

PROCESS ANALYSIS OF IMPLEMENTING STRUCTURED ELECTRONIC INVOICE AT THE POZNAŃ CITY HALL AS AN EXAMPLE OF PROCESS ELECTRONISATION AT PUBLIC ADMINISTRATION UNITS

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Provisions of Directive 2014/55/EU of the European Parliament and of the Council of 16 April 2014 on electronic invoicing in public procurement provide for an obligation for public procurement sector units to be able to receive structured electronic invoices. The article presents assumptions and results of studies carried out at the Poznań City Hall which consisted in a comparative process analysis of the current state (AS IS) of receiving traditional paper invoices and the postulated process (TO BE) of receiving structured electronic invoices.

Keywords: e-invoice, digital administration, Directive 2014/55/EU, business process modelling, BPMN, new public management

1. Introduction

On 6 May 2014, Directive 2014/55/EU of the European Parliament and of the Council of 16 April 2014 on electronic invoicing in public procurement was published in the Official Journal of the European Union. Its provisions refer to the obligation to receive electronic invoices and the standardisation of electronic invoice exchange methods and templates in processes dealing with public procurement, including in the international scope, i.e. in the Digital Single Market of the European Union [1]. Common use of electronic invoicing is one of the forms of meeting the objective of the European Digital Agenda, which is the creation of

the Single Market. The European Commission has also adopted an objective (no. IP/10/1645, 02/12/2010) to make structured electronic invoices a prevailing form of invoicing by 2020.

Directive 2014/55/EU describes an **electronic invoice** as an invoice issued, transmitted and received in a structured electronic format which allows for its automatic and electronic processing. They are not, therefore, "images" of invoices, i.e. PDF, JPG files or scans of documents, because these types cannot be automatically identified, read and processed by document sender's and receiver's systems. Fundamental elements of an electronic invoice cover a set of basic information components which an electronic invoice must include to make it interoperational and transnational in the common European market.

The deadline for implementing the Directive to Member States' domestic legal systems, i.e. ensuring that all contracting parties (public procurement sector units) will receive and process electronic invoices which comply with the European standard concerning electronic invoicing, has been set:

- for central state bodies: for 18 months from the publication of reference to the European standard concerning electronic invoicing and the list of syntaxes in the Official Journal of the European Union (the European standard was published on 17 October 2017, with a delay of 5 months),
- for units below central level: for 30 months from the publication of reference to the European standard concerning electronic invoicing [2].

Under Polish law, the implementation of Directive 2014/55/EU will be based on a proposed act on electronic invoicing in public procurement. Preparing assumptions to the act, the legislator formulated the following immediate and long-term objectives of the planned legal act:

Immediate objectives:

- fulfilling the duties imposed on Poland as a Member State of the European Union in terms of transposing Directive 2014/55/EU,
- popularising the use of electronic invoices in public procurement by means of introducing an obligation for contracting parties to receive e-invoices,
- popularising the use of e-invoices in trading, in relation to the execution of processes related to public procurement,
- making it easier for Polish entrepreneurs to participate in public procurement procedures in other EU Member States.

Long-term objectives:

- standardising the method of documenting the performance of public contracts and electronic invoicing,
- reducing the cost of the operation of companies and increasing their competitiveness [3].

It should be borne in mind that the scope of Directive 2014/55/EU includes:

- invoices for supplies covered by directives on public procurement,
- invoices sent to the public procurement sector,
- all levels of public administration (national, regional and local) in all EU Member States.

Nowadays, the literature on the subject lacks any academic publications or studies describing the effects of implementing future changes in terms of the obligation for units of the public administration sector to receive e-invoices. Therefore, the research problem is to examine the impact of e-invoicing on the functioning of the public procurement sector units.

The main goal of the article is to present the expected results (in duration, cost and human resources savings) of implementation of the postulated receipt process of a structured electronic invoice in the Poznań City Hall, relying on empirical studies performed and on the comparative process analysis of the AS IS model (reception of traditional paper invoices) and the TO BE model (reception of structured electronic invoices).

2. Characteristics of the Poznań City Hall

In view of the obligations resulting from Directive 2014/55/EU imposed on public procurement institutions, including local government units, the author carried out a study at the Poznań City Hall (PCH) which consisted in a comparative process analysis of the current state (AS IS) of receiving traditional paper invoices and the postulated process (TO BE) of receiving structured electronic invoices.

