

ON IMPLEMENTATION PLATFORM FOR GENDER-ORIENTED ECONOMETRICAL CALCULATIONS

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Abstract

The article discusses selection of the implementation platform to develop Web application for econometrical analysis of the gender imbalance in the labour market on micro-economic level. Six principles of software selection are formulated and substantiated. Using these principles, three systems from 126 were selected in several iterations. The winner is XWiki that additionally provides more comfortable features to program algorithms of econometrical calculations.

Key words: *gender, gender imbalance analysis, econometrical methods, Web application for gender audit, software implementation platform.*

JEL Classification: *C6, C8, J7, M4, M5*

Introduction

This work is a part of development of a Web platform to analyze the gender imbalance on the micro-economic level in the labor market.

With this aim, we'd apply econometrical methods for the gender audit of an institution or its subdivision. This research is performed in the framework of STCU project #6336.¹

To create a Web platform, that is, a set of Web pages and applications satisfying the targets of the project, it is necessary to select a suitable *implementation platform*.

In our case, the implementation platform should support at least Web page design, and implementation of algorithms for econometrical calculations. These are minimal requirements; details are described below.

1. Research methodology

First of all, we formulated the principles we expect for the implementation platform, and substantiated them using the available sources.

Then we took the list of available platforms and applied the formulated and substantiated principles exterminating the systems that don't satisfy them.

A small number of remaining systems was analyzed more thoroughly that permitted to select the winner.

2. Determination of basic principles at the selection of the implementation platform

We estimated existing implementation platforms regarding their suitability to the specific tasks at quantitative estimation of gender imbalance on the micro-economic level of the labor market.

Implementation platform is an existing execution environment where a newly implemented software fragment or object module should be executed taking into account the restrictions imposed by and the features accessible into this environment.

¹ This paper was elaborated in the framework of the scientific project for the years 2018-2020, entered in the State Register of Science and Innovation Projects with the code 18.80013.0807.06.STCU / 6336 "Innovative approaches to applied computations and software development for gender equality regulation on labor market" („Abordări inovatoare privind dezvoltarea calculului aplicativ și software-ului pentru reglementarea egalității de gen pe piața forței de muncă,„), within the framework of the STCU-ASM Joint Research-Development Initiatives Program, the call from 10.04.2017.

First of all, the following six principles to develop a gender audit automated platform were formulated.

- Principle 1. This should be a universal Web platform
- Principle 2. Do not develop from scratch - a ready framework
- Principle 3. On this platform it is possible to implement the knowledge base
- Principle 4. The platform must allow the extension of its functionality
- Principle 5. Free, open source, but with a not very restrictive license
- Principle 6. Work with many databases, at least, MySQL, Oracle, and PostgreSQL

The substantiation of these principles follows.

2.1. Preliminary search

The direct search for tools and platforms for gender analyze automation gave no results but we found some documents on an adjacent direction, the audit automation.

In these documents [1-3] several advantages of audit automation are mentioned. In particular, authors mention: improved accuracy; mobility; integration with environment; more frequent continuous improvement; flexible and modular approach that can be adapted and expanded as the environment changes; more detailed audit plan; better quality of evidence; strengthening the assurance function.

2.2. Principle 1: This should be a universal Web platform

Advantages of Web platforms are widely discussed, and many sources can be found. Conform the selected documents [4-12], the main advantages of Web platforms are:

- Accessibility by anybody, anywhere in the world, at any time, with immediate access to latest information.
- Accessibility for a range of devices; even low spec PCs or smart phones can be used.
- Storage increase (with clouds).
- Improved interoperability.
- Easier installation and maintenance.

- Increased security, client secure login.
- User tracking.
- A better user experience.
- Online training can be completed at user’s own time and pace.
- Cost effective development and quick development cycles.
- Web development is standards based and has a huge community.
- The application is easily customizable and scalable.
- Platform independence.
- Reduce business costs.

2.3. Principle 2: Do not develop from scratch, use a ready framework

The advantage of a ready development framework is availability of many pre-implemented functions and features. Developers should not repeat the work that was already performed and tested because time and money are always restricted.

