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Summary of SUB-PROJECT 2 activities: Experimental development of emerging technologies in the field of mobile communications related to online social networks and the study of their impact at the level of their users (Integrated Mobile Social Networks)

- Summary 2018-

Communication is a very important factor in achieving both personal and professional objectives. This is also visible through the huge number of users of online social networks. Online social networks such as Facebook, Google+, Instagram, LinkedIn, Snapchat, Twitter, WhatsApp, are accessed by a huge number of users because of the benefits they offer.

Mobile technologies play an important role in the creation and use of online social networks. Analyses show that more than 80% of social media users use mobile devices (Sterling, 2017), which represents 34% of the world's population (Kemp, 2017).

IT technologies are in continuous development, some of which also have a major impact on mobile systems, and also influence the way communication is carried out through online social networks. As Otoiu et al (2017) points out, the impact on jobs in information and communication technology field is very high.

Literature review indicates the following emerging technologies in the field of mobile communications (DeMers, 2016), (Gathere, 2017) and (ValueCoders, 2017):

- Internet of Things (IoT);
- Portable devices (wearables)
- Cloud computing;
- Augmented reality;
- Big data and their processing.

The first three emerging technologies are widely addressed in this study.

Augmented reality systems provide additional information, superimposed over a viewing surface, in order to improve the user's perception of reality. These systems are based on contextual data (geographical position, recognised images, date, etc.) as well as data provided by users (Pocatilu et al., 2017).

Augmented reality is applied in different areas such as (Poh M., 2018): education, entertainment, technique, navigation, medicine, sales, etc. Large companies that provide social media solutions integrate augmented reality solutions into developed applications (Mediakix Team, 2017). These solutions should also be expanded across online social

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networks by displaying contextual information relevant to mobile app users that integrate augmented reality technologies.

This study aims to identify and analyse available technologies and mobile applications at both theoretical and practical levels. Emerging technologies influencing the use of online social networks are also highlighted.

Online social networks are a tool associated with the Web 2.0 technology set that made its mark especially in early 2002. Web 2.0 allows intensive user participation in the process of generating the content of online tools.

Online social networks consider practices, activities and behaviours at the level of communities of people who meet through online sites to share information, knowledge and opinions using synchronous or asynchronous conversational tools. These tools allow easy transmission of different forms of multimedia content, starting with text, still or dynamic images, sounds and movies.

While there are exceptions, available research suggests that most social networks primarily support pre-existing social relationships.

Mobile applications and technologies

The term mobile apps are intended for applications developed and adapted specifically for running on mobile devices. They are chosen according to several criteria. An important criterion is network access (Pocatilu, 2012). Thus, there are independent applications (without network/Internet access) and distributed applications (with network/Internet access).

Independent applications are apps that do not require you to connect to a computer network or the Internet. Distributed applications use a connection to a computer network, which may be permanent or temporary. Within the architecture of distributed applications, the followings can be found:

- specialized client and server components;
- client and server based on REST services;
- Web application-specific technologies.

Most mobile apps, including social media apps, require connections to different remote services. As shown by Lin and Siau (2003), the main features of distributed mobile applications are the following:

- Ubiquity – access to information regardless the timeframe or of where the user is located;
- Availability – the possibility to contact anyone at any time and using mobile technologies;
- Location – by using global positioning system (GPS) information is provided specific to the area in which the user is located;
- Customizing – apps are customized according to users' preferences and habits;

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- Dissemination – information can be transmitted simultaneously to multiple users.

There are many areas of application of mobile applications. In Romania, too, the increasing use of mobile devices in various fields of activity is noted. The following can be mentioned:

- Information and communication;
- Mobile electronic business (*m-business*);
- Mobile e-commerce (*m-commerce*);
- M-banking;
- M-learning;
- Entertainment.

A very important aspect is the security of mobile applications, especially applications through which personal data is transmitted. Security mechanisms applied in traditional applications are also used. In addition, security policies are defined at the operating system level to protect against access to certain software components of the mobile device.

Mobile apps are designed to be run on mobile devices that support appropriate technology. The development of mobile applications is carried out according to the platform or operating system envisaged.

Each mobile device has an operating system that manages resources and provides the user interface. The complexity and facilities offered by the operating system vary within each category of mobile devices.

