TRENDS IN THE DEVELOPMENT OF ARCHITECTURE SOLUTIONS FOR WEB PUBLISHING SYSTEMS

Head Assist. Prof. Plamen Hristov Milev, PhD[1]

Abstract: This article deals with issues related to uploading contents on the Internet. Within this context, the specific attributes of information systems for web publishing and solutions for their architecture are reviewed. The paper analyses some conceptual problems related to those systems in terms of the opportunities provided to users to create, publish, share or comment on the content on the world wide web. It also presents the typical architecture of web publishing systems. Based on the conducted research, the paper presents findings and hypotheses about trends in the development of architecture solutions for web publishing systems. The focus of the paper is on the growing significance of social networks nowadays, and especially of social networks with interactive content. The conclusion summarizes the advantages of applying existing trends in the development of architecture solutions for web publishing systems to the design of software solutions in the sphere.

Key words: software architecture; information system; web publishing; Internet content.

JEL: D83, L86, O33.

Introduction

Nowadays, the majority of the world's population uses the Internet. The number of existing websites is 1.24 billion (Internet World Stats, 2019).

---
[1] Department of Information Technologies and Communications, University of National and World Economy, Sofia

According to reliable data sources, fifty-five per cent of all people are part of the global network (Country Meters, 2019). At the same time, they mainly use the Internet to create content. In most cases, those are blog posts; opinions posted in Internet forums; posts in social media; comments on content that has been posted earlier; posts on sites for online discussions, etc.

Many contemporary web sites provide such services. Technological advancements in terms of web technologies also enable users to create content on the global network. The aim of this article, therefore, is to accomplish the following tasks:

- Clarify some theoretical aspects of web publishing systems;
- Review some conceptual issues related to web publishing systems;
- Identify trends in the development of architecture solutions for web publishing systems.

The accomplishment of these tasks will help identify opportunities for designing information systems whose architecture shares the advantages provided by contemporary trends in creating web content. The object of this research are web publishing systems, while the subject of the research is the development of architecture solutions for those systems. The aim of our research is to identify trends in the development of architecture solutions for web publishing systems in terms of the opportunities for designing software solutions in the sphere by studying some conceptual aspects of those systems.

1. Some Theoretical Aspects of Web Publishing Systems

A system can broadly be defined as a set of components in a specific area where each element interacts with the other items in the system through one or multiple connections. Some of the elements may be indirectly related to each other (i.e. the connection between them could be ensured by a third, intermediary component of the system). Within this context, web publishing systems are systems whose elements are published materials and the links between them could exist at several levels (in several dimensions), namely:

• All publications in a system are interrelated through the source (i.e. the web site) where they have been published since a single source contains a lot of publications;

• Each source belongs to a specific group of sources (blogs, forums, social media, etc.) and thus all publications are interrelated through that group.

In a narrow sense, web publishing systems are software solutions that enable their users to upload data online. Published content may include texts, pictures, videos, links to other publications, etc. Therefore, in terms of technology, web publishing systems are information systems (applications) where users generate (create) content. Hence, such software solutions may also be defined as systems for creating content on the Internet.

In this research, the term architecture solutions is used as an equivalent to the term system architecture. In a broader sense, system architecture may be defined as the logical organization of a software solution in terms of its constituents or components (business logics, data and interface) and the manner in which they interact. Hence, the classic architecture of web publishing systems is a three-tier one and consists of a web client, a web server and data base (Fig. 1). Web architecture has a number of advantages to desktop architecture. Many of these advantages have been pointed out by different authors, the focus of attention being on the possibility to access the updated content of web systems at any time (Kirilov, R.,2016).
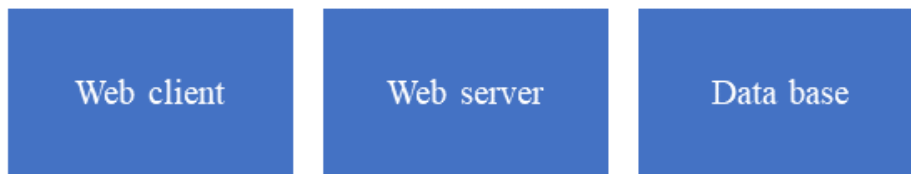

Fig. 1. The three-tier architecture of web publishing systems

This concept is part of the Web 2.0 concept that focuses on the idea of user-generated content on the Internet. This also refers to the users of public web systems. According to extensive research conducted by some

authors in the area, the employment of web systems and the automation of their performance is a major requirement to providing good quality public services (Kirilova, K., 2017; Kirilova, K., 2018). At the same time, the opportunities for developing web systems for business purposes have also been subject to analysis in the research conducted by different authors (Shishmanov, K., 2013). A web system could therefore not be attributed to a specific sector, as it needs to be constantly improved.