The characteristics of the Poznań City Hall described below, presents important data for the comparative process analysis on the current process of receipt of a paper invoice (i.e. the number of invoices received per year, the number of process rolls involved in the invoice workflow (table 1)) in PCH. Other essential data to carry out the study were obtained during observations and interviews conducted among the employees of the PCH.

Poznań is a city with county rights and a municipality. According to the City Statute, the Poznań City Council is the decision-making and controlling body, whereas the Mayor of Poznań is the executive authority. The Poznań City Hall is the institution supporting the execution of the Mayor's dispositions and, above all, it is responsible for handling the majority of public affairs of local significance. At the end of 2016, citizens were served in administrative affairs by 31 departments and equivalent PCH organisational units, which employed, in total, 1.7 thousand people (6.8% more than in 2015). PCH organisational units operate on the basis of the Organisational Regulations introduced by the Mayor of Poznań in his disposition no. 43/2016/K of 6 October 2016 [4].

In 2016, the Poznań City Hall received approximately 10 500 purchase invoices, most of which were addressed to the Department of Procurement and Office Services (Polish abbreviation: WZiOU) (4500 invoices a year; 375 a month). Traditional paper invoice circulation process is currently supported at the PCH by three IT systems:

- Electronic record of funds assignment,
- KSAT – modules: Central Register of Agreements, Receivables and Liabilities, and General Ledger,
- Electronic banking system.

The empirical study was participated by the Department of Procurement and Office Services (WZiOU), which receives, on average, 18 purchase invoices a day, 5 of which are transmitted to the PCH Chancellery and 13 of which are handed over directly to the Secretariat of WZiOU from the contractor or other unit of the City of Poznań. The studied process of receiving traditional paper invoices addressed to WZiOU is participated each time by 11 process roles which individual PCH employees are responsible for (Table 1).

Table 1. Roles in the process of receiving traditional paper invoices at the PCH

DEPARTMENT	ROLE IN THE PROCESS
Organisational Department (Chancellery)	clerical services employee
Department of Procurement and Office Services (WZiOU)	secretarial services employee Internal Consulting Division: <ul style="list-style-type: none"> • employee handling the budget • employee handling settlements (e.g. VAT) • employee handling analyses • employee handling affairs related to the Public Procurement Law • Division Manager Head of Department
Department of Finance	employee authorised employee Division Manager

The formal documents circulation process (including invoices) is at the Poznań City Hall presently carried out on the basis of provisions provided in:

- Chancellery instructions,
- Instructions concerning the circulation and control of financial and accounting documents at the Poznań City Hall (Polish abbreviation: IOiKDFK),
- and the Book of Processes.

3. Tools and assumption of comparative process analysis

The analysis of business processes compliant with the BPMN 2.0 standard (Business Process Model and Notation) was applied to carry out the empirical study concerning the comparative process analysis of receiving traditional paper invoices against the process of receiving electronic invoices at the Poznań City Hall. The BPMN 2.0 standard has been developed by the Object Management Group (OMG) and is described in standard ISO/IEC 19510:2013(E) Information technology – Object Management Group Business Process Model and Notation. Its central purpose is to provide a method of presenting business, production or administration processes that will be clear and understandable to business recipients, analysts who perform process analyses, and programmers responsible for their technical implementation [5].

The BPMN 2.0 standard allows truthful and reliable reproduction of processes occurring in a specific institution to analyse them in terms of activities performed, their duration, mutual dependencies and resources used. Graphical presentation of the process, i.e. mapping, allows "capturing" an orderly sequence of events, activities and accompanying information in a given process [6]. It makes it possible to precisely identify areas for potential improvement or for the implementation of innovative actions which allow developing a new, better-functioning process model.

Mapping and simulation of the AS IS and TO BE models were carried out in the iGrafx system. The system is one of the most commonly used programmes which employ graphics for the purpose of modelling and simulating business processes, which makes it easier to understand them and follow their course [7]. This approach makes it possible to parametrise the processes and define the consequences of postulated changes by creating an adequate mechanism managing the change and indicating the direction of improvements [8].

