E-INVOICING AND E-ORDERING: ANALYSIS AND COMPARISON

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ABSTRACT

One of the most popular trends in today's world is using small chunks of application, which could be sold or rent, on places where complex (expensive and demanding) applications are not worthwhile. Such applications can be used for invoicing, ordering, resource management, bug reporting, and so on. This paper is intended to help in analysis and comparison of some current applications for management of invoices and orders, particularly using e-Invoicing and e-Ordering. Results of this analysis will be used later in making specification and design decisions which will be used for the application.

I. INTRODUCTION

Business deals of each company, whether small or bigger, concern some sort of purchase or selling. Computer applications and Internet make possible such invoices or purchase orders to be realized by automation of those processes. First step in this automation process is using some sort of template (written with help of Some Office tool). Afterwards the process includes management of these documents in a much better and faster way. Today there are a lot of applications that can help with these tasks, and they all have some common things, but they also differ a lot from each other. Of course, it mostly depends on the effort that application's programmers put in it, but it also depends on the type of market it is intended for.

In this paper we analyze solutions realized as web services, using the SAAS idea (**Software As A Service**), the possibility of usage as **Plug In** software module in existing solutions and implementing **interoperability** issues to be recognized, by customers and suppliers and all stakeholders in the process.

In this paper we compare and analyze some of existing applications. Compared Applications are chosen by their popularity on some open source web sites (i.e. sourceforge.net), or by searches made on internet, or simply by asking people what kind of software they use for this purposes. Results from this analysis will be later used to choose which functionalities and design solutions we will use for our application. We also define methodology to compare these solutions by identifying indicators and establishing quantifiable and quality benchmarks. Then we discuss obtained results and comment integration of solutions. Solutions are worldwide, as well as macedonian and the origin will be mentioned for every application.

II. MOTIVATION

In today's world, where fast response to every issue that can arise is crucial, successful sale or order must also be processed promptly and professionally. These two requirements can't be done if the employee at one company can't access their resources to issue invoice or order in timely manner. The fast pace the world is living today requires to be able to access such facilities, to find what one is looking for and to use it for betterment of their business process, almost instantaneously. Major problems regarding issuing invoices can be using the same template for all invoices, which provides some sort of trademark for the company, to find out what prices were billed in the last invoice, to see what is selling best and to whom. Ordering applications should include catalogues of products, customer sheet, past purchases, shipping details, and so on.

All of these needs should also be provided in a distributed manner, to enable associates to issue them online. On the other hand, such distributed manipulation with these documents requires good document management, backup, bookkeeping of invoices and orders. There are a number of ERP solutions that can provide this kind of functionalities, but they are too expensive, and therefore, not so attractive to the majority of small and medium sized companies.

These solutions also require some sort of locally installed database, which also requires purchase of additional hardware and software. Maintaining such solution also requires additional resources, both human and financial, which can additionally burden the company.

What if everything you need for your small company can be found online, if you don't have to worry about management issues, if you can use it from anywhere (with internet access), and of course – not to pay too much for it? One of the best solutions today's technology giving us is renting those kinds of services, or more specifically by using web services.

Another issue is the interoperability. The question is if produce an order, is it going to be recognized by supplier, or is the invoice sent by the supplier recognized by my software. In this paper we also give an overview of standards and proposals for enabling technical interoperability, in addition to enabling the software as a service.

The last functionality of the desired system is the "plug in" capability, which means is this software produced in such a way it can be easily attached to the existing system. The main idea comes from hardware devices that can be attached with "plug and play" functionality to the existing system.

To reach those goals, the first step is to identify the functionalities of desired system, and classify them as essential, optional (nice to have but not necessary), and for future implementation.

III. DESIRED SYSTEM

A. Definitions

Def 1: (E-Invoicing) according to [1]
Electronic invoicing is the process of sending invoices "by electronic means", i.e. transmission or making available to the recipient and storage using electronic equipment for processing (including digital compression) and storage of data, and employing wires, radio transmission, optical technologies or other electromagnetic means.

