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Pilot Research on the Minimum Required Knowledge of Web Programming, Development Tools and Programming Languages

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Abstract*— In this scientific research, we will pilot investigate which programming tools and languages are most often used to create web applications. The results of this survey that are collected from respondents (experienced web developers) will be related to the following: programming tools, languages, and which modern technologies are most important for professional and scientific web developers. This research will provide the first information on whether respondents know that WAMP stands for Windows, Apache, MySQL, and PHP, then whether respondents know that AMPPS is packaged with MongoDB, Perl, Python, and RockMongo to meet broader technology needs and preferences, and which solutions web developers prefer. Through the research, some will get information about web technologies which are the most used or preferred according to respondents in the CMS systems created, which modern development environments for creating web applications are preferred by web developers, and did the respondents know that React.js is the most used JavaScript library today, with which made many big apps like Facebook, Instagram, Netflix, and Dropbox. The main research methodologies used here are the method of scientific and professional text analysis, the survey method, the chi-square test, and the comparative method. This research will be used for the next, larger, and similar research.

Index Terms*—Development programming tools and programming languages, web developers, web programming knowledge.

I. INTRODUCTION

This research paper presents the results of a survey (with Google Forms tool [1]) on the following questions: (1) Which programming tools, according to respondents (experienced web developers), should be mastered by every web developer(?), (2) Do respondents know that WAMP is an acronym for Windows, Apache, MySQL and PHP(?), (3) Whether respondents know that AMPPS is packaged with MongoDB, Perl, Python, and RockMongo (which is a MongoDB administration tool, written in PHP 5) to meet broader technology needs and preferences(?), (4) Which solutions web developers prefer(?), (5) What technologies are most commonly used by of respondents with developed CMS systems(?), (6) Which modern development environments for creating web applications are preferred by web developers(?), (7) Did the respondents know that React.js is the most used JavaScript library with which many large applications like Facebook, Instagram, Netflix and Dropbox(?). In addition to the described survey research part, the paper also applied a scientific method of content analysis, based on which certain definitions of WEB services on web servers were defined. Through the research, some will get information about which web technologies, according to the respondents, are most often used or preferred in the created CMS systems, which modern development environments for creating web applications are preferred by web developers, etc. The main research methodologies used here are the method of scientific and professional text analysis, the survey method, the chi-square test, and the comparative method. This research will serve for the next, larger, and similar research.

II. WEB SERVER SYSTEMS AND LANGUAGES FOR CREATING WEB APPLICATIONS - IN BRIEF

A. Comparison of WAMP and LAMP Tools and PHP and Python Environment

A comparison of WAMP and LAMP tools in Table 1 describes all software used for designing the Search Page Generated (SPG) system by PHP over different OSs [2].

Table 1. Comparison of WAMP and LAMP tools

Windows OS	Linux-Ubuntu 20.04 OS
Development Server-WAMP (i.e. XAMP) X: cross platform A: Apache M: MySQL P: PHP	Development Server-LAMP L: Linux A: Apache M: MySQL P: PHP
Backend: database MySQL	Backend: database MySQL
Frontend: HTML, CSS and JavaScript	Frontend: HTML, CSS and JavaScript
Scripting language: PHP	Scripting language: PHP
Application: Sublime text3	Application: Sublime text3

Source: Table 1 on page 135 from [2].

For the operation of a standard web server, it is necessary to have the following services as a priority: Apache, MySQL (that is, MariaDB) and PHP. These three make it possible for websites to run and for the user to do something in them. The web server system that is interesting is certainly XAMPP, which contains an installation (of XAMPP) for the Linux operating system and contains the following tools in the

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package: (1) Apache 2.2.14, (2) MySQL 5.1.41, (3) PHP 5.3.1, (4) PhpMyAdmin 3.2.4, (5) Perl 5.10.1, and (6) FileZilla FTP Server 0.9.33 [3].