Architecture solutions are constantly evolving and so are architecture solutions for web publishing systems. The objective of their development is to find solutions to existing problems. Therefore, in order to identify some trends in the development of architecture solutions, we need to analyse some conceptual issues related to web publishing systems first.

2. Conceptual Issues Related to Web Publishing Systems

With reference to the objectives of this research, the term web publishing systems is used to refer to any web-based information system where users can create (publish) content. Those are all systems based on the Web 2.0 concept. In general, users can generate content on those systems as:

- New posts;
- Comments to existing posts.

The opportunity given to users to create internet content has radically changed the nature of the global network. Internet users can nowadays generate, post, share and comment on any content they are interested in. In most cases, users do so on social networks. Due to the immense volume of data that is published on those systems, they are now known as social media. Such web publishing systems are often associated with the concept of big data. Different concepts about big data and the digital transformation required to process big data have been the subject of research conducted by a number of authors (Yordanova, S., Stefanova, K., 2019; Belev, I., 2018). As a matter of fact, many internet users stay informed about current events and news by using such platforms. Seventy-nine per cent of the internet

population are social media users (Internet World Stats, 2019). The ratio is illustrated in Fig. 2.
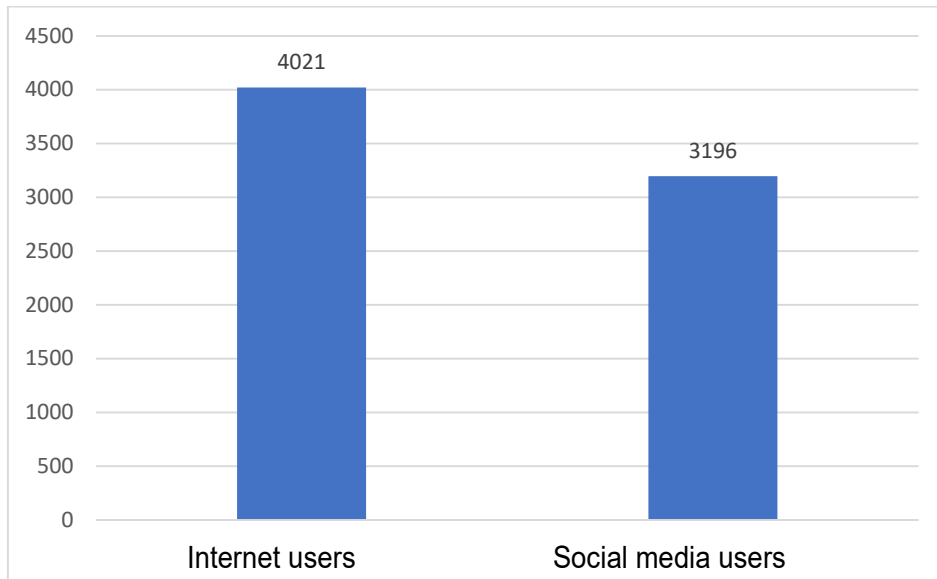

*Fig. 2 The ratio between Internet users and social media users
(millions of people)*

These findings have been confirmed from data provided by other authors. According to them, nearly 84% of the Internet users have accounts on social networks (Varbanov, R., 2015). People use web-publishing systems and social networks, in particular, to obtain information about events, companies, people, etc. Therefore, one of the conceptual issues related to those systems is that of the reliability of the information available there. It is no secret that some of the news on the Internet is misleading and is published deliberately to shift the focus of public attention from a real event. Since misinformation is a burning issue, the possibility to assess the quality of published content is of crucial importance. A large number of research works deal with the quality of data and information on information systems. Some authors approach that quality from a technological or a

business perspective. In terms of technology, data quality refers to the storage and security of information, whereas the business approach to data quality is concerned with information integrity and comprehensiveness (Kisimov, V., 2008). Other authors interpret information usefulness as a function of information quality (Traykov, B., 2013). The definition of information quality that is employed in this paper relates to the availability of the information, which a user needs, and the accuracy of that information within the specific context the user is interested in.