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Def 2: (VAT compliancy), according to [1]
For electronic invoicing to be VAT-compliant, there are two major conditions laid down in the Directive:
Acceptance by the customer: the customer should be able to decide whether to accept or decline electronic invoicing by his supplier, in case he does not wish to receive electronic invoices.
Authenticity of origin and integrity of content must be guaranteed. This can be achieved by means of:
An advanced electronic signature (AES). Some Member States allow for an advanced electronic signature to be requested based on a qualified certificate and created by means of a secure signature-creation device.
Electronic Data Interchange (EDI). Some Member States have opted to require an additional paper recapitulative statement.
Other means - not all Member States accept electronic means other than electronic signatures or EDI.

■

Def 3: (E-Procurement) according to [2] and [3]
E-procurement (electronic procurement, sometimes also known as supplier exchange) is the business-to-business or business-to-consumer or Business-to-government purchase and sale of supplies, Work and services through the Internet as well as other information and networking systems, such as Electronic Data Interchange and Enterprise Resource Planning.

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Def 4: (E-Ordering) according to [2] and [3]
The eOrdering deals with the electronic transmissions of documents during the eProcurement phase that starts with the issuing of orders by the buyer and ends with the receipt of an order response and the transmission of the delivery instructions of the ordered goods or services from the supplier.
Today the number of demands for reducing costs and optimizing the procurement process are increasing. Thanks to the translation of purchasing process into electronic form, it is possible to achieve your goals very effectively. The introduction of the electronic procurement process can reduce the number of errors and save time when compared with a written order. E-Ordering provides its customers with complete provision of electronic procurement; meaning implementation of selected e-procurement requirements, approval of the requirements, making and sending orders to suppliers automatically, approval of the supply, and payment to the suppliers. [4]

B. Functionality requirements

The desired e-ordering and e-invoicing system should implement following features:
E-invoicing system should provide report and search facilities, which can give prompt look into needed report (chart, quarterly or annual report, etc.) or search criteria (by client, paid or stored, etc.). E-ordering system should provide search by client, shipment status, and payment status.
Level of customization for given application, such as templates, time and date, company details, document details and shipment details. Impression is important for the system, since the amount of features that can be adjusted usually describes the personal identity and appearance the solution can offer to different companies.
Since almost every other country has different tax rates, every e-invoicing application that should be internationally used requires customizability in this field. Giving the fact that there are countries with more than one tax rate, the ability to implement more than one tax rate on an invoice is also a "must-have".
E-invoicing or e-ordering application should be able to give different sorts of view for issued invoices (or orders), as well as their status. Invoice/order status should include whether the invoice in question is late, paid, stored, etc. Views on invoices or orders give good insight into their overall state, for example, the number or value of orders and invoices for a given client, their payment status, trends in their purchases, and so on.
Keeping and delivering of invoices and orders is another requirement which must be implemented for dependable use of these applications, therefore, they are referred as dependability. The invoices must be preserved for future reference and legal matters. Invoices should be delivered in a form acceptable for the client.
One of the key requirements of a good system which includes working with documents are the backup facilities. Database must be backed up regularly, and the system should provide easy-to-use tools for performing backup or restore of the database, all of which contributes to the availability of the software.
Ordering application should provide item details, which helps when making orders. Those details can vary from using nothing more than text description, to different photographs or graphics for a given product or even datasheets for items to be purchased. Additional information for products can be given in a form of e-Catalogue, which can be used not only as a help for the ordering application, but also as a powerful marketing tool.
Application should provide document flow, which can give to the user help in what is expected from him next. There should be some waypoint to indicate the progress of document creation.

IV. PRESENT SOLUTIONS

We have analyzed a lot of web resources, then the sourceforge library, other internet places, and expert interviews and analysis. The overview of existing applications is listed in alphabetic order, and they are not listed from best to worst order, or from most popular to least popular. What is most important is that they are working, people are using them, and they can deliver most of the functionalities they promise. We analyze web based solutions which was the important constraint for this analysis towards establishing features and characteristics that are to be applied to the project. The implementations of invoicing and ordering are very hard to find as one web-based solution, some are mostly concerning ordering, and some invoicing. Invoicing applications are mostly "paper-replacements" (do not offer e-signature), and ordering are mostly e-catalogs or web shops. The software we include in this analysis includes world wide applications, but there are few domestic solutions, which have performances and functionalities comparable to the former.