Table 1 shows a comparison of tools in the WAMP and LAMP groups. In 2021, the authors H.J. Mohammed and K.H.A Faraj concluded in their research [2] that "… The basic Python capacity is larger but executes faster. The PHP capacity is more lightweight than Python, but timely execution is faster than Python. This means that parallel programming in Python is better than parallel programming in PHP. From the results that were evaluated Python Ubuntu is much better than PHP Ubuntu. Also, Python Windows is much better than PHP Windows. In all evaluations, Python is run or executed at a much faster rate compared to PHP. Parallel computing is constant for both cases; the only factor is parallelizing of programming or multitasking of Python is higher than PHP."

B. TIOBE Index

An interesting study related to the popularity of programming languages was presented by the TIOBE organization. C++ is TIOBE's programming language in 2022. C++ won the title because it gained the most popularity (+4.62%) in 2022. The second places are C language (+3.82%) and Python (+2.78%). Interestingly, C++ surpassed Java to become number 3 on the TIOBE index in November 2022. C++'s popularity is due to its excellent performance while being a high-level object-oriented language. Because of this, it is possible to develop fast and comprehensive software systems in C++. Another reason for the rise of C++ is its recent and constant release of new language standards with interesting features. The published part of the C++ language in 2011 was the first significant change since 1998. Adoption of the new standard took several years because there were no C++ compilers that supported the new language definition. Because of C++11, C++ has been slowly climbing the TIOBE index after being in steady decline since 2001. Another point is the recent publication of C++20, which for example introduced modules. It is likely to push C++ further up the TIOBE index for the next few years. Whatever else happened in 2022, performance seems to matter. C++ competitor Rust has re-entered the top 20, but this time it looks like it's for real. Lua, which is known for its simple interface with C, jumped from position 30 to 24. F# is another language that made an interesting shift: from position 74 to position 33 within one year. Promising languages like Kotlin (up from 29 to 25), Julia (up from 28 to 29) and Dart (up from 37 to 38) still have a long way to go before making the top 20. Note that "The TIOBE Programming Community index is an indicator of the popularity of programming languages. The index is updated once a month. The ratings are based on the number of skilled engineers worldwide, courses and third-party vendors. Popular search engines such as Google, Bing, Yahoo!, Wikipedia, Amazon, YouTube, and Baidu are used to calculate the ratings. It is important to note that the TIOBE index is not about the best programming language or the language in which most lines of code have been written." [4].

III. SURVEY RESEARCH ON THE USAGE OF WEB PROGRAMMING TOOLS

This pilot study was done with an online survey tool (with Google Forms tool [1]) on an Internet server. The sample is intentional and purposeful to obtain relevant information and ultimately valid results. The sample consisted of more experienced web developers. The sample consisted of 48 respondents, and the research was conducted over ten days (from January 8, 2023, to January 17, 2023). This research was done online, and it was easier to get to the respondents.

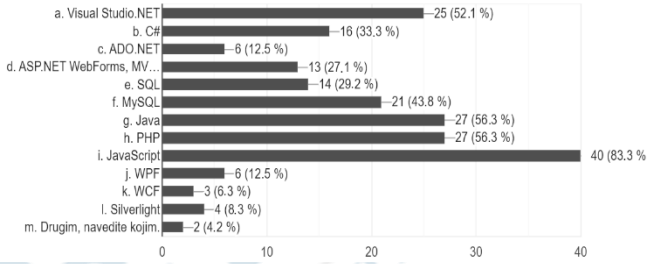

Figure 1. Presentation of the research results collected based on the first question.
Source: Authors, based on the Google Forms tool [1].

Figure 1 shows the results of the research collected based on 48 answers to the online survey of the first question of the survey: "Which of the listed tools, programming languages and technologies are the most important for a web developer and which tools a web developer should necessarily master". Based on the respondents and research results, the most important scripting language that a web developer should master is JavaScript (83.3%), followed by the programming language Java (56.3%) PHP (56.3%) and Visual Studio.NET (52.1 %).

