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Development of NEU-LIFE ASSIST Android Application and Bibliometric Analysis of mHealth Applications

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Abstract: *This study includes the development of the NEU-LIFE Assist Android application and bibliometric analysis of mHealth applications. The NEU-LIFE Assist application was developed using Android Studio. This application was designed in a manner such that large amounts of information and emergency care can be accessed with just one touch. In the bibliographic analysis of the study, explanatory graphical models were created with VosViewer to display the studies screened in the Web of Science using the "mHealth Applications" keyword. The aim of this study is to develop the NEU-LIFE Assist Android application for the elderly and people with disabilities and to determine the bibliometric analysis results of studies conducted on mHealth Applications in the related topic. In this context, the aim is to determine the trend of the studies related to mHealth Applications and to research the design focal points that should be used when designing applications. The most cited authors, the most used keywords, the most cited journals and conferences and countries where most studies are conducted related to mHealth applications were listed through a bibliometric analysis. The results shown that an increase in the applications related to mHealth are being designed. One of the most frequently used keywords in this context was determined to be "usability", which presents the need to design easy and accessible applications.*

Keywords: *Android, Mobile Applications, mHealth Applications, Bibliometric Analysis*

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1. Introduction

Today, mobile applications make our lives easier in many fields and are adopted as a necessity of life. These applications are presented to the user in either free or chargeable form from different stores according to the operating systems of mobile devices (Nawaila et al., 2022). Therefore, mobile devices that meet the needs of individuals in different fields are continually being developed. Millions of applications are downloaded each day. Each operating system has its own mobile store including the Google Play Store, Apple App Store, and Windows Phone Store. (Malavolta et al., 2015).

As the number of mobile platforms is continually increasing, it has become more difficult to develop applications because different applications must be produced for each platform (Xanthopoulos & Xinogalos, 2013). Today, when developing applications for mobile platforms, there are two main fields that be selected. A native developer only focuses on one operating system whereas the other aims for multiple platforms. However, a common concern regarding development is that performance changes can occur in natively-developed applications (Palmqvist, 2023). When mobile applications are examined, the term Mobile health (mHealth) term has now entered out lives. Smart phones and tablets create the opportunity to increase the efficiency of health services and provide individuals with mHealth services (Dobrica & Pietraru, 2017). They help provide everyone with health services without the limitation of time and place (Varshney, 2007). In the study conducted by DeRuyter, Jones & Morris. (2018), it was stated that the mHealth application needs of people with disabilities are not met. At the same time, only a limited number of participants stated their appreciation of mHealth applications. Additionally, the people with disabilities who participated in the study stated that online resources that include the comments of people who are experiencing similar situations to themselves and information on these issues would be useful. The rapid increase in smartphone usage has made it one of the most accessible devices. In particular, mHealth applications can easily be accessed through smart phones and tablets. It is estimated that the usage of mHealth will increase by 17.6% between 2021 and 2028 (Grand View Research, 2021). Mobile Health (mHealth) applications are mobile applications that can collect, monitor and support the health information of individuals collected from smart phones or tablets (World Health Organization, 2016). It is seen that mHealth applications are particular effective for use by elderly adults (Changizi, & Kaveh, 2017). Studies show that elderly adults are interested in using smart phones and that it can be beneficial for their health when used with

personalized specifications (Zhou, Rau, & Salvendy, 2014). Therefore, the adoption and application of mobile health technology can help increase the quality of life of the elderly (Ramdowar et al., 2023). As individuals get older, diseases due to age and anxiety problems can occur (Parkar, 2015). Advanced technologies can help develop the well-being of elderly adults (Tajudeen et al., 2022). mHealth applications have become more common in order to help the elderly to maintain their health and continue to live independently as the population gets older (Klaver et al., 2021). However, many restrictions and design malfunctions occur when using these technologies (Ramdowar et al., 2023). Studies show that human-centred design plays an important role in developing mHealth applications and meeting the needs of individuals in the development stage will ensure easier adaptation in the acceptance phase (An et al., 2023). The applications must be presented in a better manner in order for the elderly to have a more positive and adoptive approach to mHealth applications (Pan & Dong, 2023). In the study conducted by Pan & Dong (2023), five points were used when designing their application, namely Knowledge, Persuasion, Decision, Implementation and Confirmation. The ease of use and design principles in the application developed were considered.

2. The Aim of the Research

The aim of this study is to develop a NEU-LIFE Assist Android application for the elderly and those with disabilities and to conduct a bibliometric analysis on the mHealth applications in the related field. In this context, the aim is to determine the trend of studies conducted on mHealth Applications as well as the design focal point that must be considered in developed applications.

