles. After the procurement and installation of a reading device with a signature card, the tenderer can register once only on the award platform of the Bavarian Higher Building Authority, "www.vergabe.bayern.de". During registration, the sectors or rather the project stages worked on by the company are inquired about. This makes it easier for the contract placing authority to carry out a targeted search for specialist companies in the event of restricted invitations to tender. During the registration, the conditions of use must be accepted. The company may immediately download the tendering tool AVA Sign, a handbook and the brief guide free of charge. For the registration and the one-off set-up on the platform, the company incurs costs in the amount of 25 euros.

The software used illustrates the process steps from the drawing up of a text for publication to the publication online, the application by the companies, the making available of all award documents and finally the official announcement of the result of the submission. The software solution used in Bavaria has been certified in accordance with the Digital Signatures Act and confirmed by the regulatory authority for telecommunication and post. This guarantees the authorities awarding contracts and tenderers a high quality and legal certainty in the entire award processs.

Tenderers can fill in the list of services and the forms in a user-friendly way with the tendering program AVA Sign. Companies with calculation software can export the list of services from AVA Sign via the GAEB-interfaces and import the tender data via the GAEB file DA84 again into AVA Sign and check for completeness. The tendering program contains a plausibility and completeness check; in the case of an incomplete entry, warning notices appear. For the tenderers, the processing costs are thus reduced as well as the probability of procedures being excluded due to formal errors. The tender is provided with a qualified electronic signature and submitted in encryption via the award platform. The tenders then lie encrypted in a high security centre of Deutsche Telekom AG and can only be opened during the submission in accordance with the editorial principle according to which texts are proofread by a "second set of eyes". Prior to the opening date, the tenderer may withdraw its tender at any time. During the submission of tenders, it receives a legally binding receipt with a time stamp.

Project experience and further procedures

In future, the construction companies will download the award documents digitally via the internet onto its computer on the workplace in the enterprise and edit the lists of services with their calculation programs.

Small and mid-sized companies can also do this without a calculation program and nonetheless use the advantages of the new procedure without restriction, since a simple calculation program is contained in the tendering tool. The federal *Land* invests around 650,000 euros in the making available and maintenance of the software, the introduction of the system as well as the initial 2-year operation in the computer centre. For enterprises interested, there are information events and training courses Bavaria-wide. Bavaria started the project on 1 September, 2003 in three pilot building authorities. At all further government agencies the technical possibilities are being created at present and above all the employees are being trained correspondingly. In an e-Government agreement a top to bottom implementation of the system was decided on jointly with the local authorities. At a congress taking place in Berlin "Online award of public construction contracts", the construction director Herbert Schießl of the Highest Building Authority in the Bavarian State Ministry of the Interior reported on his experience regarding the introduction and application of the online system for the award of public contracts in Bavaria. Thus, accordingly, from September 2003 to February 2004, around 450 construction measures were put out to tender, of which up to this time 200 were online award procedures, with a participation of approx. 50 % of online applicants.

Mr Schießl also reported that the handling of forms should be improved still further and thus an added value in the building authorities could be created through the tools used. Accordingly, what was important was also an own

DSL access for the tender opening session so that the opening date could proceed punctually and quickly.

3.3. The e-system for the award of public contracts project in Berlin

Also the Berlin Ministry for Urban Development uses the program "AVA-Online" for the electronic invitation to tender and award. Representatives from the districts of Pankow and Spandau have cooperated in the working group in the preparation of the project. The goal of the ongoing pilot project is to reduce the administrative expenditure both in the companies as well as in the public authorities through the use of technology. In the Berlin project, two steps are planned. In the first phase, companies interested may inform themselves about suitable invitations to tender in the internet tender of the Berlin Ministry for Urban Development under "www.ava-online.berlin.de" and download the tender documents via the internet. These supporting documents may then be edited digitally; they are however as previously returned to the public authorities awarding contracts by post.

In the second phase, the tendering procedure takes place completely digitally. A precondition for this is the use of the qualified digital signature. The advantages for the public authority awarding the contract are already evident in the first phase. The forwarding of the partly very extensive documents is no longer required; costs and time savings can thus be realized. During the pilot invitations to tender, the proportion of downloaded documents is increasing rapidly. To date, around 25 public invitations to tender with approx. 400 digital retrievals of supporting documents have been carried out.

4. Summary

The experience to date with internet technologies has shown that a new technology is not automatically used on a broad basis as soon as this technology is technically possible. Necessary for the implementation of the electronic system for the award of public projects is therefore that it is easy to recognize benefits of use for parties tendering and authorities inviting to tender.

4.1. Preconditions for the acceptance by the parties involved

The National Federation of the German Building Trade was involved in an advisory capacity in the development of the online award system of the Highest Building Authority in Bavaria. In collaboration with representatives of the building trade and employees of the building authorities concerned, in particular the following minimum requirements were listed:

- High degree of safety through certified signature components
- High availability
- Conformity with the award work-flows
- Simple, self-explanatory use
- Cost savings potential

A significant role in the success of the introduction of the electronic system for the award of public projects is the necessary safety of the procedure. The requirements as to the qualified, electronic signature under the Digital Signatures Act must be complied with. For this, a safe signature creation unit, a chip card with a pair of keys as provided in section 17 of the Digital Signatures Act and section 15 of the Digital Signatures Ordinance [*Signaturverordnung*] is necessary. The creation of the signature is thus legally regulated, not however the encryption itself. For this reason, the *Land* Bavaria has had the e-award solution confirmed not only in accordance with the manufacturer's declaration, but also through an unambiguous certification in accordance with the Digital Signatures Act and the Digital Signatures Ordinance. Also, the signature software for the award platform of the federal government is in conformity with the law through a corresponding manufacturer's declaration in accordance with the Digital Signatures Act. The safe custody of the tenders on the platform is advantageous in comparison to the traditional system. Through the digital time stamp, it is possible to comprehend through whom and at what time the tender was submitted. Thus, from a legal perspective, nothing further stands in the way of its use.