Figure 2. Presentation of research results collected based on an online survey and another question: "Did you know that the abbreviation WAMP is an acronym for Windows, Apache, MySQL, PHP?"

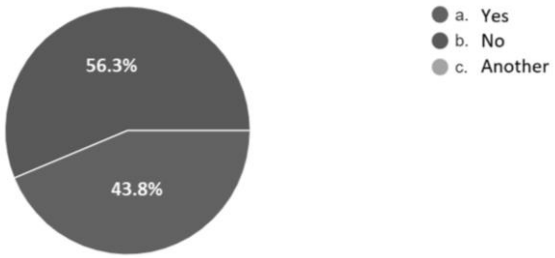

Figure 2.
Source: Authors, based on the Google Forms tool [1].

Figure 2 shows the results of research collected based on 48 answers from an online survey. Most respondents know that WAMP is an acronym for Windows, Apache, MySQL, and PHP (56.3%), while 43.8% do not know that WAMP is an acronym for Windows, Apache, MySQL, and PHP.

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Figure 3. Display of survey results based on the question: "Did you know that AMPPS is packaged with MongoDB, Perl, Python, and RockMongo to meet broader technology needs and preferences".

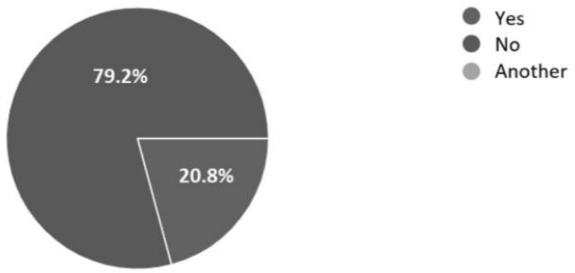

Figure 3.
Source: Authors, based on the Google Forms tool [1].

Figure 3 shows the results of research collected based on 48 answers from an online survey. Most respondents (79.2%) know that AMPPS is packaged with MongoDB, Perl, Python, and RockMongo programming languages to meet broader technology needs and preferences, while 20.8% of respondents were unaware of this fact. No one chose the third option.

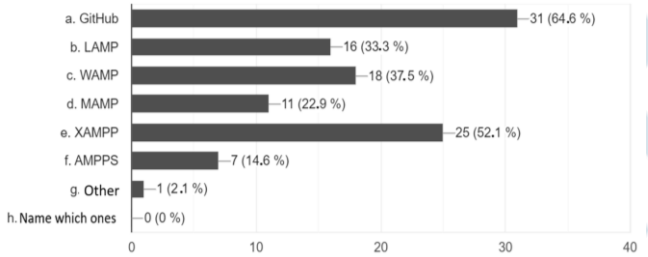

Figure 4. Display of solutions preferred by web developers.
Source: Authors, based on the Google Forms tool [1].

Figure 4 shows the results of research collected based on 48 answers to an online survey on web server system preference. Most web developers (respondents who filled out the questionnaire) prefer the web server system GitHub (64.6%), then they prefer the XAMPP system (52.1%) and after it (in third place) they prefer the WAMP system (37.5%). The smallest number (7), i.e., the percentage of respondents (14.6%) prefers the AMPPS system.

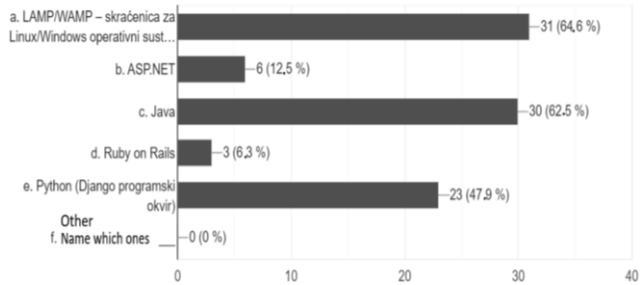

Figure 5. Presentation of the most used technologies according to the opinion of respondents in the CMS system.
Source: Authors, based on the Google Forms tool [1].