1. Developing the NEU-LIFE Assist Android application
2. Which authors are cited the most on the topic of mHealth Applications?
3. What are the most frequently used keywords related to mHealth Applications?
4. In which journals and conferences are the most publications with regard to mHealth Applications presented?
5. In which country are the most studies in the field of mHealth conducted?

3. Method

The aim of this study is to develop the NEU-LIFE Assist Android application that will help the elderly and people with disabilities to access their health information and emergency communication, to present studies in the literature review conducted in this field and searched with the "mHealth Applications" keyword and to show the importance of these studies. The proposed NEU-LIFE Assist Android application was developed by researchers with Android Studio. Additionally, the keyword "mHealth Applications" was searched in the Web of Science as all fields on the 13th of November 2023 and 482 studies were accessed. These data were exported from Web of Science and their bibliometric analysis was conducted through VosViewer. The analysis was limited to Citation of authors, Co-occurrence-all keywords, Bibliographic coupling of sources and Bibliographic coupling of countries.

4. Development of the NEU-LIFE Assist Android Application

The NEU-LIFE Assist application was developed with Android Studio. Android is an open source code operating system, is free of charge and can be used by everyone (Periyanayagi et al., 2021)

In the first stage of the mobile application, the system set up and system login must be conducted. User accounts are opened by authorized persons on behalf of elderly and disabled individuals by the software developer who makes the application available to its employees. The log in to the mobile application is conducted without an e-mail and password.

The reason the application is designed in this way is to ensure ease of use. When users log in to the application, it will direct them to the telephone contacts from which they would like to make a call.

The modes in the application are under the six main headings of Home Page, Telephone Contacts Emergency Service, Fire Brigade, Plumber, Electrician, Traffic and Police. The mode names are listed with images, colours and icons suitable to their content. The user can access the mode that they want by clicking the image under the heading.

Home Page: It was particularly ensured that the home page can be accessed with just one button. Thus, the elderly can access the necessary information with ease.

Telephone Register: This mode includes the emergency support services that individuals can easily Access. Thus they can easily Access the numbers they require and get support. This register especially includes

numbers for the emergency service, fire brigade, plumber, traffic police and police.

It is designed in a way that they can access important information and emergency help with just one click. In the study conducted by Wildenbos et al., (2015), it was mentioned that applications developed for the elderly must be plain and simple. Instant call forwarding is carried out on the devices where the application is installed using the phone numbers included in each mode. Image 1 shows a screenshot of the call forwarding mode. Instant calls can be made on the devices on which the application is installed using the telephone numbers within the mode. In this context, it is aimed to help the elderly and people with disabilities to access the emergency numbers with just one click. This application aims to help the elderly and people with disabilities to easily access health services and access the necessary people in emergency situations. Many studies state the importance of designing technology to meet the needs of the elderly (Abdulrazak et al., 2013).

5. Findings and Discussions

5.1 Citation of authors

The search conducted on VosViewer with the keyword "mHealth Applications" was conducted to analyse the citations of authors and the "Minimum number of documents of an author" was determined to be 3 and the "Minimum number of citations of an author" was set as 0. A total of 4 out of 18 authors met the thresholds.

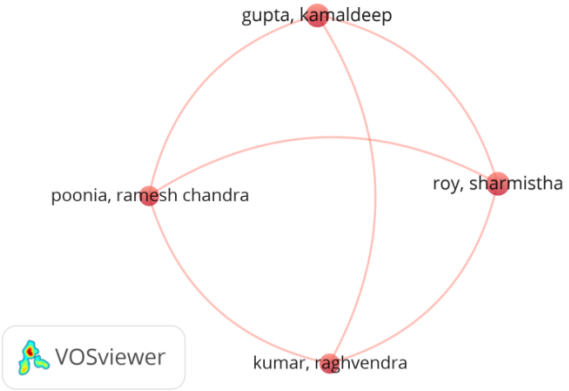

Figure 1: the "**Citation of authors"** conducted on VosViewer with the "mHealth Applications" keyword.

Author	Documents	Citations	Total Link Strength
Gupta, Kamaldeep	4	11	18
Kumar, Raghvendra	3	11	18
Poonia, Ramesh Chandra	3	11	18
Roy, Sharmistha	4	11	18

Table 1. "Citation of authors" with the "mHealth applications" keyword

As seen in Table 1 and Figure 1, the most cited authors regarding "mHealth applications" were determined. The highest total link strength was examined for each author. When the most cited authors are examined, the authors with the highest total link strength were Gupta, Kamaldeep (11 citations, 18 total link strength), Kumar, Raghvendra (11 citations, 18 total link strength), Poonia, Ramesh Chandra (11 citations, 18 total link strength and Roy, Sharmistha (11 citations, 18 total link strength).