A high availability must be guaranteed by a corresponding redundancy of the system. If this is the case, an additional benefit for all parties involved is created by the e-system for the award of public contracts project, since the flexibility of the work increases. The employees drawing up the invitation to tender can access the platform at allocated workplaces independently of time and place; the collaboration is thus simplified and accelerated. The parties tendering can submit or withdraw their tenders up to the submission date, and are thus likewise more flexible in terms of time. Submitting tenders within the time specified is thus clearly simplified. While in the traditional way several days had to be planned for the packaging and dispatching of the supporting documents, these process steps cease to exist completely here.

The examples presented have demonstrated how the award work-flow was illustrated technically in the projects. Various tools were developed to facilitate the work; examples of this are the simple editing and the compilation of the necessary forms for the award documents at the business premises of the authority inviting tenders, or the automatic check for completeness and plausibility of the tender at business premises of the tenderer.

Also the criterion of the simple and self-explanatory handling is fulfilled by both platforms used at the present time. In addition, however, it is absolutely necessary to bring the technology underlying this closer to all parties involved in order to make the necessary changes more comprehensible for the persons working with it. In the above-mentioned projects, in addition information events, specially prepared material and hot line support services are made available.

In the enterprises, only minimal costs are incurred for the use of the digital signature; these are composed of the procurement of the signature card and the reading device as well as the costs for the use of the internet. In return, however, the costs for the post and the supporting documents, for which previously a fee was charged, no longer apply, while the download of the award documents is free of charge. The costs for the training of employees is likewise expected to be minimal, since the systems used are largely self-explanatory and user-friendly. On the part of the parties tendering, funds in a high amount have already been made available for the development of the systems. In addition, the expenditure for the making available and operation of the platform, internal training courses and further development and accordingly integration of the software also fall away. Against this, there are savings potentials through the improved technical support of the process steps and through reduced personnel costs. In small and mid-sized enterprises, on a broad basis the potential for the implementation of the electronic system exists for the award of public projects and this could contribute to triggering an increase in productivity [6].

4.2. Unresolved questions

From the experience of the described pilot projects, new problems have emerged. What system and what invitation to tender platform will prevail? What technical standards will be established? Various systems are already being used. Further private parties tendering are contacting the local authorities. The tendering enterprises are now confronted with a number of diverse invitations to tender platforms in the internet. A search for invitations to tender is still intricate for them at the moment, since diverse platforms have to be retrieved, and in each case a new application and accordingly registration becomes necessary.

While the operation of the platforms is largely self-explanatory, it is however varied and the technical requirements are also different. The introduction of the new workflows changes the workflow management above all on the part of the public sector; potential savings resulting from this may cost jobs [7].

A further problem results from the handling of the certificates for the digital signature and their validity. The period of validity of a qualified certificate is according to section 14 of the Digital Signatures Ordinance (*Signaturverordnung*) restricted to 5 years, i.e. afterwards no signature can be affixed with this certificate any more; the validity is, however, in the case of accredited tenderers, verifiable for at least 30 years. Even if a provider of certification services has discontinued its business operation, through the role of the regulatory authority as a so-called Root CA by virtue of law, the permanent verifiability of the signatures is guaranteed. The certificates can be verified via the internet at the respective trust centre. Since, however, signature cards have to be sourced from several parties tendering, various databases must also be checked regarding the validity of the signature.

The goal of the e-system for the award of public contracts projects is the implementation of the award processes digitally. First of all, however, tenders must also be admitted in paper form. Cost savings on the part of the public sector can only be realized if the majority of tenderers actually participate in the digital procedure. A proportion of 50 % of digital tendering in the Bavarian project shows that in the enterprises there is widespread willingness to make change.

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ELEKTRONINIŲ STATYBOS DARBŲ PLĖTRA VOKIETIJOJE

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Santrauka

Vyriausybinės organizacijos deda daug vilčių į informacines priemones, siekdamos tobulinti elektroninius prosesus, ypač nekilnojamojo turto sektoriuje, taupyti. Projektine e. sistema, skirta visuomenėms sutartims pasirašyti, Vyriausybė siekia prižiūrėti, kontroliuoti viešuosius pirkimus naudodama tik intranetą. Teisiniai reikalavimai, apibrėžti patvirtinto elektroninio parašo aktu, numato viešųjų pirkimų sutarties sąlygų, oficialių įvykdymo terminų keitimo galimybes. Dėmesys telkiamas į reglamentavimą teisiniu pagrindu. Atsiranda patvirtinto specialiu pažymėjimu elektroninio parašo poreikis. Techniniu aspektu tai įgyvendinama remiantis valstybinio sutvirtinimo koncepcija. Vokietijoje buvo atlikti tyrimai, kurie lėmė viešųjų pirkimų e. sistemos realizavimą, įgyvendinant tris bandomuosius projektus: vyriausybės e. teisinės erdvės (bazės) projektas, Bavarijos federacinėje žemėje vykdomų viešųjų pirkimų teisinė sistema ir Berlyne vykdomų viešųjų pirkimų teisinė e. sistema. Šią patirtį galima pritaikyti ir naujų ES šalių narių e. vyriausybių plėtotei.

Reikšminiai žodžiai: elektroninė sistema, elektroninis parašas, e. valdžia, patvirtintas elektroninis parašas, teisinių sprendimų bazė, teisinių sprendimų priėmimo procesas, darbo trukmė, kodifikacija, valstybinio sutvirtinimo procesas.

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