Another conceptual issue relates to the availability of different versions of the same content on an Internet information system. Many of the web publishing systems allow their users to change the content of their posts, thus creating different versions of one and the same post. In result, making a reference to the content on such web publishing systems could be a problem.

Another conceptual issue is that of the addictiveness of some technological solutions (applications) for creating content on the Internet. As digital technologies are a dynamic business, it would be appropriate to use the term 'life cycle of technological solutions'. In each business, novelties generate profit. Sooner or later, a new web publishing system is designed which replaces (partially or totally) earlier versions of web publishing systems. In contrast to technologies, technological solutions (software solutions based on those technologies) have a relatively short useful life. There are numerous examples of systems that had been at the vanguard in their sector but were replaced by new solutions before long. This trend has its benefits since technological solutions may become harmful at a certain point, especially when users get addicted to them. Internet addiction is dangerous as it takes a lot of time, which users could spend on a variety of alternative activities.

Another conceptual issue related to web publishing systems is the phenomenon known as information noise. The volume of information (i.e. posts) on the Internet is constantly increasing and so is information noise alongside useful information. Hence, one of the major challenges which web publishing systems are facing is how to reduce that noise. It would be logical to predict that at some point in the future web publishing systems will be storing so much information generated by users that the manner in which

those systems operate will have to be redesigned so that they could continue to exist and be used.

The findings of the research of the conceptual issues related to web publishing systems could be summarized as follows:

- Most Internet users use social media networks;

- A criterion for assessing the quality of the information available on such systems is the opportunity they provide to users to find the information they need, as well as the accuracy and relevance of that information within the specific context the user is interested in;

- When making references to a post on web publishing systems, users need to establish whether the system supports the option to view different versions of a post that may have been published at different points of time, so that they could refer to a specific version of the post;

- Due to the large volume of information noise in web publishing systems, it is necessary to use algorithms for assessing the content of posts and comparing it to the content of posts in other information systems.

Systems for creating Internet content are designed by employing technological advancements and architecture solutions. Therefore, bearing in mind the conceptual issues that have been outlined, we need to review current trends in the development of those systems in order to identify opportunities for designing related software solutions.

3. Trends in the Development of Architecture Solutions for Web Publishing Systems

For the purposes of our research, we will make the following hypotheses about existing trends in the development of architecture solutions for web publishing systems:

- Web publishing systems are mainly accessed via mobile devices;

- Users access web publishing systems chiefly to post and search interactive content, and above all – pictures;

- Web publishing systems are primarily designed in server-side PHP and client-side JavaScript;

 • Web publishing systems mainly use the Apache server and MySQL database management system.

 The data employed in this research has been provided by reliable sources that study Internet usage and the technological aspects of designing web-based information systems. Figure 3 illustrates the ratio between all Internet users and those who use mobile devices to access the world wide web (Statista, 2019).[2]
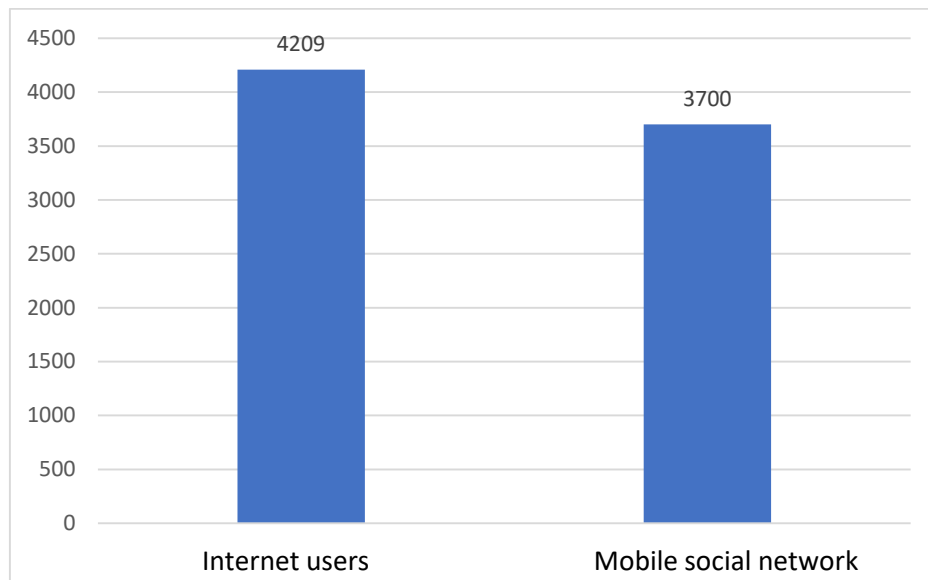