A. Elektronsko Fakturiranje

Elektronsko fakturiranje is an online application [5]. It supports invoicing, but not ordering. It is customized from Bambooinvoice by Macedonian company Bitsia. BambooInvoice is built using PHP 5 and needs a database (MySQL and MySQLi 4.1+). In order to generate invoices in form of PDFs, DOM extension is needed. It works an all today's browsers. Main characteristics are:

Invoice generating (as PDF)
- e-mailing invoices
- user access delegation
- automated generation of date and time
- invoice notes and pays

B. EOrdering Software

EOrdering Software is Desktop application which is used for creation of web shops[6]. EOrdering software is designed by US company LAJ Design. It supports most of the browsers, and requires some additional plug-ins to view all objects. It can be used for preparing e-ordering catalogues and web shops. Some of the features are:

- Shopping cart
- eCommerce web site with backend processing.
- Create Active Server pages (ASP) to process the orders and email with the order to vendor
- PHP for processing the orders and email with the order to vendor
- Using PayPal for order processing
- Uses VeriSign for real time order processing

C. invoicesontherun

Invoicesontherun is an online application, designed by US company with the same name[7]. Only invoicing is supported. It can generate pdf files which user can download or print, or send via e-mail. It offers free of charge service (which is limited), but to use all features it supports, you need to pay a fee. All browsers are supported. Main features:

- invoice generation (PDFs)
- e-mailing invoices
- invoice notes and pays
- invoice preview

D. oXFakturiranje

oXFakturiranje is a Desktop application created by Macedonian company Objectx, which works offline[8]. It requires MSSQL Server and .Net Framework installed on the computer. oXFakturiranje supports invoicing only. Items which are listed on the invoice can be chosen from the database, or can be entered for one-use only into the invoice. It is built modular, and the base packet consists of preparing and printing invoices, and invoices overview. Additional plug-ins include fiscal bills, retail cashbox, invoice reporting, and payment records. Records are kept in MSSQL Database, which can be shared between points of sale.

E. Pakom Company Shop

Pakom Company Shop is a web application, where company's partners can view price lists tailored to their status, find out about dealer actions, and make online orders[9].. Partners can also view their account and the history of their purchases in a given period of time. Partner authentication is done through PKI, where partner first must sign an agreement and obtain client certificate. Partner then logs on to the web shop using the certificate installed on their computer. There is also contact feature, where clients can talk to the sellers who are online, and get help with their order. This Web Shop is created by Serbian Kimtec

F. peppol

The objective of the PEPPOL (Pan-European Public eProcurement On-Line) project is to set up a pan-European pilot solution that, conjointly with existing national solutions, facilitates EU-wide interoperable public eProcurement. The vision of the PEPPOL project is that any company and in particular SMEs in the EU can communicate electronically with any European governmental institution for the entire procurement process. The final outcome of PEPPOL should be an interoperational environment build upon national systems and infrastructures supporting the full cycle of eProcurement activities. [10]

The pilot project will facilitate the electronic cross border exchange of orders, invoices, and catalogues. It also includes the reuse of company information required for bidding. The mutual recognition of electronic signatures will also be addressed.

G. phpay

Phpay is an Online ordering application, designed by german Kansok [11]. Phpay is built using Apache as web server, php

and MySQL. It works both as web shop or a web catalog. It works under GPL license, and is available for download. Listed below are some of its features:

search engine
different views of item lists are available
possible to add HTML-Code in database to insert images to navigation or create different detail-views
user-handling, md5(passwords)
multi-language: english, german, dansk, french, dutch, polish, spain, czech and italian
supports different currencies

H. wosbee

Wosbee is an online ordering application[12]. Wosbee, created by Finnish company Smilehouse, supports online ordering, but not invoicing. It is built upon Workspace Small Business software[13]. It is available for download, and requires Tomcat, Java and MySQL as prerequisites, or it can be used through some web sites for building customized web shop. Some of the features are:

Web shop administration
product organization
search, view, modify orders
visual customization

V. COMPARISON METHODOLOGY (DEFINING INDICATORS)

The objective of this analysis is e-invoicing and e-ordering, and both of them are rarely found as a buddle software at one place (except for the peppol, which is a special case). In this paper we will classify comparison in two parts, one of which are functionalities that should be common for both types of modules; and one for specific type of software (ordering or invoicing) which will include problem-specific indicators (features). Indicators will be grouped in three major categories:

technical requirements
functionality requirements
usability requirements

A. Technical requirements

Technical requirements (also described as non-functional requirements) for this kind of software, in general, are mostly described by type of software, its requirements (both hardware and software), data protection they are using and their capabilities to adapt to most popular software suites used today. These requirements are given as follows:

1 Type of software – is that software desktop or web application; does it provide desktop application as thick client to an web oriented software. 0 = not realized as web application, 1 = web application with authentication and authorization, form submission and checking status, 2 = includes full transactions and delivery, 3 = includes possibility for accounting, reporting and user management, 4 = realized as a web service, 5 = realized as a web service with initiation of customized features and add ons,

2 Installation – 0 = requires full installation as special application, 1 = special application with upload feature, 2 = thin client installation, 3 = web browser, need additional application installation, 4 = thick client, 5 = requires no installation, just web browser

3 Customization – 0 = no customization is possible, 1 = rudimentary customization, 2 = customization templates, 3 = upload of graphics and schemes, 4 = options can be set in details, 5 = open code.

4 Integration – 0 = no integration possible, 1 = integration through export/import data, 2 = integration using database connectors, 3 = application suite, 4 = application using web service, 5 = plug in web service

5 Browser support – applies only to web applications; what types of browsers are supported, are there any special requirements (plug-ins, browser versions, etc.). 0 = no browser support possible, 1 = desktop application with upload capability, 2 = works with specified browsers, 3 = does not work with older browsers, 4 = plug ins required, 5 = works with all browsers

6 Interface to ERP products - Is it a standalone application or a part of bigger software, can it provide interface to ERP products? 0 = no data interchange possible, 1 = requires manual adaptation, 2 = has custom made ERP, 3 = plug in convertor required, 4 = need technical assistance for integration with specified web services, 5 = easy integration with specified web services

7 Interface to CRM – is the software compatible with any CRM software, and if yes, which ones? 0 = no data interchange possible, 1 = requires manual adaptation, 2 = has custom made CRM, 3 = plug in convertor required, 4 = need technical assistance for integration with specified web services, 5 = easy integration with specified web services

8 Backup facility – 0 = no backup possible, 1 = can be saved as document locally, 2 = database backup facility, used locally, 3 = backup provided by server, 4 = backup made by server, can be downloaded locally 5 = easy-to-use customized backup facility.

B. Functional requirements

Under functional requirements we understand features implemented in the software, which are roughly divided into functionalities regarding users, document handling, and application flexibility. We specified these eight functional requirements:

1 User administration – are there more than one user to use the application simultaneously? Is user administration defined somehow? 0 = no user data interchange possible, 1 = special importer application required, 2 = semi-automatic import through type-specific document, 3 = plug in importer required, 4 = requires technical help in integration with LDAP, 5 = easy integration with LDAP web services.

2 Export capability – Most of companies have custom made applications used for working with purchase and sale. Application should have facility which enables it to export the invoice or purchase order in needed form. 0 = no export capability, 1 = mail only, 2 = limited export types, 3 = support