In their study, Gupta & Roy (2022) stated that the mHealth applications used with smart phones provide solutions on the basic topics of health but that considering user satisfaction and using these applications more efficiently will be beneficial. The increase in the usage of digital technologies has made mHealth a necessity for regular health services and follow up. With the increase in the related mHealth applications, it has become more complicated to determine which applications are more suitable (Gupta et al., 2022).

5.2 Co-occurrence-all keywords

Co-occurrence-all keywords was analysed in the study conducted on the "mHealth Applications" keyword in VosViewer, and as a result, the "Minimum number occurrence of a keyword" was chosen as 5. Of the 287 keywords, 7 met the thresholds.

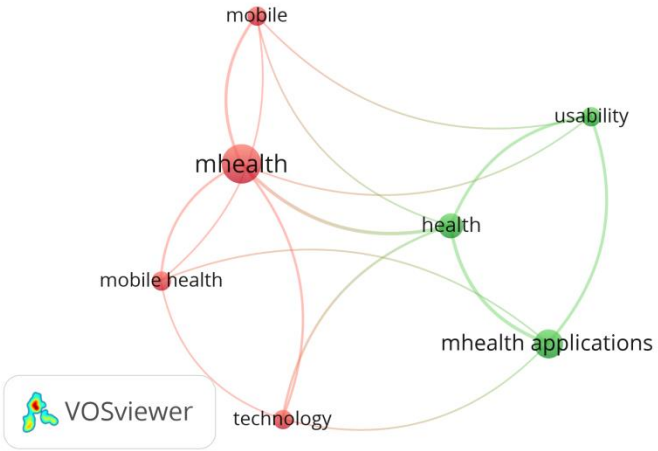

Figure 2: "**Co-occurrence-all keywords"** created by VosViewer with the "mHealth Applications" keyword

Keyword	Occurrences	Total Link Strength
Health	8	14
mHealth	20	12
mHealth Applications	11	9
Mobile	5	6
Mobile health	5	5
Technology	5	6
Usability	5	8

Table 2. "Co-occurrence-all keywords" with the "mHealth Applications" keyword

As seen in Table 2 and Figure 2, the most frequently used keywords related to "mHealth applications" have been determined. The occurrences and total link strength of keywords were also examined. When the most frequently used words are examined, the following was observed: Health (8 occurrences, 14 total link strength), mHealth (20 occurrences, 12 total link strength), mHealth applications (11 occurrences, 9 total link strength), mobile (5 occurrences, 6 total link strength), mobile health (5 occurrences, 5 total link strength), technology (5 occurrences, 6 total link strength) and usability (5 occurrences, 8 total link strength). When the most frequently used keywords in the studies concerning mHealth are examined, the one that is most prominent is the keyword related to "usability". While many studies have shown that

smartphone usage has increased, there are many design limitations preventing the mHealth applications from being adopted (Hoque & Sorwar 2017).

5.3 Bibliographic coupling of sources

In the study conducted on VosViewer regarding the "mHealth Applications" keyword and the bibliographic coupling of sources were analysed, "Minimum number of documents of a source" was set as 1. "Minimum number of citations of a source was specified as 20. 8 met the thresholds.

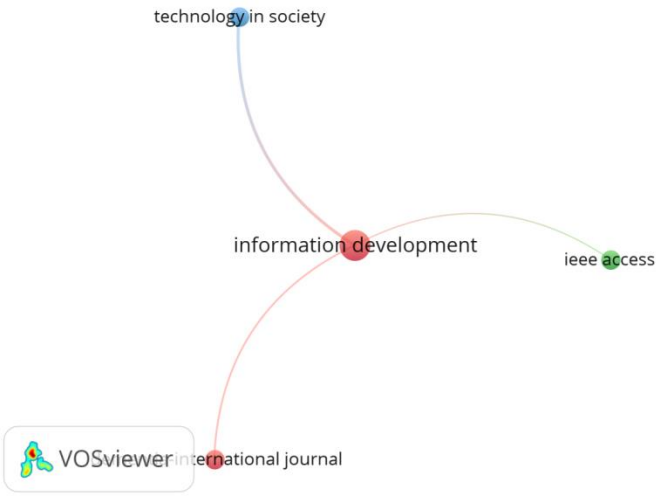

Figure 3: **"Bibliographic coupling of sources"** created by VosViewer with the keyword "mHealth Applications"

Source	Documents	Citations	Total Link Strength
Dementia-International Journal of Social Research and Practice	1	20	2
IEEE Access	1	38	1
Information Development	2	33	9
MedInfo 2017: Precision Healthcare Through Informatics	2	34	0
Military Medicine	1	60	0
Technology in Society	1	89	6
Telematics and Informatics	1	26	0
Transactions on Emerging Telecommunications Technologies	1	22	0