For example, the following pre-implemented Web platform functions are mentioned in [13]:

- Database support;
- Web templates (dynamic HTML code);
- User management (registration, logins, sessions, access rights);
- Payment management;
- URL Mapping.

2.4. Principle 3: On this platform it is possible to implement the knowledge base

Knowledge base (KB) is, generally speaking, a database with added rules and tools of inference. This facilitates the decision making process.

Document [14] provides a detailed introduction in KB. Ready-made KB software solutions exist, for example, Confluence [15].

Important benefits of KB are:

- Quick access to full information on any problem. This permits don’t put customers on hold, and don’t transfer them between agents;
- Lower training expenses. KBs are easier to use;

- Better organization of your data;
- Standardization of answers;
- Better feedback, etc.

2.5. Principle 4: The platform must allow the expansion of its functionality

Many contemporary development platforms, for example, Eclipse, are modular and expandable. Moreover, this feature is inherent for more wide range of applications. Examples are: Notepad++ (text editor); all modern browsers, etc.

2.6. Principle 5: Free, open source, but with a not very restrictive license

Many Open Source licenses require a license to be reproduced. It is desirable that commercial use was allowed.

The advantages of Open Source Software (OSS) were widely discussed. The most important benefits of OSS are [16-19]:

- OSS are free to use without complex licensing, and cheaper in use as the result;
- OSS are highly reliable because they are created by skillful and talented people;
- OSS are following of standards;
- They provide more flexibility;
- They are continually evolving in real time;
- You are not locked into using a particular vendor's system that only works with their other systems;
- You can modify and adapt open source software for your own requirements.

2.7. Principle 6: Work with many databases, at least, MySQL, Oracle, and PostgreSQL

This is possible with JDBC/ODBC driver. This will imply database independence.

3. Application of the substantiated principles

Conforming principle 1 (P1), CMS (Content Management Systems) and Wiki systems were selected as being Web implementation platforms. Conforming P5, only free open source systems were taken for the subsequent analysis.

The corresponding lists from Wikipedia contain 107 CMS and 29 Wikis. Somewhere Wikis are treated as subset of CMS, and 10 systems are included in both lists. In total, 126 systems are enlisted.

We integrated two approaches to the selection of our implementation platform.

At the first approach, we checked features of each of 126 systems against our principles and other considerations, deleting unsuitable systems. This was performed in several iterations.

In the corresponding table (Tab. 1), these CMS and Wikis are listed alphabetically. First of all we deleted systems that seem to be abandoned by developers. With such systems, there is no possibility to get any help or consultation. We fixed the date of December 31, 2014, and got rid of systems that did not issued versions after this date, and systems with unknown date of the latest release. 22 CMS and Wikis that were exterminated with this criteria are marked with -0 in Tab 1. 104 systems remained after this iteration.

Table 1. 126 Web development platforms (CMS and Wikis)

No.	Excl.	System	No.	Excl.	System	No.	Excl.	System
1	-6	Alchemy CMS	43	-6	Grav	85	-6	Phire CMS
2		Alfresco Community Edition	44	-0	Habari	86	-0	PHP-Nuke
3	-6	Ametys CMS	45		Hippo CMS	87	-0	phpWebLog
4		Apache Roller	46	-6	Ikiwiki	88	-0	PhpWiki
5	-6	ATutor	47	-6	ImpressCMS	89	-6	Pimcore
6	-6	b2evolution	48	-6	ImpressPages	90	-6	PivotX
7	-6	BetterCMS	49	-6	Jahia Community Distribution	91	-0	Pixie (CMS)