most common types (doc, pdf, xls), 4 = requires additional plug-ins, 5 = fully customizable export.
3 Search facility – 0 = no search facility, 1 = basic search facility, 2 = search by one or more field, 3 = search with advanced choice criteria, 4 = search with customizable fields, 5 = full search facility.
4 Report facility – 0 = no report facility, 1 = basic report facility, 2 = report by one or more field, 3 = report with advanced choice criteria, 4 = report with customizable fields, 5 = report facility with graphics.
5 Tax – 0 = no tax included, 1 = fixed tax, 2 = choice from predefined tax rates, 3 = predefined tax rates, more than one per invoice, 4 = customizable tax rate, 5 = fully customizable tax rates, can include more than one per invoice.
6 Status and View – 0 = no status and view facility, 1 = basic status/view facility, 2 = status and view by one or more field, 3 = status and view with advanced choice criteria, 4 = status and view with customizable fields, 5 = full status and view facility with graphics.
7 Document types and delivery options – 0 = can only be printed, 1 = application specific type, 2 = e-mail, can only be printed, 3 = common document type (doc, pdf, xls…), 4 = implemented delivery mechanism, 5 = fully support using custom made add ons.
8 Item details – 0 = no item details, 1 – only item code, 2 = short description, 3 = description and graphic, 4 = item detailed specification, 5 = full specification, datasheets, links to product page.

C. *Usability requirements*

Software is often judged by the appeal it has to the users. These requirements may be the crucial difference that can decide between two solutions with equal quality. Users should feel comfortable in everyday use of the software; they should be able to have where to go and who to ask if they find themselves in odd position. Additional features that can help them to do their work more easily and which can tell them what to do next are also important. So we stated next few requirements as most important for this category:
1 Personalization 0 = no personalization possible, 1 = limited personalization, 2 = common application elements can be personalized, 3 = user can personalize the application according to his preferences, 4 = fully customizable application, including skins, adding or removing fields, 5 = user can personalize application behavior and trigger other actions
2 Support – 0 = no help and technical documentation, 1 = frequently asked questions, 2 = only help or technical support, 3 = video presentation, forums, 4 full support of help and technical documentation with video and other sophisticated tools, 5 = live support.
3 Ease of use – most of the users are accustomed to using web browsers and web forms, but not so much to new applications with unique user interface. 0 = new application with unique interface, 1 = application with familiar interface, 2 = application with help and hints, 3 = web-form-like interface,4 = web form with customizable fields, 5 = WYSIWYG interface,
4 Language support – how many languages are supported? Is macedonian one of them? 0 = no language support possible, 1 = more than one language, 2= limited language support implemented, 3 = multilingual support implemented – according to EU, 4 = implemented support in macedonian, 5 = full language support implemented.
5 E catalogue – 0 = no catalogue, 1 = item classification by type, 2 = downloadable catalogue, 3 = online catalogue, 4 = catalogue connected with order, 5 = fully customizable configurator.
6 Established workflow – 0 = no workflow, 1 = simple menu, 2 = interactive menu, 3 = simple workflow, 4 = step by step guide through document creation, 5 = workflow with proving facility.

D. *Overall achievement*

Although we established over twenty indicators we will be using to evaluate software solutions, not every one of them has the same impact on decision which of them is(are) the best, which features must be implemented, or what can be regarded as an optional feature. With regards to our interest in SAAS (Software As A Service), possibility of usage as Plug In software module in existing solutions and implementing interoperability issues, and the question of data security; those indicators that address this topics will be awarded with factor 2. We will refer to them also as the "essence" of the solution. With factor 1.5 will be evaluated most of the functional features, as well as usability feature such as workflow, and they will be the "quality" of the software. With weight factor 1 will be evaluated most of the usability features and customization options, also referred as the "appeal". These factors together with corresponding indicators are given in the next table:

Table 1: Classification for indicators, according to the type of requirement and weight category.

	appeal	quality	essence
Technical		3, 5	1, 2, 4, 6, 7, 8
Functionality	5, 8	1, 3, 4, 6	2, 7
Usability	1, 2, 3, 4, 5	6	

We will give comparison separately for each solution using their average scores per group, to determine which software performs best for given indicator group. Software that scores "0" in at least one indicator will not be considered when evaluating given group. The formulas are:

$$\text{Technical}_{\text{average}} = \frac{1}{n} \times \sum_{i=1}^{n} technical_i \quad (1)$$

$$\text{Functionality}_{\text{average}} = \frac{1}{n} \times \sum_{i=1}^{n} functionality_i \quad (2)$$

$$\text{Usability}_{\text{average}} = \frac{1}{n} \times \sum_{i=1}^{n} usability_i \quad (3)$$

