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Identifying the essential features of an eldercare software platform through analyzing caregiver surveys conducted in Bulgaria

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Abstract

Population aging is a global challenge, exacerbated by two main issues. Firstly, there is a significant increase in the number of elderly adults, and secondly, there is a notable decrease in qualified staff available to care for retirees. In recent years, European countries have responded by raising the retirement age, but this only offers a partial and temporary solution. Training qualified personnel is an alternative, yet it's a lengthy and costly endeavor. Enhancing staff efficiency through improved qualifications is crucial, but as mentioned, it's time-consuming. A key strategy in optimizing the work of elderly caregivers is the large-scale digitization of their activities. To do this effectively, a thorough understanding of the daily needs and challenges faced by caregivers is essential. This understanding can be gleaned from a carefully structured questionnaire, comprising three questions divided into four categories, each encompassing specific predefined needs and challenges. These were evaluated by respondents, with their scores subsequently aggregated and normalized. From these normalized values, we can derive the critical functions needed for a software platform dedicated to digitizing social workers' tasks.

Keywords: Senior; Social worker; Questionnaire; Digitization; Platform

1. Introduction

Population structure in European represents a two-fold problem: first, we see a rise in the number of aged adults individuals, and second, there is a disproportionate decrease of people of working age as illustrated by Fig. 1 (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Ageing_Europe_-_statistics_on_population_developments#Older_people_.E2.80.94_population_overview). Demographically speaking, population aging is an ongoing and seemingly irreversible social process in European nations, Bulgaria included. Numerous studies have been conducted across Europe to understand the needs, challenges, and possibilities of care for aging populations. According to [10] the aging people in Europe are considered as those aged 65 years and more. They focus on various aspects, including healthcare, social services, technology, and lifestyle changes, among others. [2 - 5].

In 2017, Bulgaria's total age dependency ratio, representing the number of dependents (those under 15 or over 65) per working-age person, stood at 54.5%, up from 44.5% in 2005. This ratio is somewhat more favorable in urban areas, at 50.3%, compared to a higher average of 67.5% in rural areas. Furthermore, for every 100 new retirees (aged 60-64) in 2017, there were only 64 individuals entering the working age (15-19), a significant decrease from the 2001 ratio of 100 to 124. The lifestyle of the aged adults population in Bulgaria has specific characteristics: it is marked by low levels of physical activity, poorer physical and mental health indicators in comparison to other EU member states, less

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engagement in cultural life, and less than half of the aged adults population uses information and communication technologies, among others [5].