Fig. 3 The ratio between all Internet users and mobile social network users (millions of people)

 As the figure above shows, nearly 90% of all Internet users access the world wide web via mobile devices. This supports the hypothesis that web publishing systems are mainly accessed via mobile devices.

 Figure 4 presents the share of different social networking websites that are most visited by Internet users (Internet World Stats,2019).

---

[2] Statista, 2019, 09.03.2019, https://www.statista.com/
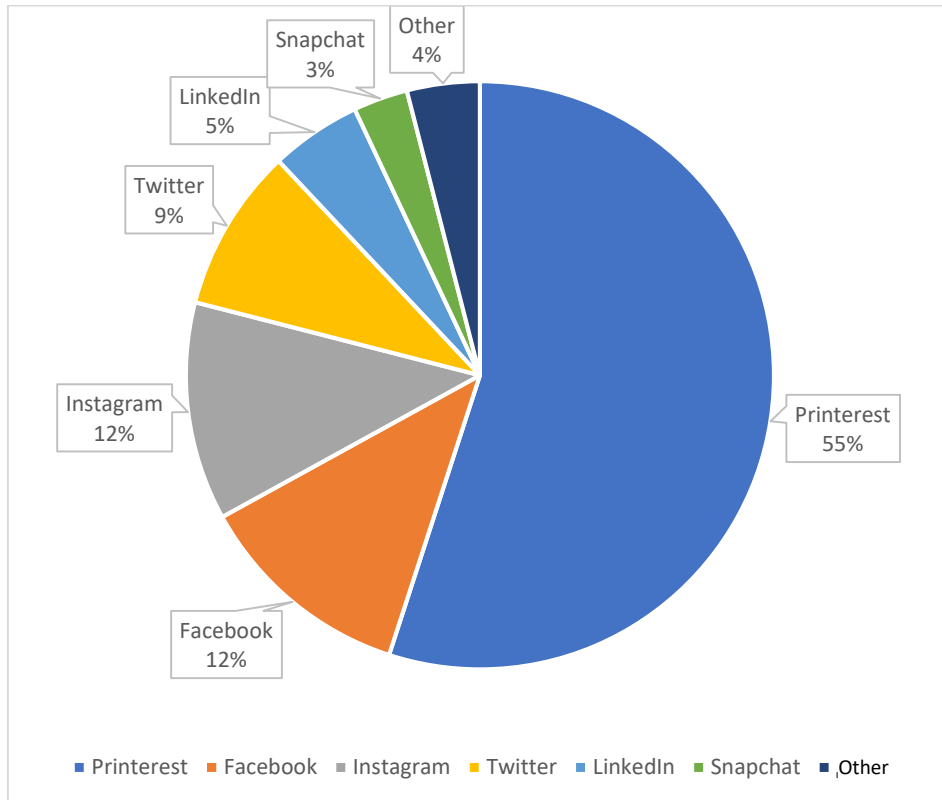
Fig. 4 The share of the most visited social networking websites by Internet users (as a percentage)

As the pie chart indicates, the share of social networks with interactive content (mainly photographs) is 70%. This confirms the hypothesis that users of web publishing systems are chiefly interested in posting and searching interactive content, and especially photographs.