After the stage of mapping and simulating the AS IS model, which reflects the actual state, and following the analysis of selected indicators that characterise the currently executed process of paper invoice reception, the next stage of the study was initiated. It consisted in creating process maps and simulating the TO BE state after the implementation of the postulated process of structured electronic invoice reception at the Poznań City Hall. The purpose of the stage was to display planned changes after e-invoice implementation on process maps and to verify, using the simulation showing the correctness of maps, the logical sequence of new, suggested activities and changes in the value of adopted indicators. The maps display static situation and actions taken in a specific time. The simulation "animates" the map - it adds a dynamic character to presented activities, which allows depicting their changes in time [9]. The comparative analysis of selected indicators allowed estimating differences related to duration, cost and the use of

resources in the process, occurring between the AS IS (paper invoice) and the TO BE (e-invoice) model at the Poznań City Hall. The selected indicators were calculated in accordance with the BPMN 2.0 standard relying on the parameters and information gathered during the observation and interview carried out with the employees of the Poznań City Hall.

The construction of the TO BE model and the simulation were carried out on the basis of the following research assumptions which allowed the implementation of the process of receiving structured electronic invoices.

1. The IT system employed in the unit of the public procurement sector (the contracting party) is adapted to the reception and processing of structured electronic invoices.
2. The supplier of the public contract has an IT system which issues and transmits structured electronic invoices.
3. The contracting party's and the supplier's systems are compatible, i.e. an e-invoice issued and sent by the supplier may be received and processed by the contracting party.
4. The supplier has an obligation to identify an e-invoice by providing contract number or the application for the public contract under execution.
5. Correct identification allows transmitting the e-invoice to the secretariat of a suitable department, without the participation of the general chancellery.
6. If a specific unit lacks secretariats in individual departments, the e-invoice is always sent to the general chancellery.
7. After its reception, the e-invoice is processed in the electronic form throughout the entire process of invoice circulation in a specific unit (it is not printed and there is no parallel circulation of its paper version).
8. There is a possibility to transmit data between the IT system receiving/processing structured electronic invoices and the financial and accounting system in a specific unit.
9. All activities resulting from applicable labour law (e.g. substantial description of the document, verification in formal and accounting terms) related to the traditional invoice circulation process must be performed in the e-invoice circulation process.
10. Employees of a specific unit of the public procurement sector are duly trained in the use of the new IT system (or module) receiving and processing structured electronic invoices.

4. Results of the study carried out at the Poznań City Hall

Results of the study have shown that the introduction of the postulated TO BE invoice circulation model at the Department of Procurement and Office Services

(WZiOU) has reduced average working time spent on the processing of one invoice by 16%, from 108 minutes to 91 minutes (Figure 1).

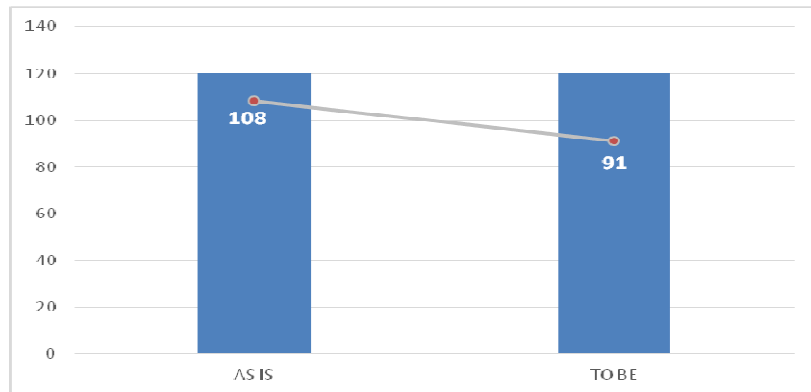


Figure 1. Comparison of AS IS and TO BE models - average time of work on one invoice (minutes)

At the same time, average time of processing (i.e. working time + waiting time) one invoice has dropped by 62%, from 4 days to 1.52 day (Figure 2). It is a consequence of the fact that an electronic invoice is transmitted via the IT system from one work station to another directly after its description and approval in the system. Having ended their work on a document, an employee passes it further to another person automatically, through the system. The electronic process of receiving a structured invoice significantly reduces or entirely eliminates certain business roles, in particular the time spent on waiting and transmitting the document manually, signing, stamping and other activities related to the process of paper invoice reception.

