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EVALUATION OF CRITERIA FOR THE APPLICATION OF MOBILE OPERATING SYSTEMS

***Abstract. The purpose** of the work is to evaluate the criteria for the application of mobile operating systems.*

***The methodology** used in the work consists in determining effective means of using mobile operating systems, as well as analyzing modern mobile operating systems, which are mediated by various system modules related to innovative projects in the development of cellular communication systems.*

***The scientific novelty** of the work lies in the identification and generalization of criteria for the application of mobile operating systems as key factors for improving the quality of development, implementation and use of mobile applications in the context of the development of a cloud environment.*

***Conclusions.** It has been established that modern operating systems differ in the specifics of the implementation of internal algorithms for managing the main resources of mobile devices, which include processors, memory, etc., which are determined by certain resources, mediated by modern design methods, types of hardware platforms, development and implementation environments, etc.*

It is determined that in the modern environment of active implementation of mobile operating systems, to optimize the performance of tasks, they are assigned a leading role, which provides an opportunity to increase the efficiency of specialists. The main advantages and disadvantages of the most widely used systems are investigated: Android, iOS, Windows Phone and BlackBerry OS.

The requirements for choosing the type of program according to the characteristics of the cell phone are substantiated, which concerns a certain type of program that adapts to the tasks set. The level of complexity of mobile operating systems used by means of network communication and data exchange, which have the peculiarities of their processing, is determined. The versions of mobile systems that have the ability to adapt to different operating systems developed for a mobile phone model are analyzed. This will allow specialists to use smartphones with innovative and effective programs. It has been determined that with the advent of touch-sensitive mobile devices, a number of tasks, in particular those for remote performance, become particularly relevant and require further analysis and research. It is proposed that, in order for the system to increase the efficiency of implementing the tasks set, applications be developed and used using programming languages based on Java and Visual Basic for mobile devices for further adaptation of the system to devices.

***Key words:** system software, digitalization, software product, operating systems*

Алла КАПІТОН, Тамара ФРАНЧУК, Дмитро ТИЩЕНКО, Альона ДЕСЯТКО. ОЦІНКА КРИТЕРІЇВ ЗАСТОСУВАННЯ МОБІЛЬНИХ ОПЕРАЦІЙНИХ СИСТЕМ

Анотація. *Метою роботи є оцінка критеріїв застосування мобільних операційних систем.*

Методологія, *використана в роботі, полягає у визначені ефективних засобів застосування мобільних операційних систем, а також аналіз сучасних мобільних операційних систем, що опосередковані різноманітними системними модулями, пов'язаними з інноваційними проектами в розробці систем стільникового зв'язку.*

Наукова новизна *роботи полягає у визначенні та узагальненні критеріїв застосування мобільних операційних систем як ключових факторів підвищення якості розробки, впровадження та використання мобільних доданків в умовах розвитку хмарного середовища.*

Висновки. *Встановлено, що сучасні операційні системи відрізняються особливостями реалізацій внутрішніх алгоритмів керування основними ресурсами мобільних пристроїв, до складу яких слід відносити процесори, пам'ять тощо, які обумовлені певними ресурсами, що опосередковані сучасними методами проектування, видами апаратних платформ, середовищем розробки та впровадження тощо.*

Визначено, що в сучасному середовищі активного впровадження мобільних операційних систем, для оптимізації виконання поставлених завдань на них покладено провідну роль, що надає можливість підвищити ефективність роботи фахівців. Досліджено основні переваги та недоліки найбільш відомих вживаних та актуальних сьогодні мобільних операційних систем.

Обґрунтовано вимоги вибору типу програми відповідно до характеристик стільникового телефону, що стосується певного типу програми, яка адаптується до поставлених завдань. Визначено рівень складності мобільних операційних систем, що використовуються засобами мережевого зв'язку та обміну даними, що мають особливості їх обробки. Проаналізовано версії мобільних систем, що мають можливість адаптуватися до різних операційних систем, розроблених для моделі мобільного телефону. Це дозволить фахівцям використовувати смартфони з інноваційними та ефективними програмами. Визначено, що з появою сенсорних мобільних пристроїв, низка завдань, зокрема для виконання віддалено набуває особливої актуальності та потребує подальшого аналізу та дослідження. Запропоновано, задля того, щоб система підвищила ефективність реалізації поставлених задач, розробляти та використовувати додатки за допомогою мов програмування, які базуються на Java та Visual Basic для мобільних пристроїв задля подальшої адаптації системи до пристроїв.

Ключові слова: *системне програмне забезпечення, цифровізація, програмний продукт, операційні системи.*

Introduction. Operating systems may differ in the features of the implementation of internal algorithms for managing the main resources of mobile devices (processors, devices, memory), features of the used design methods, types of hardware platforms, areas of use, and many other properties.