Figure 5 shows the relative share of the most popular server-side programming languages for creating web content (Web Technology Surveys, W3 Tech, 2019).
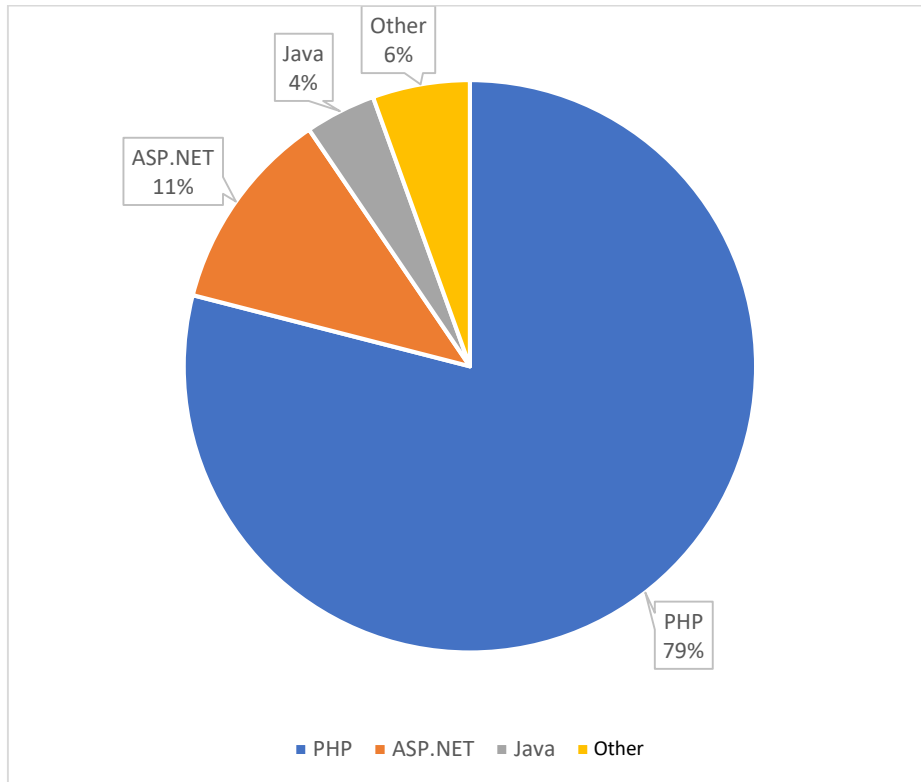
Fig. 5 The relative share of different server-side programming languages for creating web content (as a percentage)

As Figure 5 shows, nearly 80% of all contemporary web systems use the PHP server-side programming language. ASP.NET is used to develop nearly 10% of the web-based systems, and Java is used by only 4% of them. This confirms the hypothesis that web publishing systems are primarily developed with the server-side PHP technology.

Figure 6 presents the relative share of different client-side programming languages that are used to create web content (Web Technology Surveys, W3 Tech, 2019).
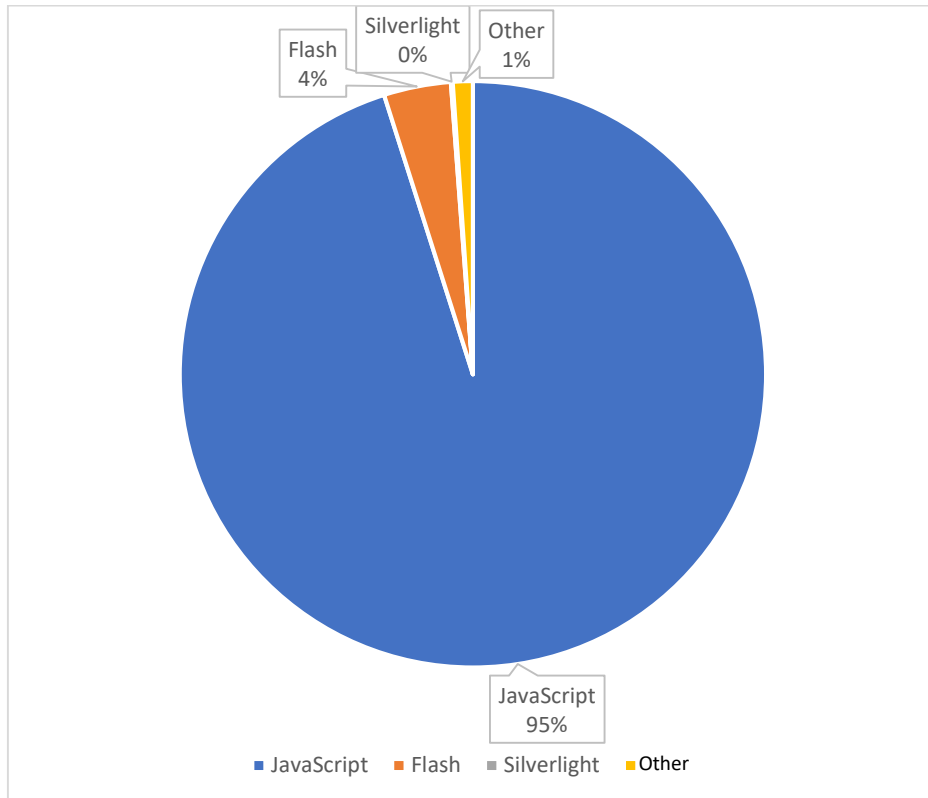
Fig. 6 The relative share of different client-side programming languages for creating web content (as a percentage)