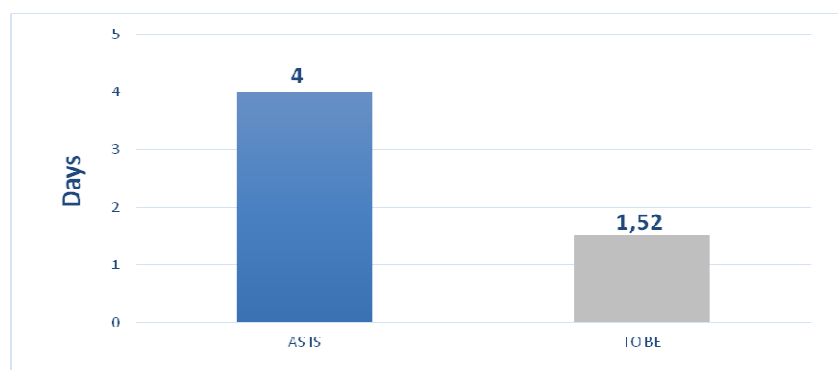


Figure 2. Comparison of AS IS and TO BE models - average time of processing one invoice (days)

The average cost of processing one invoice has dropped by 15% between AS IS and TO BE models. The forecast cost of processing one e-invoice in the postulated TO BE model is estimated at PLN 43.93 (Figure 3), due to which the total monthly cost of processing 375 invoices received by the Department of Procurement and Office Services is PLN 16 476 (Figure 4). In the AS IS model, the monthly cost of processing all invoices was PLN 19 402, which means that it has dropped by 15%. Reduction of the cost of processing one e-invoice and, consequently, the total cost of processing all invoices of WZiOU, is caused by shorter time necessary for an e-invoice to circulate, reduced use of individual process roles and adequate decrease in the cost of the entire process as compared to the AS IS model.

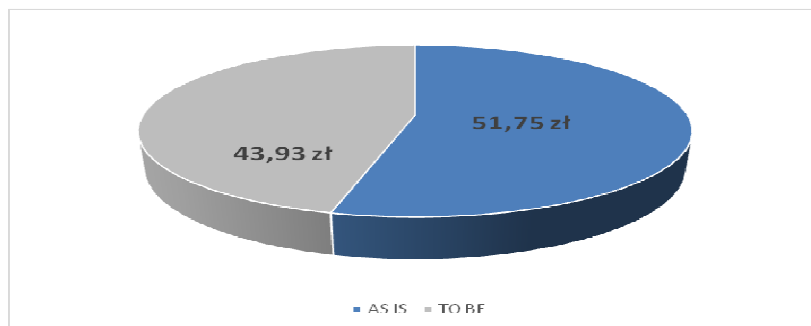


Figure 3. Comparison of AS IS and TO BE models - average cost of processing one invoice (PLN)

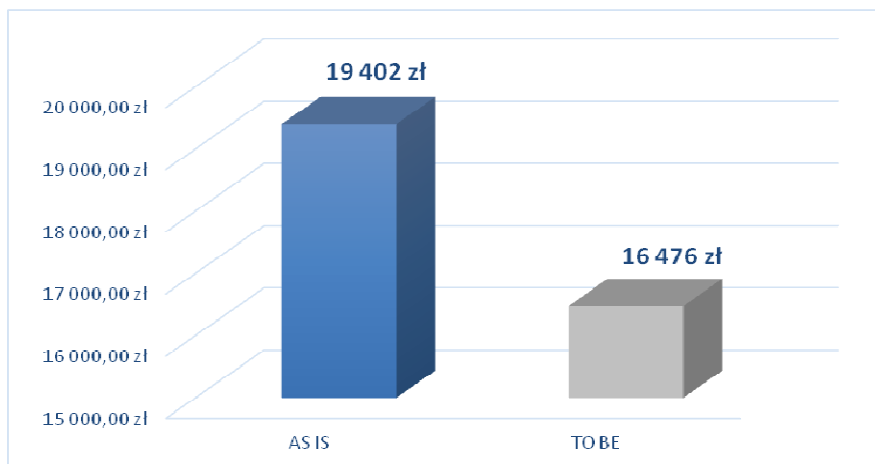


Figure 4. Comparison of AS IS and TO BE models - total monthly cost of processing 375 invoices (PLN)