Mobile operating systems can be (Pocatilu, 2012):

- Open – provides an application programming interface, with the ability to write applications for that platform;
- Closed – do not provide an application programming interface (API); certain operating systems of this type provide support for device-independent technologies, enabling the development of applications using that technology.

When choosing the target mobile platform of the developed applications, account shall be taken of both their market share and the potential of the ecosystem.

Depending on the portability criterion of the binary code of the resulting executable file, mobile applications can be clustered as follows:

- Native – apps are run directly by the mobile device processor;
- Portable – interpretable or compiled binary code (JIT – Just in Time) is run in a virtual machine.

For native-coded apps, they can only run on one category of mobile devices. Applications with interpretable or compiled JIT binary code may run on different mobile devices, provided that the specific platform (virtual machine) is installed in advance.

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The choice of a particular type of mobile application depends on the technologies used within the organization, the user interface requirements, the hardware and software platforms for which the application is developed, and the level of staff training.

From the point of view of existing solutions, support for the following types of mobile applications is noted:

- Web applications – these are played in a control included in a native application or browser;
- Native applications – the executable binary code is generated for each selected platform;
- Hybrid applications - running in a native container application.

Choosing a solution for developing mobile apps should take into account several factors, such as: the purpose of the app, the target users, the ways of entering data, the need for network access, the features of the device, etc.

Emerging technologies presented (portable devices, IoT, cloud computing) also influence how users will interact through online social networks. Therefore, an important direction of study is to study the possibilities of integrating all these technologies into online social networks and determining the impact on them in the context of the use of mobile devices.

At this time, the category of portable devices includes watches, smart bracelets, devices incorporated in clothing and devices used at the head (eyes, ears, etc.). Portable devices run their own operating system, which are connected to a mobile device via Bluetooth technology. Portable device connectivity is mainly based on mobile devices, but new generations also include support for local wireless networks and/or mobile networks. Portable devices may also have NFC technology, GPS receiver, as well as other sensors (gyroscope, heart rate monitor, etc.).

Applications dedicated to portable devices are developed using libraries provided by the manufacturer. Portable devices are also based on a notification system provided by both mobile apps and apps installed on the portable device.

Apps installed on portable devices connect to online social networks and can send and receive messages and files.

For the development of applications for portable devices, they must be based on an open operating system in terms of access to the application programming interface. This category includes Wear OS (Google), WatchOS (Apple) and Tizen (Samsung) operating systems.

IoT (Internet of Things) involves connecting devices/equipment to an Internet network, which can communicate with each other independently. Existing devices connected to the Internet include (Flatwords Solutions, 2018): WiFi routers, sensors, WiFi and RFID tags, recognition equipment. IoT solutions are currently available in a multitude of areas, including social media.

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One disadvantage in the use of these technologies is the security aspects, given that these devices are constantly connected to the Internet.

Arduino or Raspberry Pi-based development plates with dedicated or technology-specific development environments can be used to prototype IoT systems. Within the Social Internet of Things, heterogeneous devices not only connect and interact but also collaborate with each other to accomplish specific tasks. This "social" interaction requires cooperation between IoT devices.

Very large amounts of data are transferred through social networks. Dedicated apps also collect a lot of data about users and the context in which they use them. It is possible to integrate components for the real-time processing of the data collected and to provide the synthesized results to both users and interested companies. In-app components require the deployment of specific algorithms (Sloan and Quan-Hasse, 2017), but optimize for the limitations of mobile devices in terms of processing power. These large amounts of data need to be stored and processed, and cloud computing services are a solution to this. Another important aspect is cost efficiency, which can be increased by using cloud technologies to support these mobile social media-based platforms.

The use of these emerging technologies in online social networks is beneficial in terms of their potential. In order to determine the impact of emerging technologies on online social networks, from the user's perspective, the following steps are needed:

- Developing an application prototype that integrates these technologies; in (Mao Z. et al., 2017) are presented the main aspects related to the development of mobile applications for online social networks;
- Selecting users who will test the prototypes of mobile apps for online social networks;
- Developing metrics to measure the impact of these technologies on users;
- Collecting data on how the integration of these technologies influences the functioning and use of online social networks through mobile devices;
- Analysis of the obtained results.

Portable devices can be connected to online social networks directly or via mobile devices. Cloud services will be used to set up devices, as well as to store data, through their own server. Stored data can be processed later or in real time in (Sloan and Quan-Hasse, 2017) with specific methods of analysis of online social networks.