As Figure 6 indicates, JavaScript is the client-side programming language that is used by nearly all modern web systems. Flash is used by only 4% of the web-based systems, while the share of the Silverlight technology is 0.1%. This confirms our hypothesis that JavaScript is the client-side programming language that is most used by systems for creating content on Internet.

Figure 7 illustrates the percentages of different web servers that are used to access web content (Web Technology Surveys, W3 Tech, 2019).
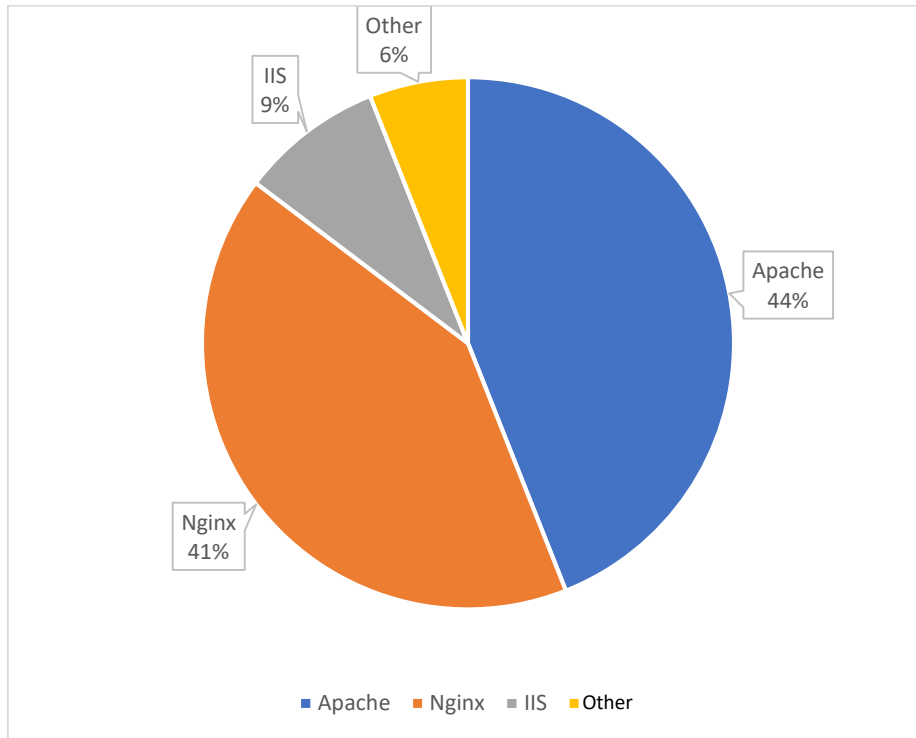
Fig. 7 The share of different web servers used to access web content (as a percentage)

Figure 7 clearly indicates that Apache and Nginx are the two web servers that are most used by modern web applications – the relative share of usage of each of them exceeds 40%. Microsoft IIS is used by nearly 10% of the web based systems – those that are developed with the ASP.NET platform. This neither confirms, nor disconfirms the hypothesis that Apache is the most used web server by the systems for creating Internet content, as its relative share is only slightly higher than that of Nginx, the web server that ranked second according to the findings of the usage statistics survey.