Figure 5 presents the comparison of average working time spent on one invoice, divided into individual business roles participating in the invoice reception process in AS IS and TO BE models. A significant fact is that the role of the chancellery is eliminated (see Table 1), because, in compliance with the assumptions, a properly identified e-invoice from the supplier's system goes directly to the secretariat of WZiOU, without the participation of the chancellery. Working time of the secretariat, which has assumed certain obligations that had previously been imposed on the chancellery (e.g. invoice reception in the system, verification of its correctness) has therefore grown by 138%, from 2.22 to 5.29 minutes. Due to the involvement of electrification in the process of invoice reception, average working time of an employee handling settlements (WZiOU) and an authorised employee in the Department of Finance (WF) has dropped by approx. 35%. The Head of WZiOU, a budget officer and an employee of the Department of Finance have reduced their time spent on a single invoice by approx. 15%. It should be noted that the Head of WZiOU and employees handling affairs related to the Public Procurement Law and analyses have not reduced their average time spent on processing one invoice, because their duties related to invoice processing result from applicable legal regulations (e.g. substantial description, verification in terms of compliance with the Public Procurement Law) and will not change after the implementation of the postulated structured electronic invoice reception process.

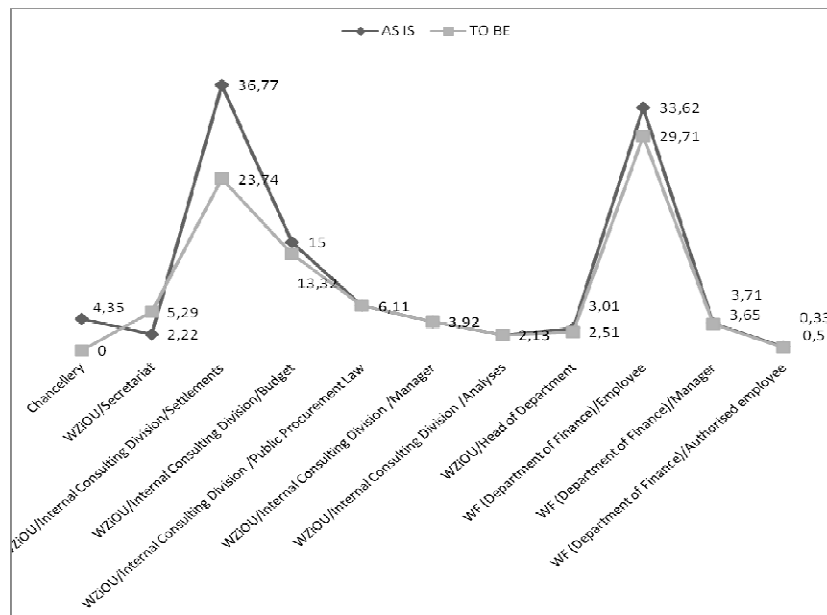


Figure 5. Comparison of AS IS and TO BE models – average time spent on one invoice for individual business roles (minutes)

4. Conclusion

Under provisions of Directive No. 2014/55/EU and the proposed Polish act on electronic invoicing in public procurement, all units of the public procurement sector will have an obligation to receive structured electronic invoices from **26 November 2018** [3]. It means that if a contractor of a public contract sends an electronic invoice to a public procurement sector unit, the public entity (or other entity acting on the basis of the Public Procurement Law or the act on agreements granting license to carry out construction works or services) will be obliged to accept it.

Literature on the subject currently lacks any academic publications or studies describing the effects of implementing future changes in terms of the obligation for units of the public administration sector to receive e-invoices. Thus, relying on empirical studies performed and on the comparative process analysis of the AS IS model (reception of traditional paper invoices) and the TO BE model (reception of structured electronic invoices) at the Poznań City Hall, the author has come to the following conclusions:

1. Implementing the process of receiving structured electronic invoices (TO BE) will reduce working time by 16% and the time of processing a single invoice by 62% as compared to the acceptance of paper invoices (AS IS).
2. Implementing the process of receiving structured electronic invoices (TO BE) will reduce the average cost of processing a single invoice by 15% as compared to the process of receiving paper invoices (AS IS).
3. Implementing the process of accepting structured electronic invoices (TO BE) will reduce the consumption of individual work resources by 16% (AS IS).

Results of the comparative process analysis of AS IS and TO BE models carried out for a selected set of indicators showing duration, cost of processing and resources used in the process of receiving a traditional paper invoice prove that actions aimed at the electronisation of administrative processes will bring measurable benefits and savings in terms of costs, time and work of people involved in the process.

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