Then we will use our weight factors to see which application aims for high interoperability and SAAS goals, which offers most features (thereby pursuing for heavyweight application

style), and which goes for appeal to please wide user population. First we will give scores by each category (fields with N/A will be regarded as 0):

$$appeal_{score} = F.5+F.8+U.1+U.2+U.3+U.4+U.5 \quad (4)$$

$$quality_{score} = T.3+T.5+F.1+F.3+F.4+ F.6+U.6 \quad (5)$$

$$essence_{score} = T.1+T.2+T.4+T.6+T.7+T.8+F.2+F.7 \quad (6)$$

At the end we will give overall view on all evaluation put together, with applied weight factors:

$$overall_{score} = appeal_{score} + 1.5 \times quality_{score} + 2 \times essence_{score} \quad (7)$$

VI. Software Comparison

Regarding the number of software solution and comparison indicators that will be included, the best way to compare software and try to find common ground and differences will be by putting them in one table. Indicators will be given by their category and item number and put into rows, while columns will represent different applications. What we want to accomplish by this approach is to find out what is "must have" for invoicing (ordering) software, and what can be regarded as an additional feature. In choosing contextual indicators for invoicing and ordering software, we used some of the guidelines and resources found at internet [14] and [15].

To be able to provide meaningful interpretation of our results, we will give view on the Categories of indicators, regardless of their weight factor:

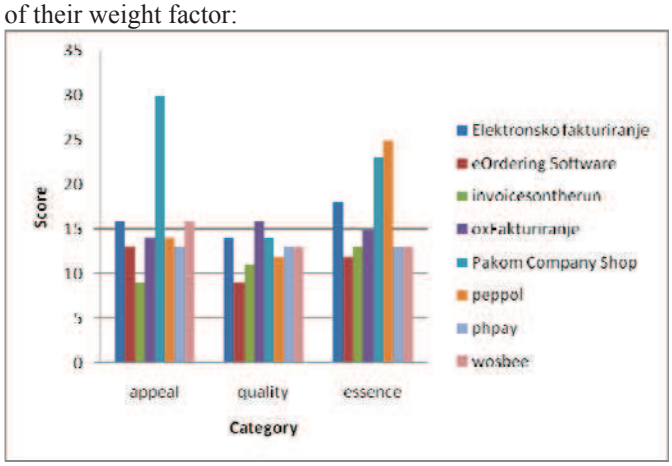

Figure1: Column charts with scores achieved by software solutions for each category (without weight factors).

What we can conclude from the table and Fig.1 is that the application with best appeal is Pakom Company Shop (PCS), and that all other applications are far behind it in this field. On quality, scores are fairly equal, with oxFakturiranje achieving the best score, which is quite normal, since it is desktop application, part of a much bigger application suite for small businesses. In the essence category, best score is achieved by peppol, closely followed by PCS, which was also expected, since they are both web applications, supported by bigger organizations, and intended to be modular in nature.

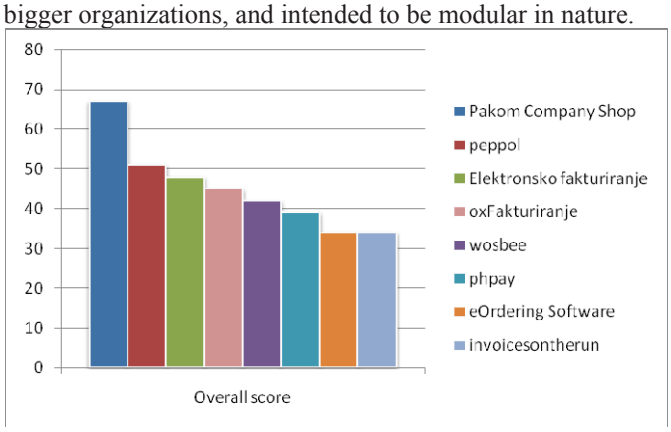

Figure 2: Overall score achieved by the software (without weight factors).