Figure 5 shows the results of research collected based on 48 answers from an online survey. According to 64.6% of respondents, the most used technologies when developing content management systems are: (1) LAMP/WAMP (64.6% of respondents), (2) Java as a programming language and machine-independent platform (62.5%), (3) Python (Django programming framework) (47.9%), (4) ASP.NET (12.5%) and (5) Ruby on Rails (6.3%).

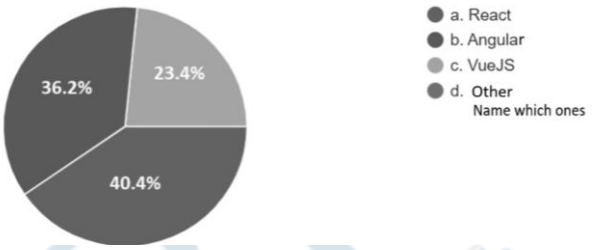

Figure 6. Presentation of web developers' preferences for modern development environments when creating web pages
Source: Authors, based on the Google Forms tool [1].

Figure 6 shows the results of the research collected based on 47 responses to the online survey. Most of the web developers (40.4%) decided on the modern React development environment, i.e., they determined how they prefer the React modern development environment for the development of websites and applications, while 36.2% of the respondents chose the Angular option and finally VueJS was chosen by 23.4% of the respondents. VueJS represents a progressive JavaScript framework used to develop interactive web interfaces. Respondents did not specify other development environments in question 6. React is a JavaScript library for creating user interfaces. React, sometimes called a frontend JavaScript framework, is used to create single-page applications. React allows the creation of reusable interface components. Also, SOAP Version 1.2 is a lightweight protocol intended for exchanging structured information in a decentralized, distributed environment [5].

Figure 7. Presentation of respondents' answers to question seven: "Did you know that React.js is the most used JavaScript library today, which has been used to build many large applications such as Facebook, Instagram, Netflix, and Dropbox?"

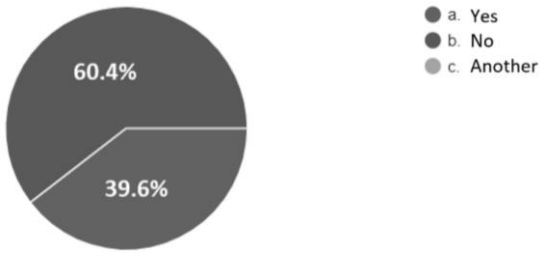

Figure 7.
Source: Authors, based on the Google Forms tool [1].

Figure 7 shows the results of research collected based on 48 answers to an online survey. Most respondents (60.4%) did not know that React.js is the most used JavaScript library

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today, which has been used to build many large applications such as (1) Facebook, (2) Instagram, (3) Netflix and (4) Dropbox.

IV. CHI-SQUARE TEST AND ANALYSIS OF RESULTS

In this chapter, we will look at the analysis of survey results and we will perform a procedure called the chi-square test, which is used in most cases if it is about qualitative data or if the data distribution deviates significantly from normal or theoretical. At the very beginning, it should be emphasized that the chi-square test is calculated with frequencies, and it is not allowed to enter measurement units in the calculation. The basic research data can also be measured values, but only their frequencies are entered into the chi-square.

Table 2 shows the counting of respondents' answers to questions: 2, 3, 6 and 7 within the GoogleDisk spreadsheet. Some of the type functions are applied: „=COUNTIF(G1:G49;"b. Angular")", =COUNTIF(G2:G51;"a. React"), =COUNTIF(G3:G52;"c. VueJS"), =COUNTIF(C1:C49;"b. No"), =COUNTIF(C1:C49;"a. Yes").