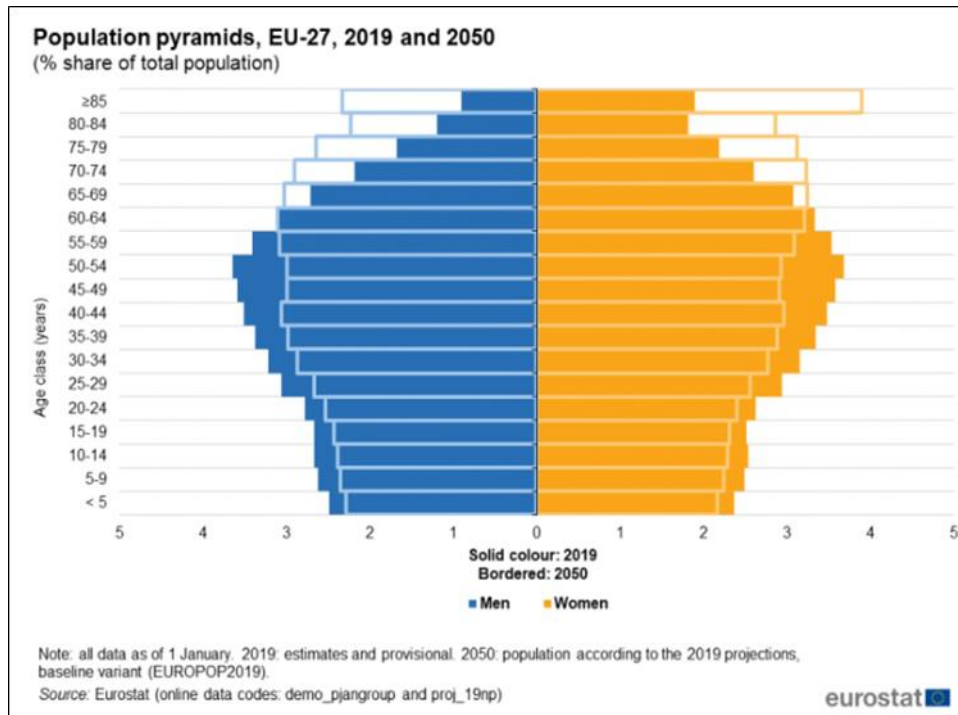


Figure 1 Population pyramids in EU according to EUROSTAT

Care for the aged adults has sparked important debates in recent decades. This is because, in the face of social transformations and the latest economic trends, population aging has been recognized as one of the most vulnerable to various conditions in the world. In the scientific literature, there are many concepts to denote the persons, who provide supportive care. In Bulgaria, they are known as caregivers. In short, a caregiver is a person who cares for a patient with a chronic condition, debilitating illness, mental health problems, or an aged adults patient. Supportive care providers are becoming more and more relevant due to the growing need for reliable people taking care of a sick relative, a disabled person, a child, or an aged person in the family. Laleva and Georgieva [6] reviewed the varieties of these health professionals and their specific duties. Indeed, in professional settings, there are a range of roles related to caregiving, each with distinct duties and responsibilities. Here are some common types of professional caregivers. (<https://helpfulprofessor.com/types-of-caregiver/>) (<https://www.griswoldhomecare.com/be-a-caregiver/who-are-caregivers-/types-of-caregivers/>) (<https://jevsathome.org/types-of-caregivers/>).

- Home Health Aides and Personal Care Aides: These professionals help with daily activities, health-related tasks, and provide companionship;
- Nursing Assistants and Orderlies: They work in healthcare facilities and assist with basic care tasks under the supervision of nursing staff;
- Licensed Practical Nurses (LPNs) and Licensed Vocational Nurses (LVNs): These caregivers provide basic medical care and help with tasks like monitoring vital signs, changing bandages and administering medication;
- Registered Nurses (RNs): They offer more advanced medical care, including administering treatments and medications, interpreting patient information, and coordinating patient care.

The World Health Organisation has outlined five key strategies in response to the challenges posed by a rapidly aging population:

- Fostering personal commitment to healthy aging;
- Aligning health systems to better serve the needs of the aged adults;
- Developing chronic care systems to manage long-term health issues;
- Creating an age-friendly environment that caters to the needs of older individuals and
- Enhancing metrics for monitoring and understanding the health and well-being of the aged adults [7].

In many countries, including Bulgaria, care for the aged adults is provided by both public and private organizations. Each type has its own unique characteristics, benefits, and challenges.

The Republic of Bulgaria has adopted a National Strategy for Long-Term Care (2014-2034) [1], aimed at creating conditions for an independent and dignified life for the aged adults and people with disabilities by providing quality, affordable and sustainable long-term care services tailored to the individual needs of the respective person. According to the Action Plan (2018-2021), adopted in Bulgaria, the implementation of national strategy for the aged adults long-term care (LTC) was the main objective. LTC is defined as a group of services and support for people need help to carry out their daily activities and/or need ongoing medical care for an extended period, because of mental and/or physical illness, and/or disabilities,. The Strategy includes:

- Building a network of accessible and high quality services in the community and in homeenvironments, which will provide an opportunity to prepare and remove the aged adults and people with disabilities from specialized institutions;
- Protecting the dignity of and creating an opportunity for independent living for the aged adults and people with disabilities by providing quality, affordable and effective inter-sectoral services for long-term care tailored to the needs of the community and
- Closure of all functionally outdated and unresponsive to the current needs of the target groups specialized institutions for the aged adults and disabled in the next 20 years.

The vision of the Strategy is based on fundamental principles, among which:

- Placing the user at the center of the service and respecting the rights and dignity of people and their inclusion in the decision-making process;
- Accessibility, transparency and non-discrimination in the construction and provision of services;
- Effectiveness and efficiency of services, inter-sectoral interaction and innovation;
- Preventive measures (prevention of institutionalization and unnecessary hospitalization and re hospitalization) and
- Sustainability and long-term effect of the achieved results [8].