Table 3. "Bibliographic coupling of sources" with the keyword "mHealth Applications"

As seen in Table 3 and Figure 3 when the bibliographic coupling of sources related to "mHealth applications" is examined, the journals and conferences that have received citations regarding "mHealth Applications" have been determined. The results indicated the following: Dementia-International Journal of Social Research and Practice (1 document, 20 citations, 2 total link strength), IEEE Access (1 document, 38 citations, 1 total link strength), Information Development (2 documents, 33 citations, 9 total link strength) MedInfo 2017: Precision Healthcare through Informatics (2 documents, 34 citations, 0 total link strength), Military Medicine (1 document, 60 citations, 0 total link strength), Technology in Society (1 document, 89 citations, 6 total link strength), Telematics and Informatics (1 document, 26 citations, 0 total link strength), Transactions on Emerging Telecommunications Technologies (1 document, 22 citations, 0 total link strength). This data show that studies related to mHealth and its citations are increasing.

5.4 Bibliographic coupling of countries

In the study conducted with the keyword "mHealth Applications" in VosViewer, "Minimum number of documents of a country" was selected as 5 when analysing Bibliographic coupling of countries. "Minimum number of citations of a country was determined as 0. 5 met the thresholds.

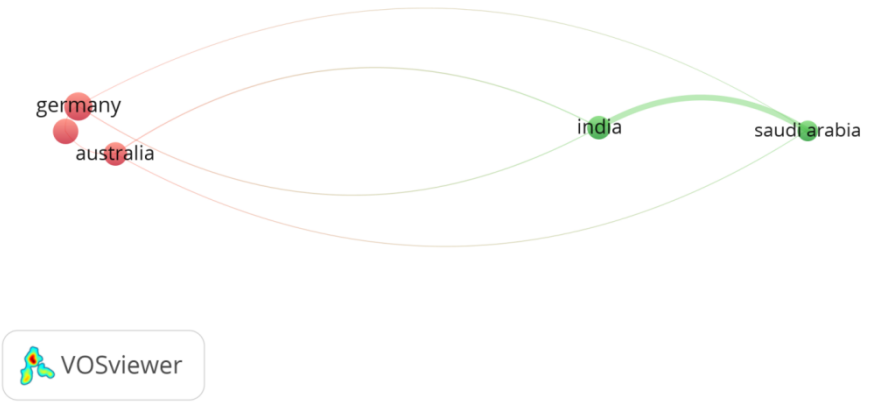

Figure 3: "**Bibliographic coupling of countries"** created by VosViewer with the "mHealth Applications" keyword.

Country	Documents	Citations	Total Link Strength
Australia	6	74	10
Germany	8	33	8
India	6	100	154
Saudi Arabia	5	15	150
USA	7	131	4

Table 4. "**Bibliographic coupling of countries"** with the "mHealth Applications" keyword.

When the bibliographic coupling of countries shown in Table 4 and Figure 4 are examined, the countries that have made the most publications and citations related to "mHealth applications" are determined to be Australia (6 Documents, 74 Citations, 10 Total Link Strength), Germany (8 Documents, 33 Citations, 8 Total Link Strength), India (6 Documents, 100 Citations, 154 Total Link Strength), Saudi Arabia (5 Documents, 15 Citations, 150 Total Link Strength) and the USA (7 Documents, 131 Citations, 4 Total Link Strength). The relevant analysis results show that the countries with the most cited publications on mHealth Applications are Australia, Germany, India, Saudi Arabia and the USA.

6. Conclusion and Future Studies

The NEU-LIFE Assist Android application was developed in this study to enable the elderly and people with disabilities to access emergency health and general health needs with one click through their smart phones or tablets. Additionally, the bibliometric analysis shows that the number of mHealth applications being designed is increasing. However, when designing these applications, the skills and requirements of the relevant users must be taken into account. Designs must be created in a manner that is clear and easy to use. "Usability", which one of the most frequently used keywords related to mHealth Applications, confirms that these applications must be designed in an easy to use manner. When the bibliographic coupling of sources was examined, it was seen that the publications that received most citations are: Dementia-International Journal of Social Research and Practice, IEEE Access Information Development, MedInfo 2017: Precision Healthcare through Informatics, Military Medicine, Technology in Society, Telematics and Informatics, Transactions on Emerging Telecommunications Technologies. The countries in which mHealth is citied the most in studies are Australia, Germany, India, Saudi Arabia and the USA. In future studies,

in the development of applications, "usability" must be considered and designs must be made accordingly. Due to this study being limited to Android applications, it is recommended that applications that can be used on other operating systems are designed.

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