The OS controls the device, runs programs, provides data protection, performs various service functions for user and program requests. The OS includes the following groups of components: the core containing the scheduler; device drivers; network subsystem; file system; system libraries; hell with utilities. The presence of an operating system is the main feature that distinguishes a smartphone from an ordinary mobile phone. When choosing a specific smartphone or communicator model, the OS often becomes a determining factor.

The operating system Symbian OS (EPOC 32) was created by the Symbian company – a joint venture of Motorola, Ericsson, Nokia and Psion based on the Psion Software division of the Psion company. Symbian OS is a full-featured operating system, created taking into account all the requirements of the telecommunications industry and most modern standards and protocols, such as Bluetooth, GPRS, etc. The core of the system – multi-tasking, highly productive and extremely compact – can be transferred to almost any platform without great expense.

Full Unicode support allows you to easily adapt the system for any language, flexible extension mechanisms allow you to solve all problems with mail and Web encodings. Symbian OS is used for applications have the following common features: careful development of the user interface, with the aim of making the programs as easy to use as possible, regardless of the level of user training; standard graphic control elements implemented in the EIKON library, including a toolbar, toolbars, convenient control using a keyboard and/or pen; increase and decrease the scale of the image on the screen to adjust the image taking into account the type of program data, lighting conditions and the user's eyesight; support for printing to most standard printers, printing through a serial, parallel or infrared port, or to a printer connected to a desktop PC; support for embedded objects, which allows, for example, to embed Word documents in an Agenda record; data exchange between applications via a standard clipboard, data exchange with other devices via an infrared port; Companies such as Nokia, Sony Ericsson and some other smartphone manufacturers equip their smartphones only with Symbian OS. The main competitor of Symbian OS is the Microsoft Windows Mobile operating system.

Analysis of recent research and publications. Studying the current nuances of the domestic and global market, in particular the requirements for the use of mobile applications and their standards, it should be noted that the issues of development, use and implementation of modern mobile applications and the selection of appropriate mobile systems is relevant and requires a comprehensive and thorough analysis to study and offer recommendations for optimizing their selection, which contributed to the choice of the research topic and the identification of the tasks set in the publication.

Kryvoshy V., Gafiyak A. performed a comparative characteristic of the most famous operating systems Linux and Windows [1, 120–121]. Matyash S., Gafiyak A. analyze the general characteristics of operating systems presented on the world market [2, 122–123]. Franchuk T., Tyshchenko D., Desiatko A., Karpunin I. explore the features of digitalization processes using mobile devices in various industries [3, 61–66]. Kapiton A., Franchuk T., Tyshchenko D., Desiatko A., Sas N. analyze the requirements for mobile terms in the process of modeling objects and management processes [4, 37–41]. Kapiton A., Karpov A. study the features of implementing a fully functional system on mobile devices [5, 230–232]. Tyshchenko D., Franchuk T., Stepashkina K., Karpunin I. investigate the requirements for operating systems in order to enable effective design and development of information systems for a given purpose [13, 200–207]. Tyshchenko D., Franchuk T., Zakharov R., Moskalenko V. study the issues of supporting dynamic security needs [14, 149–152].

Features of using mobile operating systems, issues of developing OS on mobile devices, research of operating systems for mobile platforms, their varieties, as well as the evolution of the most popular mobile operating systems, such as Android, iOS and their competitors, are a relevant topic that is constantly being researched by leading scientists in the IT industry. The problems of implementing modern mobile operating systems and their widespread use in all industries are most often of interest to scientists from our country and other countries, the results of which are presented by them in numerous publications [6–12].

Main part. Mobile operating systems – these are a series of small programs or applications adapted to mobile phones to provide various functions that the user can use. Since the so-called smartphones appeared on the market, their reactivity among the population was important, so it began to be mass-produced all over the world. The first smartphones to revolutionize the smartphone world were BlackBerrys. Outdated, currently unsupported software platforms are presented on (Fig. 1). The most used mobile operating systems are presented on (Fig. 2).

Each company selects the type of program according to the characteristics of the cell phone. That is, depending on the smartphone model, a certain type of program is placed that adapts to the conditions of this phone. Mobile operating systems are simpler than those used in computers; a large percentage of them are wirelessly connected.

Data processed on mobile devices also comes in different formats, such as audio, photos and videos. Some phones do not include certain applications that are included in the software on some computers. In the case of the Android system, in most cases it lacks programs for working with documents, photo, video editor and other programs (Fig. 3.) [6–12].