With the adoption of the Action Plan 2022-2027, targeted interventions will continue to ensure equal access to long-term care, increase the quality and expand the scope of provided social services with a focus on services in the home environment, support and development of integrated services and the implementation of an integrated approach and integrated support in the coming years. The focus of policy in the field of long-term care should focus on the achievement of three main and interrelated goals - accessibility of services, high quality, and long-term sustainability [9].

A major role in the performance of the above-described tasks is entrusted to social patronage. Social patronages, also known as social care homes or patronage's care, are public institutions in Bulgaria. These institutions are known for their role in providing social services in the community. The Municipal enterprises "Social Patronage" are specialized social institutions with the purpose of providing social services in the community.

The variety of social services are: preparation and delivery of food to homes with specialized transport, household services, assistance in obtaining general and specialized medical care, social work for supporting the social reintegration of lonely, aged adults people, children, youth and aged people in a disadvantaged social situation.

2. Objectives and Methods

The methodology used in survey identifies the needs and preferences from the target users. The respondents of the survey are professional caregivers, and social workers from Social Patronages in the five largest cities in Bulgaria. The rationale behind this is that social caregivers are most familiar with the activities related to the care of the seniors. For this reason, the authors believe that their knowledge of the field can be an important and objective source of information regarding the functionality of an elderly care platform. That's why the focus is on the impact of digitization on their activities and needs in five objectives.

- Objective 1: To identify the environment of the social caregivers in Bulgaria. What has been done so far in the field of research, applied projects, developed platforms and devices?
- Objective 2: To identify the needs, preferences and requirements of the aged people and their relatives and caregivers related to decision makers.

- Objective 3: To contextualize the requirements of the services, according to the needs and the environment analyzed.
- Objective 4: To outline which of caregivers' activities can be streamlined by development of respective caregiving platform.

According to objectives these questions were aimed at understanding the potential benefits of digital support in their daily work activities and the types of digital support that would benefit the customers they serve. The questionnaire composed of following three questions

- Q1: What specific work in your daily practice could benefit from some kind of digital support?
- Q2: What activities in your daily work with aged people take most of your time?
- Q3: What kind of digital support would benefit the customers of the caregivers?

Each question covers following four categories: 1. Health and Wellness Monitoring; 2. Other sensors; 3. Communication and 4. Administrative.

In each category, a predefined set of options is established to address specific needs and challenges. Needs and challenges were predefined according to expectations of interviewing team. Additionally, an 'Others' option was included for more comprehensive responses.

The survey was distributed to 96 workers from social patronages across six Bulgarian towns, with a gender distribution of 85% female and 15% male participants. Each participant was given 100 points for each category. The participants were asked to allocate these points across the options, with the distribution based on the perceived importance or relevance of each option, according to their personal experience or expectations. An additional option 'Others' was added to reflect specific needs and challenges not included in the questionnaire. After the participants finished filling out the forms, the points assigned to each identified need or challenge were summed up and normalized in percentage of total score. This process took into account the total points per question and category, with the overall sum being 960. Each category and question received a Total Rating based on the predetermined sum of percentage of predefined options except Others. These scores indicate the extent to which the predefined needs and challenges align with their daily work activities, as well as their insight into how and when digitization can enhance these activities. For each option an averages for the three questions were computed. In the end an overall Total rating for each category was computed as average of total ratings of questions.

3. Results and discussion

The results in percent of processed answers from all 96 respondents are presented in Table 1.

The column Category contains category names. The column Needs and Challenges contains names of predefined options including Others. Columns Q1, Q2, and Q3 contain the normalized evaluations per option and per question. The last column contains Averages ratings per option and per category. The rows Total Ratings contain sums of values of predefined options except Others.

Table 1 Summary of Caretakers' Responses

Category	Needs and Challenges	Q1	Q2	Q3	Averages rating of category based on choices, %
Health and Wellness Monitoring	Blood pressure	16.67	6.08	8.33	11.38
	Pulse	8.33	3.12	6.56	5.73
	Sugar Levels	8.33	4.89	6.78	6.61
	Sleeping patterns	5.17	2.54	4.78	3.86
	Medication Intake Tracker and Reminder	25	8.54	12.64	16.77