Table 2. Presentation of the counting of respondents' answers to questions 2nd, 3rd, 6th and 7th

"Did you know that the abbreviation WAMP is an acronym for Windows, Apache, MySQL, PHP?"	Second question	"Did you know that AMPPS is packaged with MongoDB, Perl, Python, and RockMongo to meet broader technology needs and preferences"	Third question	"Web developers' preferences for modern development environments when creating web pages"	Sixth question	"Did you know that React.js is the most used JavaScript library today, which has been used to build many large applications such as Facebook, Instagram, Netflix, and Dropbox?"	Seventh question
No	27	No	38	Angular	17	No	29
Yes	21	Yes	10	React	19	Yes	19
Other	0	Other	0	VueJS	11	Other	0

Source: Authors.

Table 3. Presentation of the chi-square test for answers to the 2nd question of the online survey

	Yes	No	Other	In total	Divided
f_0	21	27	0	48	24
f_t	24	24	0	48	
	f_0	f_t	f_0-ft	$(f_0-f_t)^2$	Chi-square
	21	24	-3	9	0.375
	27	24	3	9	0.375
				Σ of Chi-square:	0.75

Source: Authors.

Table 3 shows the chi-square test for the answers to the 2nd question of the online survey. The sum of chi-squares is 0.75. Namely, we put forward the null hypothesis: "There is no significant difference between the obtained answers and randomly distributed answers", while the alternative hypothesis is: "There is a significant difference between obtained answers and randomly distributed answers". If the answers were given completely randomly, each of them would have the same probability, so we would expect each answer 48/2=24 times. Therefore, the expected frequency for each answer would be 24. The results are shown in Table 3. Also, in the second part of the table, the data needed in the formula were calculated. The principle of interpretation of the obtained chi-square result: if no differences were found between the observed and expected frequencies, the chi-square expression would be 0, the greater the differences between the observed and expected frequencies, the greater and more definitive the chi-square expression. Therefore, the smaller the chi-square, the more likely it is that the null hypothesis should be accepted, and the larger the chi-square, the more likely it is that the hypothesis should be rejected. The alternative hypothesis is accepted because the observed results are significantly different from those that we would expect under a certain hypothesis. The table of chi-square limit values shows up to which value (with a certain number of degrees of freedom) we consider that the chi-square is still high enough for us to reject the hypothesis, i.e., "What is the minimum value of the chi-square for us to reject the hypothesis?" As a practical rule, the fact that the central value of the chi-square with a certain degree of freedom amounts to approximately as many degrees of freedom as we have can serve. Therefore, we can accept the null hypothesis (without looking at the chi-square table) if the obtained chi-square is less than or equal to the number of degrees of freedom. In our case, the sum of the chi-squares based on table 3 (Σ of chi-square) is 0.75, based on the answer to the 2nd question, which means that the null hypothesis is rejected, and the alternative is accepted: "There is a significant difference between obtained answers and randomly distributed answers".

Table 4. Presentation of the chi-square test for answers to the 3rd question of the online survey

	Yes	No	Other	In total	Divided
f_0	10	38	0	48	24
f_t	24	24	0	48	
	f_0	f_t	f_0-ft	$(f_0-f_t)^2$	Chi-square
	10	24	-14	196	8.16666666666667
	38	24	14	196	8.16666666666667
				Σ of Chi-square:	16.3333333333333

Source: Authors.

Table 4 shows the chi-square test for answers to the 3rd question of the online survey. In this case, the sum of the chi-squares based on table 4 (Σ chi-square) is 16.33, based on the answer to the 3rd question, which means that the null hypothesis is rejected. The alternative hypothesis is accepted in the second case as well: "There is a significant difference between obtained answers and randomly distributed answers".