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No.	Excl.	System	No.	Excl.	System	No.	Excl.	System
8	-0	blosxom	50	-6	Jamroom	92		Plone
9	-6	BlueSpice MediaWiki	51	-6	Joomla!	93	-6	PmWiki
10	-0	Bricolage	52		Kajona	94	-6	Prestashop
11	-6	C1 CMS	53	-6	Kentico CMS	95	-6	ProcessWire
12	-0	Cliki	54	-6	Known	96	-0	Radiant
13	-6	CMS Made Simple	55	-6	Lively Wiki	97	-6	Refinery CMS
14	-6	CMSimple	56	-6	LocalWiki	98	-6	Sellerdeck eCommerce
15	-6	Coderity	57		LogicalDOC Community Edition	99	-6	Semantic MediaWiki
16	-6	Composr CMS	58	-6	Magento	100	-6	Serendipity
17	-6	concrete5	59		Magnolia	101		SilverStripe
18	-6	Contao	60	-0	Mambo	102	-0	SMW+
19	-6	ContentBox Modular CMS	61	-6	MediaWiki	103	-0	SPINE
20	-6	Crafter CMS	62		Mezzanine	104	-6	SPIP
21		django CMS	63	-0	MiaCMS	105	-0	Swiki
22	-6	DNN	64	-6	Microweber	106	-6	Textpattern
23	-6	DokuWiki	65	-0	Midgard CMS	107	-6	TiddlyWiki
24	-6	Dotclear	66	-6	MindTouch	108	-6	Tiki Wiki CMS Groupware
25		dotCMS	67	-6	MODX	109	-6	Trac
26		Drupal	68	-6	MoinMoin	110	-6	TWiki
27	-6	DSpace	69	-6	mojoPortal	111	-6	Typo
28	-6	Enonic XP	70	-6	Movable Type Open Source	112		TYPO3
29	-6	EPrints	71	-6	Mura CMS	113	-6	Umbraco
30	-6	Exponent CMS	72	-0	Novius OS	114	-6	UseModWiki
31	-6	eZ Platform	73	-0	Nucleus CMS	115	-6	UserPress

No.	Excl.	System	No.	Excl.	System	No.	Excl.	System
32	-0	eZ Publish	74		Nuxeo EP	116		Wagtail
33		FarCry CMS	75	-6	OctoberCMS	117	-6	WebGUI
34		Fedora Commons	76	-6	Omeka	118	-6	Wiki.js
35	-0	FlexWiki	77	-6	OpenACS	119	-0	WikiWikiWeb
36	-6	Foswiki	78	-6	OpenCart	120	-6	WordPress
37	-6	Geeklog	79		OpenCms	121	-0	Xaraya
38	-6	GetSimple CMS	80		OpenKM	122	-6	XOOPS
39	-6	Ghost	81		OpenWGA	123		XWiki
40	-6	Git-Wiki	82	-6	Orchard Project	124	-6	ZimWagn
41	-6	Gitit	83	-0	papaya CMS	125	-6	Zoho Wiki
42	-6	Gollum	84	-6	pH7CMS	126	-6	Zwiki

Source: elaborated by the authors

Then we applied principle 6 (P6). While most CMS may use different DBs, Wikis are more peculiar: some of them restrict us with a single DB (MySQL, MS SQL Server, etc.), some use simple files, some keep their data through back-ends like Git. From all listed Wikis, only XWiki can work over all three DBs mentioned in P6. We found 20 CMS that satisfy P6; in total we had 21 systems for further checking. 83 systems that does not conform P6 are marked -6 in the table.

Then we switched to the second approach and took into account popularity, complimentary reviews, importance of users, etc., and then checked several most used systems with our principles. Lists of mostly used ten CMS and ten Wikis follow as Tab. 2 and Tab. 3.

Table 2. The top website platforms and popular CMS²

No.	Excluded by principle	System	Market share, %	Active sites, total	Number of websites in the most visited million
1	-6	WordPress	59.9 %	26,701,222	239,139
2	-6	Joomla!	6.6 %	2,009,717	13,480

² <https://websitesetup.org/popular-cms/>

3		Drupal	4.6 %	964,820	23,330
4	-6	Magento	2.4 %	372,915	12,095
5	-1	Blogger	1.9 %	758,571	15,079
6	-1, -5	Shopify	1.8 %	605,506	11,587
7	-5	Bitrix	1.5 %	200,210	3,925
8		TYPO3	1.5 %	582,629	3,568
9	-5	Squarespace	1.5 %	1,390,307	9,799
10	-1, -6	PrestaShop	1.3 %	262,342	2,099

Source: BuiltWith.com, W3tech.com, SimilarTech, Google Trends.
 December 19, 2017.