	Health data feedback	4.17	3.45	3.78	3.81
	Emergency button	12.5	4.17	8.52	8.34
	Others	19.83	67.21	56.94	43.52
Total Rating		80.17	32.79	43.06	56.48
Other sensors	Fall sensor	25	8.17	17	16.72
	Smoke detector	9.33	6.34	5.17	6.95
	Flood detector	4.17	4.35	5.17	4.56
	Turning off appliances	4.17	2.48	4.17	3.61
	Movement sensors	15.83	14.17	8.33	12.78
	Emergency alarm	12.5	7.17	8.17	9.28
	Door opening sensors	5.17	3.37		4.27
	Others	23.83	53.95	51.99	41.83
Total Rating		76.17	46.05	48.01	58.17
Communication	Contact with caregivers	25	7.14	13.33	15.16
	Contact with family	12	3.57	16.67	10.75
	Contact with doctors	4.56	7.14	13.33	8.34
	Acquiring prescriptions	6.17	7.14	9.67	7.66
	Smart contacts	4.17	7.14	5.33	5.55
	Sharing news / keeping them informed	12.5	0	6.67	6.39
	Video contact	12.08	7.14	3.23	7.48
	Internet	0	7.14	6.33	4.49
	Others	23.52	53.59	25.44	34.18
Total Rating		76.48	46.41	74.56	65.82
Administrative	Accompanying them to doctors / institutions		43.75		43.75
	Administrative work	12.5		8.06	10.28
	Organizing of events	18.75	6.87	12.34	12.65
	Preparing documents for submission	12.5	16	18.75	15.75
	Kitchen staff support	6.25			6.25
	Others	50	33.38	60.85	48.08
Total Rating		50.00	66.62	39.15	51.92

The category that received the highest rating according to the survey, as expected, was Communication. This category is most relevant to the daily activities of social workers, and the authors, also see considerable opportunities for work optimization in this area.

The scores for questions related to Other Sensors and Health and Wellness Monitoring were closely matched. These scores reflect the expectations of social workers regarding the applicability of a proposal in the questionnaire for monitoring the health and living environment of caretakers.

The low score of Administrative reflects the belief that current digital approaches at the very least can improve the efficiency of caregivers' activities. Further improvements could be realized through the continued development of e-government and the introduction of software interfaces to external systems, such as a digitized system for aged adults care (Fig. 2).

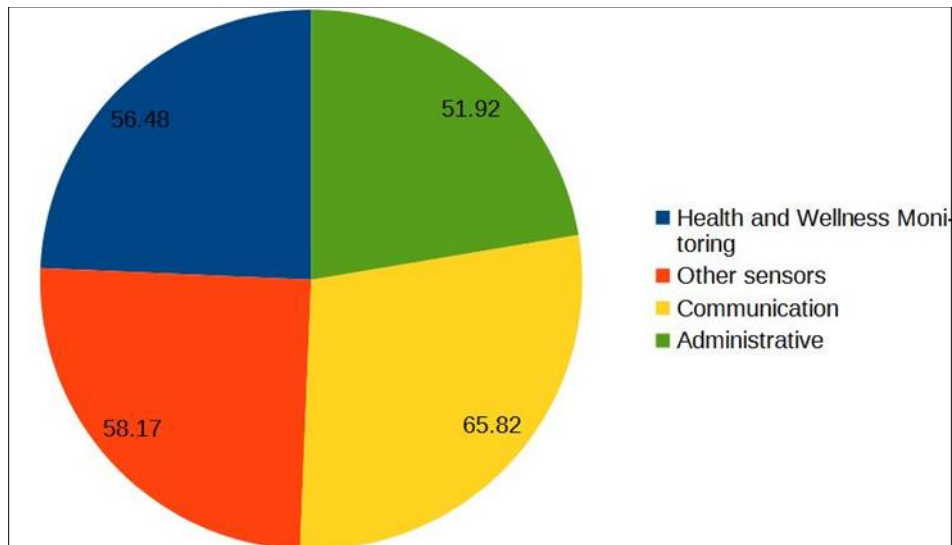


Figure 2 Answers from Table 1 Total ratings per category

In the following sections, we will provide further explanations for each need and requirement. The focus will be on the highest-ranked items in each category.

The first focus is on “Others” option for Needs and Challenges in the questionnaire. The average score of 34.29 for Needs and Challenges was clarified by social workers, who cited activities like using public transport to travel to their caretakers' locations, performing nursing duties such as changing diapers and cleaning bodies, cooking, and buying food. Furthermore, a portion of their daily activities is devoted to completing administrative forms.