Security issues are also considered to ensure the confidentiality and integrity of users' data.

In this research, we captured and analysed the main technologies and mobile applications available at the theoretical and practical level, in the context of online social media use, taking advantage of emerging technologies.

The existence of emerging technologies that will influence communication through mobile technologies within online social networks is noted. Measuring the

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impact of these technologies is necessary in order to develop mobile applications to support users and companies providing such services.

An important direction of research in this area is to determine the impact these emerging technologies have on the followings:

- changes in the deployment of mobile applications;
- how users interact with online social networks;
- users' perspective on new technologies;
- how security and confidentiality issues are perceived.

In order to determine the influence these technologies have, it is necessary to develop a system of metrics and indicators, as well as to obtain the data necessary to determine the impact on users.

From the perspective of the Concept of IoT and Wearable devices, a number of conclusions can be noted above:

- wearable devices have the potential to override the natural filters of the consumer body, which block advertising messages;

- new social communities are developing around interconnected devices;

- wearable devices increase consumer involvement;

- screen size of wearable devices is limited;

- content becomes even more concise;

- imagination and creativity remain the main weapons in the fight with wearable devices;

- wearable devices create a completely different user interface than a computer or phone;

- confidentiality becomes more nuanced;

- content must be relevant to the consumer.

Qualitative research provided more information which shall be presented below. In the first focus group with 8 randomly chosen people, an attempt was made to obtain more information on different aspects specific to marketing, wearable/IoT technologies on how to currently use online social networks and their usefulness according to the interview guide.

The people who participated in the discussion have heard of the concept of wearables, but are little familiar with these technologies. There is a positive attitude towards these technologies, not much additional information is provided because they are not very familiar with these technologies. On a personal level, there is very little involvement of wearables in the daily lives of respondents. They are not at all familiar

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with these technologies, they would try to use them but they are not very open to investing. As a general conclusion, we can say that these technologies have a very low level of personal involvement as well as for their use in online social networks.

In the second focus group, a study was carried out on different aspects specific to marketing, wearable/IoT technologies on how to currently use online social networks and their usefulness in the organisation's marketing strategies.

Some of the findings of the research are presented below:

- People in companies have heard of the concept of wearables, but are less familiar with these technologies.
- There is a positive attitude towards these technologies, they are used more on a personal level and sometimes for sports activities.
- It is noted that there are organizational accounts online and the most well-known social network is Facebook.
- Online social networks are often used in companies and have the main role of promotion and communication.
- At the organizational level, there is very little involvement of wearables in the foundation of certain strategies; respondents are not at all familiar with these technologies; see a greater inclination towards their use ONLY on a personal level.

As a general conclusion, we can say that these technologies have a very low level of involvement at the company level as well as for the foundation of decisions and strategies.

Among the main conclusions we can draw after the realization and the two quantitative research carried among both users and organisations, we can mention that innovation and organisational evolution play a key role in the development not only of new technologies but also of society at large, and of how it will interact and communicate with stakeholders.

Regarding the degree of familiarity and habit among organisations with the technologies of wearabels and the Internet of Things, 46% use it to a large extent and 15% to a very large extent. Most organisations consider it advantageous to use these technologies and the impact they have on the use of social networks, with 70% admitting that they have a major impact. More than 95% of respondents say that the organization in which they work has at least one media social media account, using this

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means of communication with the organization's stakeholders very often (in a proportion of 42%) and often (44%). At the moment, wearables and The Internet of Things technologies are not yet widely used to develop and base marketing strategies in our country, so we can see that only 6% use these new technologies to a very large extent, while 15% to a large extent.

On the other hand, the use of social media helps organisations develop a number of market strategies. 55% of the surveyd companies said that social media helped them to a large extent, while 30% indicated the response `to a very large extent`. The most used device is the Activity Tracker, which is considered to be very useful, followed by Smartwatches, Wearable Cameras, Headphones, Smart Glasses, Headsets in last place being Smart Clothing.

Of the users who participated in the survey, only 31% mentioned that they are very familiar with wearables and the Internet of Things, and 59% believe that there is a major advantage in using these new technologies. Smartwaths are considered to be very useful, followed by Headphones, Activity Trackers, Smart Glasses, Headsets and as with Smart Clothing organizations finding it in last place.