When we compare overall scores (Fig.2), we see that best score is achieved by PCS, followed by peppol and Elektronsko fakturiranje (EF). This is also quite expected, since only PCS and peppol provide both e-invoicing and e-ordering services. It is also pleasing to see good result made by EF, one of the macedonian products in this analysis.

To be able to see the impact of our modified evaluation, we apply our formula for measuring overall achievement and we get following scores, for each of the Requirements:

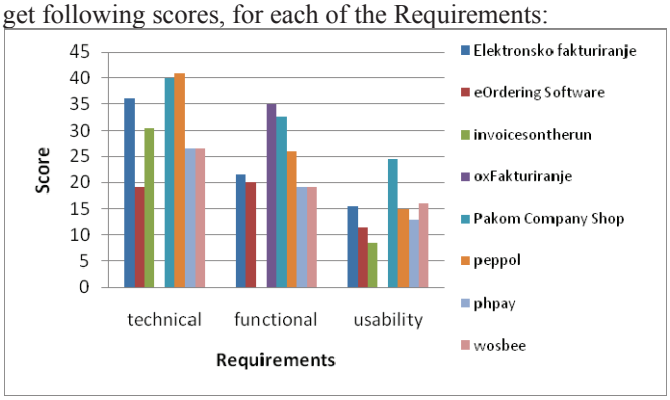

Figure 3: Column charts showing score achieved by software solutions, for each requirement.

In the following picture we show overall scores with applied weight factors, achieved by each of the software:

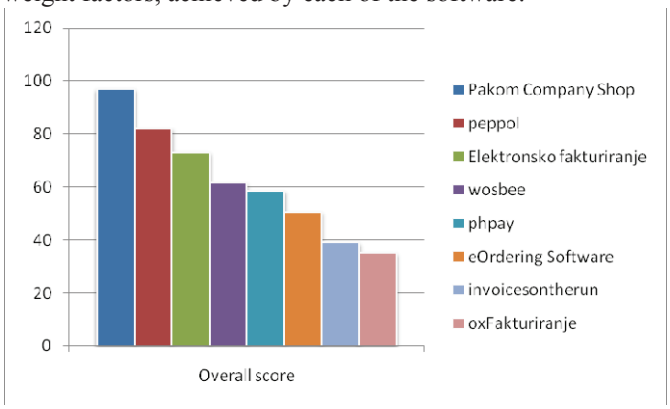

Figure 4: Overall score for the software, sorted from best to worst.

Again, not surprisingly, best score is achieved by PCS, followed by peppol and EF. But, when we compare Fig.2 and Fig.4 we notice that oxFakturiranje has fallen to the end of the score scale, which was expected, since we find more value in web applications, than in desktop applications. Also, with the appliance of our weight formula, relative difference between top web solutions is not so great as it was before.

VII. CONCLUSION

Most of today's software that deal with invoicing and ordering are concentrated on only one aspect of the problem, and there are software solutions dealing with invoicing or ordering only. Two of the solutions stand out in this analysis: Pakom Company Shop and peppol, and they cover both problems. We find this result useful, since they both implement some of the features we value the most, but we also see that there is still much place for improvement. When we take closer look on features provided by Pakom Company Shop, we can see that it's advantages are the great number of functionalities it provides, and also the great "usability" factor, which make it appealing and easy to use, and also the security provided with PKI implementation. It's disadvantages are that it doesn't support the idea of SAAS, and it lacks interface to be implemented with ERP or CRM solutions.

Peppol, on the other side, has this topics covered, but what it lacks is bigger number of functionalities, which doesn't surprise, since it is still in development stage. But it's great flexibility, interoperability, and the fact it is being designed to become part of much greater system, gives us enough ground to give him this score.

What has became clear during this analysis is that we should use advantages of both these solutions, and build upon it to achieve our goals: to design and develop solution that will be compliant to the SAAS idea, to develop the solution so it can be used as Plug In module for different kinds of software, and to implement interoperability to enable it for wide use.

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