Regarding Administrative activities, with lowest score - 51.92, travel to caretakers and institutions, as well as waiting in lines to submit administrative documents, consumes a considerable portion of their work time. The e-government system in Bulgaria is not yet fully developed, which means many forms and documents still need to be filled out manually.

With respect to Health and Wellness Monitoring, and Other Sensors, the interviewed participants mentioned additional sources for health-related data. These include computer tomography (CT), X-ray, Magnetic Resonance Imaging (MRI), chest auscultation with a doctor's stethoscope, blood tests, urine analysis, and more. However, integrating this data with medical centers is a complex process. To alleviate this issue, the authors propose storing these images and other measurement information on shared disk space, accessible only to users who have obtained consent from the data owners.

The answers related to the Communication category, ordered by the priority given to each question presented on Fig. 3. The needs expressed in the survey, such as Contact with Caregivers (15.31), Contact with Family (10.75), Contact with Doctors (8.34), and Video Contact (7.48), could be addressed by providing a telecommunication platform that allows for audio and video calls between all involved parties. This will enable aged individuals to reach their doctors, relatives, friends, and service staff as needed. These parties, in turn, will also be able to initiate contact with the aged individuals. By implementing such a video communication platform, along with the use of several health monitoring devices, certain visits to the doctor could be avoided potentially. This could significantly reduce the workload for social patronage employees, whose expressed need for accompanying aged adults to doctor visits received a score of 8.34.

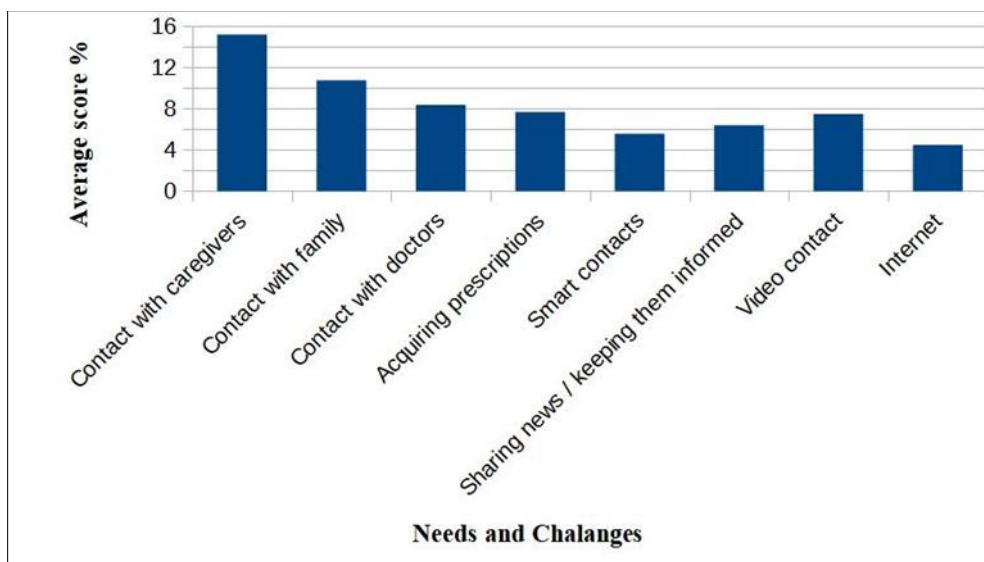


Figure 3 Communication category

The responses and their corresponding weights for questions from the Other sensors' group are illustrated by Fig. 4. As it can be seen, the Fall sensor (16.72), Movement sensor (12.78) and Emergency alarm (9.28) have highest scores. The participants in that interview expressed a need for a device capable of signaling, when an aged adults individual has fallen and requires assistance. Such a device has already been developed. Resembling a car key in size and appearance, it features several buttons, one of which is an emergency alarm that the aged adults person can press in the event of a fall. The device also automatically triggers in the event of a sudden change in direction or location. If the device is accidentally dropped without a fall occurring, a cancel button can be pressed to abort the alarm. If this button isn't pressed, a signal is sent to administrators, a call center, or relatives, who can then respond and provide help to the individual. As such, this device serves simultaneously as a fall sensor and an emergency alarm, fulfilling two crucial needs indicated by both pilot sites with scores of 16.72 for the fall sensor and 9.28 for the emergency alarm. Additionally, cameras could be installed in the home to improve service quality by allowing confirmation of fall incidents through visual verification. This would be especially pertinent for aged people individuals living at home.