Figure 8 presents the relative share of different content management systems (Statista, 2019).
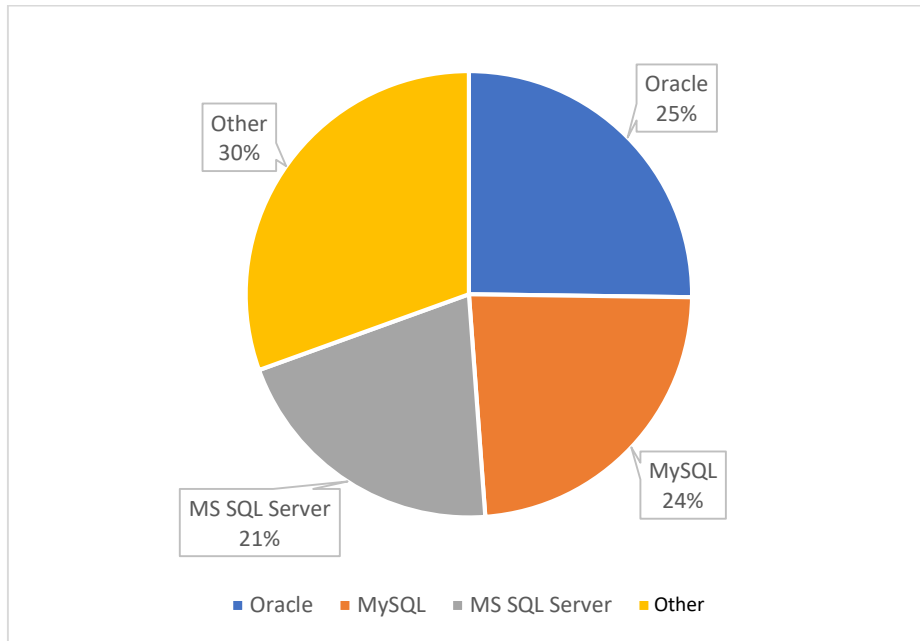
*Fig. 8 The relative share of different content management systems
(as a percentage)*

As illustrated by the pie chart above, in terms of content management systems that are part of the architecture of modern web systems, Oracle, MySQL and Microsoft SQL Server are the three leading systems, the relative share of each of them exceeding 20% and the share of Oracle being slightly higher than the shares of MySQL and Microsoft SQL Server. This neither confirms, nor disconfirms our hypothesis that the systems used to create content on the Internet use primarily MySQL data base, although the relative share or MySQL is slightly lower than that of Oracle.

The findings of our research about the trends in the development of web publishing systems can be summarized into the following conclusions about the design of related software solutions:

- In terms of technology, it would be best to develop such a system by employing PHP and JavaScript programming languages, an Apache web

server, and MySQL for managing content, since those are the most popular technologies on the market;

- In terms of the cycle of technological solutions, such a system would best focus on publishing interactive content, mainly photographs, as indicated by the latest consumer preferences;

- In terms of its architecture, such systems would best be developed as mobile ones, i.e. as mobile applications (including the different versions supported by different mobile platforms) or as web systems that can be accessed via mobile devices.

Conclusion

The major results of the research we have conducted can be summarized as follows:

- Theoretical aspects of the design of web publishing information systems with three-tier architecture have been reviewed;

- Conceptual issues related to web publishing systems have been analysed; the findings of the conducted analysis indicate that the largest share is that of social networks and one of the major issues in terms of their development relates to information quality;

- Trends in the development of architecture solutions for creating web content have been defined. Such systems are mainly accessed via mobile devices nowadays, while users are mainly interested in interactive content.

In conclusion, the advantages of employing these trends in the development of architecture solutions for web publishing systems when designing software solutions in the sphere could be defined as follows:

- Available modern technological standards in practice;
- High reliability ensured by applying established technologies with guaranteed support in future;
- Web-based architecture designed through modern concepts;
- Management of interactive content.

References

Belev, I. (2018). Software business process management approaches for digital transformation, Yearbook of UNWE, Sofia, , ISSN 1312-5486.

Country Meters (2019). https://countrymeters.info, 09.03.2019

Internet World Stats. (2019). Usage and Population Statistics, 09.03.2019, https://www.internetworldstats.com/

Kirilov, R. (2016). Softuerni resheniya za upravlenie na proekti, safinansirani po operativnite programi na evropeyskiya sayuz, sp. Biznes upravlenie, Svishtov, br. 3, ISSN 0861-6604.

Kirilova, K. (2017). Metodicheski aspekti na administrativnoto obsluzhvane v publichniya sektor, sp. Ikonomicheski i sotsialni alternativi, Sofiya, br. 2, ISSN 1314-6556.

Kirilova, K. (2018). Predizvikatelstva pred administrativnoto obsluzhvane na obshtinite v Balgariya, Nauchni trudove na UNSS, Sofiya, tom 4, ISSN 0861-9344.