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Table 5. Presentation of the chi-square test for answers to the 6th question of the online survey

	React	Angular	VueJS	In total	Divided
f_0	19	17	11	47	15.6666666666667
f_t	15.6666666666667	15.6666666666667	15.6666666666667	47	
	f_0	f_t	f_0-ft	$(f_0-f_t)^2$	Chi-square
	19	15.6666666666667	3.33333333333333	11.1111111111111	0.709219858156029
	17	15.6666666666667	1.33333333333333	1.77777777777778	0.113475177304965
	11	15.6666666666667	-4.66666666666667	21.7777777777778	1.39007092198582
				Σ of Chi-square:	2.21276595744681

Source: Authors.

Table 5 shows the chi-square test for answers to the 6th question of the online survey. In this case, the sum of the chi-squares based on Table 5 (Σ chi-square) is 2.21, based on the answer to the 6th question, which means that the null hypothesis is rejected. The alternative hypothesis is accepted in the third case as well: "There is a significant difference between obtained answers and randomly distributed answers".

Table 6. Presentation of the chi-square test for answers to the 7th question of the online survey

	Yes	No	Other	In total	Divided
f_0	19	29	0	48	24
f_t	24	24	0	48	
	f_0	f_t	f_0-ft	$(f_0-f_t)^2$	Chi-square
	19	24	-5	25	1.04166666666667
	29	24	5	25	1.04166666666667
				Σ of Chi-square:	2.08333333333333

Source: Authors.

Table 6 shows the chi-square test for answers to the 7th question of the online survey. In this case, the sum of the chi-squares based on Table 6 (Σ chi-square) is 2.08, based on the answer to the 7th question, which means that the null hypothesis is rejected. The alternative hypothesis is accepted in the fourth case as well: "There is a significant difference between obtained answers and randomly distributed answers".

V. CONCLUSION

The main research methodologies used here are the method of scientific and professional text analysis, the survey method, the chi-square test, and the comparative method. The pilot research presented here lists some definitions of (local/other) web servers and presents the concrete results of the survey research. The research concluded that the most important scripting language that every web developer should master is JavaScript, then the programming languages Java and PHP, and Visual Studio.NET, then that most respondents know that the abbreviation WAMP is an acronym for Windows, Apache, MySQL, and PHP. The survey concluded that most respondents know that AMPPS is packaged with MongoDB, Perl, Python and RockMongo programming languages to meet broader technology needs and preferences. It should be noted that when it comes to web server systems, most web developers (respondents who filled out the questionnaire) prefer the GitHub web server system, then they prefer the XAMPP system, and after it (in third place) they prefer the WAMP system. The smallest number, i.e., the percentage of respondents, prefers the AMPPS system.

Through research, we have come to the result that according to 64.6% of respondents, the most used technologies are: (1st) LAMP/WAMP (64.6% of respondents), (2nd) Java as a programming language and machine-independent platform (62.5%), (3rd) Python (Django programming framework) (47.9%), (4th) ASP.NET (12.5%) and (5th) Ruby on Rails (6.3%). Most web developers opted for the React modern development environment, i.e., they determined how they prefer the React modern development environment for the development of websites and applications, while 36.2% of respondents chose the option Angular and VueJS, the same was chosen by 23.4% of the respondents. In the end, we came to the information that most of the respondents did not know that React.js is the most used JavaScript library today, which has been used to create many large applications such as Facebook, Instagram, Netflix, and Dropbox.

In addition to the presentation of our pilot research, with the help of the chi-square test, in the paper, we looked at the reflection of the TIOBE organization and other original scientific articles.

It should be noted that in this pilot study, the null hypothesis ("There is no significant difference between the received responses and randomly distributed responses") was rejected. In contrast, the alternative hypothesis ("There is a significant difference between the received responses and randomly distributed responses") was accepted, based on the Chi-Squared test, in all four cases. Also, this research serves for the next, much larger, and similar research developing very soon which will use Artificial Intelligence Tools with similar concepts and structure as this pilot research (in coordination with some other pilot research done before).

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