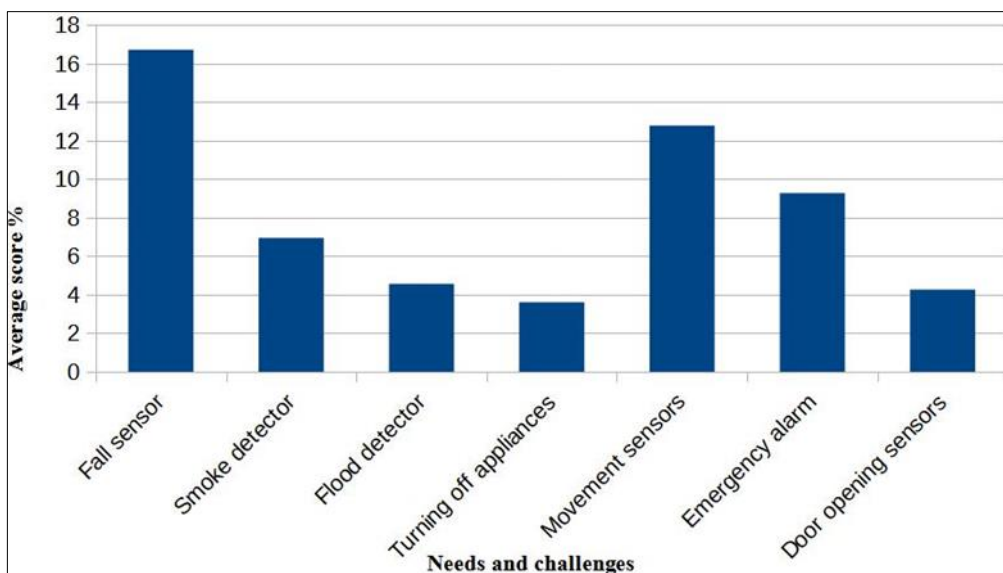


Figure 4 Kinds of proposed sensors

The ratings of responses to questions in the 'Health and wellness monitoring' category are presented on Fig. 5. A medication intake tracker or reminder (12.5) could be particularly useful for clients living at home, as they may often forget to take their medication. Moreover, this could increase visibility for doctors and service personnel regarding their adherence to the medication regimen. This need could be addressed by creating a calendar that includes time slots for

specific medications. An alert could then appear on the client's screen at the set time to remind them to take the corresponding medication. To dismiss the alert, the client would need to press a button confirming that they have taken the medication. This confirmation could then be sent as a signal to selected parties, such as staff, doctors, or relatives. Moreover, this system could also contribute to the general safety of the seniors. If the alert remains unresolved for a certain period, indicating inactivity, it could signal potential issues with the client's responsiveness. This could then trigger a check-up call from a call center or staff.

Health Data Feedback - This need was articulated in general terms, referring to devices capable of routinely providing health measurements to customers, thereby granting them a sense of reassurance and knowledge. Such devices could include those for measuring blood pressure (8.33), pulse rate (5.56), and blood sugar levels (2.78), among others. Furthermore, daily questionnaires for the old persons could be developed to gauge their overall health and well-being each morning. These questionnaires could be customized, with the responses determining subsequent actions. If responses are satisfactory, the system would acknowledge that the customer is doing well. If responses are inconclusive, the system would alert the administration, staff, or a call center to investigate further. Alternatively, certain responses could trigger an alert, immediately establishing contact with a doctor. The system would store the history of their responses, along with any taken health measurements, providing the senior citizens with health data feedback either every morning or on-demand.