Specialists must carefully select the programs that will be used on the various platforms that must support their functioning. The advantages of these operating systems include the ability to connect for data transport, which will increase the amount of memory, and therefore enable and enhance multi-functionality and

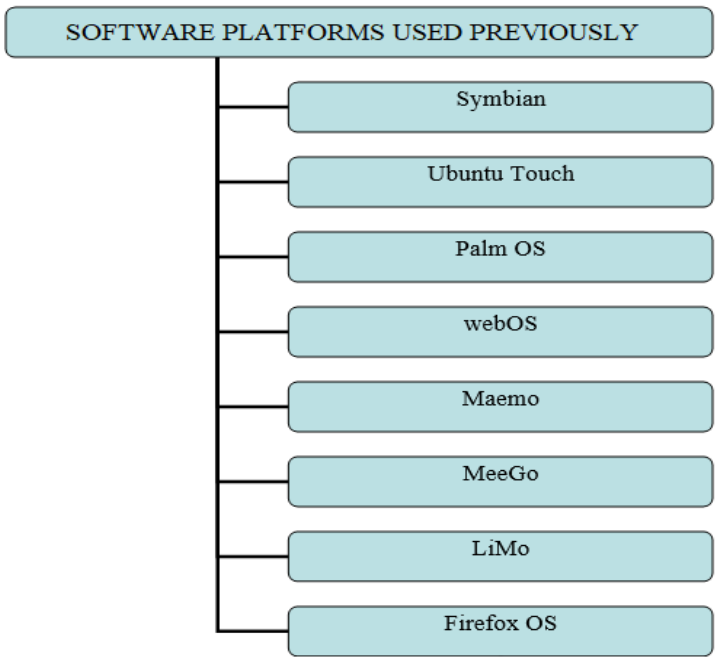

Fig. 1. Software platforms used previously

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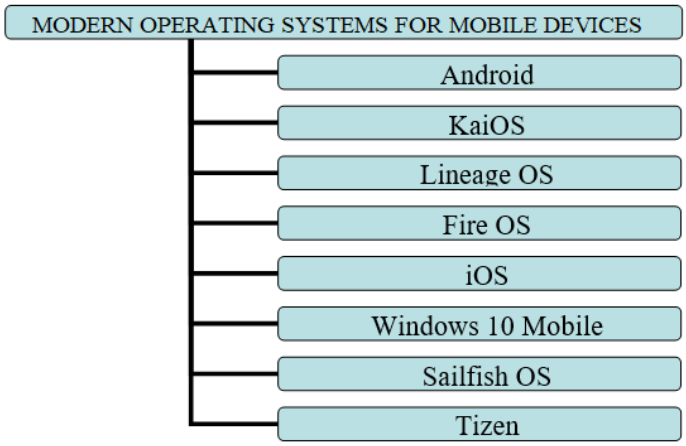

Fig. 2. Modern operating systems for mobile devices

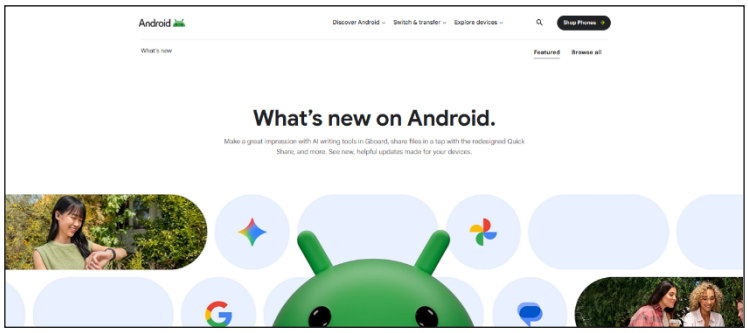

Fig. 3. Official website https://www.android.com/

multi-tasking, which requires constant updating and modification of bootable applications. Analyzing modern mobile operating systems, we can conclude that they are uniform and similar to each other. The development of new versions, subspecies, modifications proposed by specialists is based on their modular change of components, similar to RAM and computer software. These components constitute a complex of operations that individually perform different functions. So, an updated version of the mobile operating system is being built that performs a series of operations that launch a process during which a series of processes and resources, called modules, are activated. This allows you to optimize the tasks and increase the speed of their execution. Modules and commands determine the sequence of actions and functionality of RAM [6–12].

These types of devices had a variety of programs and modules that allowed people to do a variety of things that were done on computers just a few years ago. These devices work with Android and Windows systems. On the other hand, Apple developed the iOS operating system, which was used only for the company's devices. It is also innovative, which allowed it to become a benchmark for other operating systems that would be developed later. The interface was fast and convenient. Thus, the versions of mobile operating systems grew until we reached the ones that are currently on the global market. They offer customers optimal services where applications and operations are very diverse and serve as a tool for work and entertainment (Fig. 4) [6–12].