Kisimov, V. (2008). Upravlenie na kachestvoto na biznes dannite v informatsionna sistema, sp. Ikonomicheski i sotsialni alternativi, Sofiya, br. 6, ISSN 1314-6556.

Shishmanov, K. (2013). Analiz na vazmozhnostite za razvitie na informatsionnite sistemi na predpriyatiyata, sp. Biznes upravlenie, Svishtov, br. 2, ISSN 0861-6604.

Statista. (2019). https://www.statista.com/   09.03.2019

Traykov, B. (2013). Programi za tarsene v internet, sp. Biznes upravlenie, Svishtov, br. 3, ISSN 0861-6604.

Varbanov, R. (2015). Potentsialat na sotsialnite medii v biznesa na kompaniite, sp. Biznes upravlenie, Svishtov, br. 3, ISSN 0861-6604.

Web Technology Surveys, W3 Tech. (2019).   09.03.2019, https://w3techs.com/

Yordanova, S., Stefanova, K. (2019). Osnovni tehnologii i prilozhni nasoki za digitalna transformatsiya na biznesa v sreda na golemi danni, sp. Biznes upravlenie, Svishtov, br. 1, 2019, ISSN 0861-6604.

BUSINESS management

D. A. Tsenov Academy
of Economics, Svishtov

Year XXIX * Book 2, 2019

CONTENTS

BUSINESS

management

2/2019

TO THE READERS AND AUTHORS OF "BUSINESS MANAGEMENT"

The journal of "Business Management" publishes research articles, methodological articles and studies, review articles, book reviews, commentaries and good practices reports.

1. **Volume:**
   - Articles: between 12 – 20 pages;
   - Other publications (review articles; book reviews, etc.): between 5 – 10 pages.
2. **Submission of materials:**
   - On paper and electronically at one of the following e-mail addresses:
     bm@uni-svishtov.bg or zh.tananeeva@uni-svishtov.bg
3. **Technical requirements** (the article template is can be downloaded from the webpage of the journal):
   - Format – Word for Windows 2003 (at least);
   - Font – Times New Roman, size 14 pt, line spacing 1,5 lines;
   - Page size – A4, 29–31 lines and 60–65 characters per line;
   - Line spacing 1,5 lines (at least 22 pt);
   - Margins – Top – 2.54 cm; Bottom – 2.54 cm; Left – 3.17 cm; Right – 3.17 cm;
   - Page numbers – bottom right;
   - Footnotes – size 10 pt;
4. **Layout:**
   - Title of article title; name, scientific degree and scientific title of author – font: Times New Roman, 14 pt, capital letters, Bold – centered;
   - Employer and address of place of employment; contact telephone(s) and e-mail – Times new Roman, 14 pt, capital letters, Bold – centered.
   - Abstract – up to 30 lines; Key words – from three to five;
   - **JEL** classification code for papers in Economics (http://ideas.repec.org/j/index.html);
   - Introduction – it should be from half a page to a page long. It should state the main ideas and/or objectives of the study and justify the relevance of the discussed issue.
   - The main body of the paper – it should contain discussion questions, an outline of the study and research findings/main conclusions; bibliographical citation and additional notes, explanations and comments written in the footnotes.
   - Conclusion – it should provide a summary of the main research points supported by sufficient arguments.
   - References – authors should list first references written in Cyrillic alphabet, then references written in Latin alphabet.
   - Graphs and figures – Word 2003 or Power Point; the tables, graphs and figures must be embedded in the text (to facilitate language correction and English translation); Font for numbers and inside text – Times New Roman, 12 pt;
   - Formulae must be created with Equation Editor;
5. **Citation guidelines:**
   When citing sources, authors should observe the requirements of **APA Style**. More information can be found at: https://www.uni-svishtov.bg/default.asp?page=page&id=71#jan2017, or: http://owl.english.purdue.edu/owl/resource/560/01/
6. **Contacts:**
   Editor in chief: tel.: (++359) 631-66-397
   Co-editor in chief: tel.: (++359) 631-66-299
   Proofreader: tel.: (++359) 631-66-335
   E-mail: bm@uni-svishtov.bg; zh.tananeeva@uni-svishtov.bg;
   Web: bm.uni-svishtov.bg
   Address: "D. A. Tsenov" Academy of Economics, 2, Em. Chakarov Str., Svishtov, Bulgaria