Conforming P1, we excluded non-universal platforms. Blogger (rank 5) is a Google application dedicated exclusively blog support. Other specialized systems in the list are Shopify and PrestaShop (rank 6 and 10) oriented to e-commerce.

Shopify and Squarespace are paid systems with two weeks free trial, and Bitrix is commercial with very restricted free variant: this violates P5. WordPress, Joomla!, Magento, and PrestaShop (ranks 1, 2, 4, 10) were excluded before as they violate P6.

Table 3. Top Ten Wiki Engines³

Rank	System	Note
1	MediaWiki	Used by the Wikipedia project, which is the most popular wiki (PHP and MySQL).
2	MoinMoin	A Python language wiki engine, features flexibility and modular design.
3	PhpWiki	A very popular Php language Wiki based on UseModWiki, with many features added.
4	XWiki	A sophisticated Wiki platform build with Enterprise technology and also declared as the Next Generation Wiki
5	OddMuseWiki	Really popular descendant of UseModWiki ("one big Perl script").

³ <http://wiki.c2.com/?TopTenWikiEngines>

Rank	System	Note
6	TikiWiki CMS + Groupware	A full-featured, open source, multilingual, all-in-one Wiki+CMS+Groupware written in PHP.
7	PmWiki	A popular Php language Wiki, easy installation, simple design, nice feature list.
8	DokuWiki	Standards compliant, simple Wiki engine written in PHP, accepted into Debian and Fedora linux distro's.
9	Foswiki	The free open source fork from TWiki, a powerful Perl language structured wiki with numerous plugins, aimed at large corporate Intranets.
10	MojoMojo	The modern Perl language wiki, powered by the Catalyst Framework and the DBIC ORM. Hierarchical structure, AJAX live previews, 3-way merge edit conflict resolution, attachment gallery etc.

Source: elaborated by the authors

We fixed XWiki as a single candidate from Wikis that conforms P6. This table supported this selection as XWiki is the 4th most used Wiki system.

Then we took systems that remained at both approaches, and restrict our final selection by them. There were three systems: Drupal, TYPO3, XWiki. All three are declared as Enterprise-Level systems.

As to remaining P2, P3, and P4, P2 is satisfied by all three systems. P3 is connected with P4 as knowledge base is obviously a rare addition that should be developed. All three systems are extendable (P4), but extension of XWiki is the simplest one.

XWiki permits to include Python code directly into Web page providing rich API. Being the CMS, Drupal and TYPO3 provide many ready-made web applications with excellent design that we won't use, while programming of calculations in them is more difficult.

All extensions for Drupal and Typo3 should be written in PHP and are subject of the specific arrangement and packing. TYPO3 even provides Extension Builder to facilitate the process. XWiki also can use specifically

arranged and packed extensions, but the used languages are Java and Python.

The final selection of our implementation platform was XWiki. We found three systems that seems equal in their features, and two small but important advantages became the deciding factor:

1. simplicity of extension (direct coding permitted);
2. richer and more powerful programming languages (Python and Java vs. PHP).

4. Characteristics of XWiki

XWiki is a Java open source software development platform based on the Wiki principles, under a LGPL license. It can be installed on almost any computer including under Windows and Linux. In addition to being a full-featured Wiki, it is also a second generation Wiki allowing collaborative web applications to be written easily and quickly. On top of this platform several products are developed, targeted mainly on aiding enterprise-level needs.

XWiki has a friendly community of developers and users. The community is made of individual users as well as companies around the world which are using XWiki for Intranets and Communities.

Development for XWiki is performed at many levels: server-side platform programming in Java with J2EE technologies, server-side application development in Velocity, Python, CSS and HTML, RIA development in GWT, and client-side development in JavaScript.