The software operates locally and does not require an Internet connection. This is its advantage. Such machines can be: office servers, which can be used for software with low resource requirements; high-power personal computers, which are actually used as servers. Larger businesses with extensive IT infrastructure use large server machines and a staff of specialists to maintain them as computing equipment. Cloud computing is the same servers, super-powerful computer machines. All hardware is maintained by technical specialists and programmers. Such clouds have many advantages for accounting programs, compared to local servers. Like any other software, management, accounting, or other accounting systems can be stored and administered locally or on remote servers – clouds.

With the help of the technologies available to us today, the creation of innovative tools that contribute to effective financial management has become possible. Based on the research chosen by the authors, its purpose is to analyze and improve the use of cloud technologies for accounting and optimize financial reporting in the process of qualitative modification of cloud services. Accounting application solutions require hardware

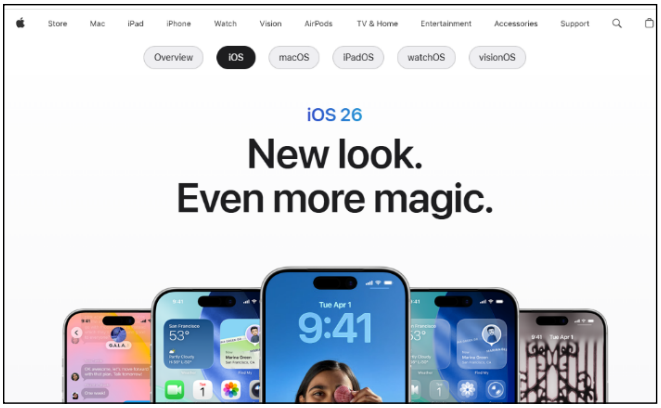

Fig. 4. Official website https://www.apple.com/os/ios/

for storing and processing information, while server capacities – computers – are used to host automated management and accounting systems. The server requires special placement conditions – a specially ventilated room, a staff of specialists to service it, etc.

Conclusions. The mobile application industry is rapidly developing and constantly provides new opportunities for the convenience and improvement of the quality of life of users. Mobile applications open up limitless horizons for us for communication, entertainment, work and many other areas. A mobile application is software specially designed for use on mobile devices such as smartphones and tablets. Mobile applications have become an integral part of modern digital life and play a key role in both everyday life and business.

Main characteristics of mobile applications: Platform dependency (Mobile applications are developed for specific mobile platforms, such as Android, iOS, Windows Phone and others. Each platform has its own technologies and development tools); User-friendly interface (Mobile applications have an intuitive and user-friendly interface designed for use on touch screens of mobile devices. They are optimized for small screens and use gestures and touch interface for interaction); Access to device features (Mobile apps can use various features of mobile devices such as camera, GPS, accelerometer, microphone and many others. This allows them to provide enhanced interactivity and personalization capabilities); Download and Installation (Users can download mobile apps from official app stores (such as Google Play for Android and App Store for iOS) and install them on their devices). Mobile applications have become an integral part of modern life, influencing various aspects of everyday life and entrepreneurship. The role of mobile applications is important and has a wide range of applications.

The following positive points should be highlighted: Simplification of routine tasks (Mobile applications allow you to simplify many routine tasks such as scheduling, travel planning, financial accounting and many others. They create an opportunity for more efficient management of time and resources); Communication and Social Networks (Mobile applications for social networks, messengers and communication tools allow people to stay connected even over long distances. They have become essential for messaging, communication and sharing multimedia content); Entertainment and education (Mobile applications provide access to a variety of games, multimedia content and educational resources. They contribute to both the entertainment and educational development of users).

In business it will be such moments as: Efficiency and Productivity (Mobile applications enable businesses to improve efficiency and productivity. They provide access to business tools that simplify record keeping, planning and analysis of activities); Customer Service (Mobile applications allow companies to improve customer service by providing a convenient way to interact with and order products and services. This helps increase customer loyalty); Marketing and Advertising (Mobile applications allow businesses to run marketing campaigns and promotions. They provide tools to promote your brand and attract new customers). Analytics and research: Mobile apps provide access to data and analytics that help businesses make informed decisions, as well as market research and competitor analysis. All these factors demonstrate the important role of mobile applications in both daily life and business, making them an important subject for further research and development.

Research and study of the main, most common mobile operating systems are constantly in the field of view of the requirements of modern development and rapid growth of gadgets, mediated by a rapid response to today's requirements. In addition to the above mobile operating systems, others exist, are being developed and improved, which have limited application in certain industries.

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