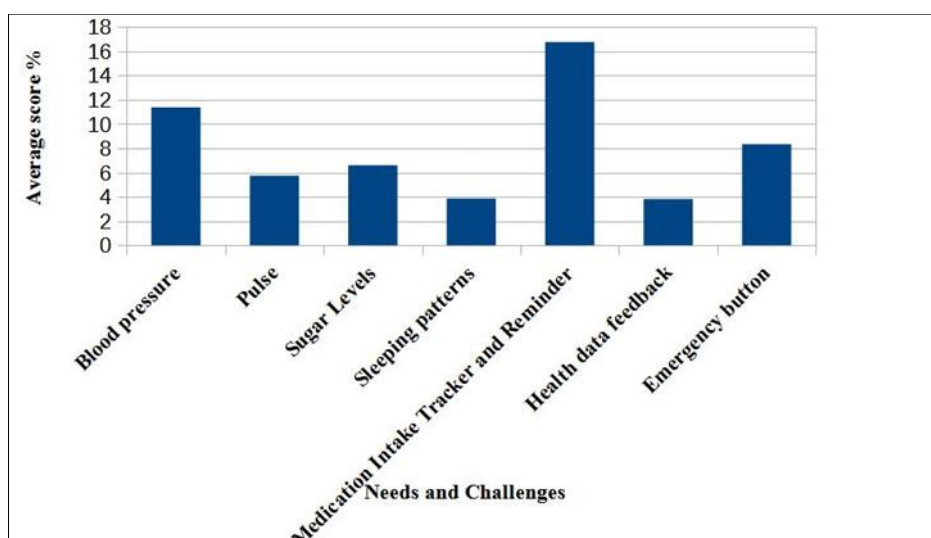


Figure 5 Health and Wellness Monitoring

The responses from the Administrative section of the questionnaire referred to Fig.6. The following scores were observed: General Administrative Work / Accompanying Them to Doctors or Institutions (43.75) / Preparing Documents for Submission (15.75) - This generally signified an improvement in the daily administrative processes taking place at each deployment site. One suggested improvement is the digitization of some documents and databases, which could later be submitted electronically to institutions. Additionally, providing tools to better reach customers, such as adding events to their calendars (Organizing of Events 12.65) could also be beneficial. Another aspect to be addressed is the intake interviews, where the specific needs of the customers are discussed. Here, notes on their condition are taken and personalized healthcare plans are established. These processes could be transformed by creating digital files for each client, where data can easily be amended. In this setup, customers would have full visibility of their status and input, and control over data sharing.

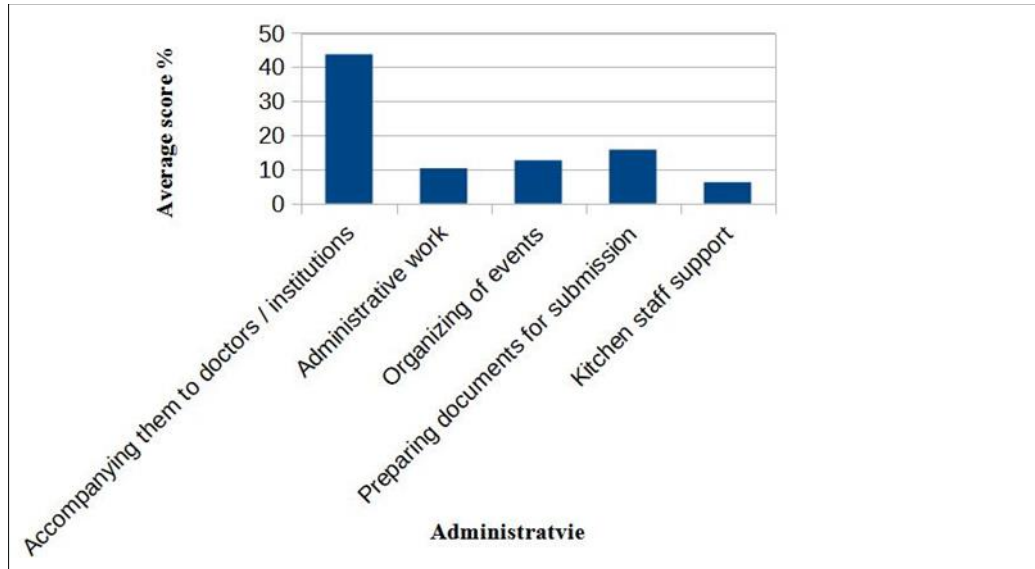


Figure 6 Distribution of administrative activities

Currently, for Social Patronage in particular, intake interviews and all documentation are paper-based. Digitization would significantly streamline their tracking process. Furthermore, by digitalizing customers' calendars (as suggested under Fall Sensor) and scheduling visits, staff members could better organize their time and have more visibility over their workload and upcoming agenda.