Proposed projects vary from server-side J2EE programming, rich application development on the client-side, GUI and usability improvements, integration with open protocols like Open Social or XMPP, and many others.

Other XWiki advantages are:

- Easy installation wherever there is Java
- Wiki syntax support and powerful WYSIWG editor
- Export to multiple formats
- Support of various DBMS for data storage
- Internationalization and support for multiple languages
- User authorization
- Possibility to use Python as the programming language, etc.

Conclusion

Finally, we selected XWiki as our implementation platform. Using formulated and substantiated principles we found three systems that seems equal in their features (Drupal, TYPO3, XWiki). The winner was defined by simplicity of extension, and accessibility of more powerful programming languages.

References

- [1]. Emily Ysaguirre. The Benefits of Automating Audit Processes. Ensure transparency and improvements in real time. June 15, 2015. <https://www.qualitydigest.com/inside/quality-insider-article/061515-benefits-automating-audit-processes.html>
- [2]. Vasarhelyi M.A., Warren J.D., Teeter R.A., Titera W.R. Embracing the automated audit: How the Audit Data Standards and audit tools can enhance auditor judgment and assurance. *Journal of Accountancy*, 1 April 2014. <https://www.journalofaccountancy.com/issues/2014/apr/automated-audits-20127039.html>
- [3]. B.Musthaler. The only way to survive the audit process is with automation. *Network World*, May 2, 2011. <https://www.networkworld.com/article/2202732/infrastructure-management/the-only-way-to-survive-the-audit-process-is-with-automation.html>
- [4]. <https://www.magicwebsolutions.co.uk/blog/the-benefits-of-web-based-applications.htm>
- [5]. Red Rock Software Pty Ltd (Australia). 10 Benefits of Web Based Applications and Systems. 2015-09-30. <https://redrocksoftware.com.au/10-benefits-of-web-based-applications-systems/>
- [6]. Taras Baca. Benefits of Web Based Applications. April 6, 2013. <http://www.flapps.com/benefits-of-web-based-applications/>
- [7]. Key Benefits of Web Applications for Business. 6th August 2018. <https://evergreencomputing.com/blog/5-key-benefits-of-web-applications-for-business/>
- [8]. Tom Desousa. Benefits of Web Based Applications. https://www.streetdirectory.com/travel_guide/136495/world_wide_web/benefits_of_web_based_applications.html

- [9]. <https://www.quora.com/What-are-the-advantages-and-disadvantages-of-web-based-application-development-vs-desktop-application-development>
- [10]. Lara Fox. Advantages And Disadvantages - Web Apps. Jun 22, 2018. <https://www.objectiveit.com/blog/the-advantages-and-disadvantages-of-web-apps>
- [11]. Paul Stanley. Advantages of Web Applications. <https://www.pssuk.com/AdvantagesWebApplications.aspx>
- [12]. Web-based vs Installed software – Pros and Cons. <https://www.excellerate.com/products/check-in-system/checkin-features/web-based-vs-installed-software-pros-and-cons/>
- [13]. <https://www.quora.com/What-is-a-web-framework-1>
- [14]. <https://www.atlassian.com/it-unplugged/knowledge-management/what-is-a-knowledge-base>
- [15]. <https://www.atlassian.com/software/confluence/knowledge-base>
- [16]. Crystal R. Lombardo. 7 Main Advantages and Disadvantages of Open Source Software. <https://connectusfund.org/7-main-advantages-and-disadvantages-of-open-source-software>
- [17]. Rachel Bridge. Open source software: Advantages & disadvantages. Jun 25, 2018. <https://entrepreneurhandbook.co.uk/open-source-software/>
- [18]. Crystal Lombardo. 8 Advantages and Disadvantages of Open Source Software. November 12, 2016. <http://visionlaunch.com/8-advantages-disadvantages-open-source-software/>
- [19]. What Are the Advantages And Disadvantages Of Open Source. <http://www.ictinnovations.com/what-are-the-advantages-and-disadvantages-of-open-source>