4. Conclusion

Following the research conducted, we achieved several key objectives:

- Identification of Optimization Opportunities: The work environment of social workers was recognized as having numerous activities that can be streamlined through digitization. However, it was also noted that further enhancements in several other activities depend on the deeper integration of digital solutions at municipal and state levels.
- Clarification of seniors needs: Drawing on social workers' expertise, we differentiated the primary needs of the elderly that can be addressed through digitization from those that remain beyond the scope of digital solutions.
- Contextualization of Requirements and Services: The needs and services were analyzed and contextualized to better understand and address them effectively.
- Definition of Essential Functionality of Aged Persons Care Platform: As a direct outcome of achieving the fourth goal, we formulated a comprehensive list of functions. These functions are tailored to meet the most pressing needs social workers, thereby providing a focused approach to care and assistance.

The list of that functionality follows:

- Implement a fall sensor device, cameras, and an internet connection to send signals. The platform should be designed to automatically place a call to a preferred party when an alarm is triggered;
- Establish a video platform and internet connection for effective communication;
- Integrate data acquisition from medical measurement devices. The system should be designed to regularly send data and trigger an alert when it reaches a certain threshold;
- Implement self-assessment questionnaires. The system should be designed to trigger a call either by a call center representative or directly by a doctor based on certain responses;
- Implement a personal schedule for each customer for better time management;
- Design a system that alerts staff or relevant parties when a customer hasn't confirmed they have taken their medication for a certain period of time;
- Consider the possible usage of cameras, strictly conforming to the General Data Protection Regulation (GDPR);
- Apply home sensors that, once triggered, send an alert directly to the call center or staff who can then activate a camera to investigate and call the emergency center if needed;

- Maintain a shared space for data related to the health status of caregivers, such as computer tomography, X-ray, and Magnetic resonance images. This could also include other data like results of self-assessment questionnaires, drug prescriptions, etc. Access to this personal data should be allowed only after obtaining consent from the data owner and
- Ensure strict support of GDPR across all processes and systems.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors: Mariyana Ivanova Lyubenova, Alexandre Ivanov Chikalanov and Yuliyana Ivanova Petkova declare the absence of any conflict of interest in the publication of this study.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

References

- [1] Population and social conditions Collection: Statistical books. European Union, 2019. Editors Strandell H., Pascal Wolff P. PDF: ISBN 978-92-76-09815-7. doi:10.2785/811048
- [2] <http://foryou.bg/wp-content/uploads/2019/02/ANALIZ-NA-GRIZHATA-ZA-VAZRASNI-HORA.pdf>
- [3] Janssen F, Szende A, Cabases J, Ramos-Goni M., Vilagut G, Koenig H. Population norms for the EQ-5D-3L: a cross-country analysis of population surveys for 20 countries. *The European Journal of Health Economics*. 2019; 20:205–216. doi.org/10.1007/s10198-018-0955-5
- [4] Bruner K, Ada-Katrin B, Händler-Schuster D. Exploring Health-Related Needs of Elderly People(70+) at Home: A Qualitative Study From Switzerland. *Journal of Primary Care & Community Health* 2021; 12: 1–7. doi: 10.1177/21501327211055635
- [5] Lee MK, Oh J. Health-related quality of life in older adults: its association with health literacy, self-efficacy, social support, and health-promoting behavior. *Healthcare*. 2020; 8(4):407.doi:10.3390/healthcare8040407
- [6] NATIONAL STRATEGY FOR ACTIVE LIFE OF ELDERLY PEOPLE IN BULGARIA (2019 - 2030), MINISTRY OF LABOR AND SOCIAL POLICY in the Republic of Bulgaria.
- [7] Laleva K., Georgieva L. TYPES OF CAREGIVERS. *Varna Medical Forum*. 2016; t. 5/ appen. 4: 347-351.
- [8] World Health Organization (2018). Aging and Health Basic Facts. <http://www.who.int/en/news-room/fact-sheets/detail/envejecimiento-y-salud>.
- [9] ACTION PLAN FOR THE PERIOD 2018-2021 FOR THE IMPLEMENTATION OF THE NATIONAL STRATEGY FOR LONG-TERM CARE in the Republic of Bulgaria.
- [10] ACTION PLAN FOR THE PERIOD 2022-2027 FOR THE IMPLEMENTATION OF THE NATIONAL STRATEGY FOR LONG-TERM CARE in the Republic of Bulgaria.