



# Using Public Registers for Development of Electronic Demography System: The Case of Azerbaijan

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Received 15 Dec. 2020, Revised 22 Mar. 2021, Accepted 03 Apr. 2021, Published 25 Nov. 2021

**Abstract:** E-demography is an effective tool for conducting social studies and monitoring population data at various levels and sections and is considered as one of the key components of e-government. The population register data is currently used in demographic researches, studies on the use of data from other public registers, as well as the formation of an e-demographic system, include very limited areas. The aim of the paper is the development of an e-demography system using public registers. The paper examines the existing research in the field of e-demography and approaches to the formation of e-demography on the basis of the population register. Integration of public registers using personal identification number was reviewed. All data collected in public registers have a great role as an important source for demographic research. The paper proposes a conceptual model of an e-demography system based on public registers in the case of Azerbaijan. The transfer of personal-oriented data from public registers to the e-demographic system provides broad opportunities for the study of individual characteristics.

**Keywords:** E-government, E-demography, Demographic Characteristics, Population Register, Electronic Register

## 1. INTRODUCTION

The relationship between demography and other sciences allows analyzing demographic processes, investigating causes and making forecasts. Demography as a field of multidisciplinary research is the study of event and process patterns occurring in the structure, location, migration and dynamics of the population based on social, economic, cultural, biological and geographical and the other factors. In other words, demography is a multidisciplinary field of research that studies population, change in birth and death rates, migration, age structure, national and ethnic composition, geographical location of the population, its dependence on socio-economic, historical and other factors [1, 2, 3].

Currently, demography is an innovation driver for all sciences and is energized by exchange of ideas with other disciplines [3]. In the digital age, introduction and impact of the Internet, social networks and smart phones on human life are considered to be new sources of information and data for the study of demographic behavior. The scientific direction that we can call data science or electronic demography (e-demography), is the innovation driver for all sciences and is energized by the exchange of ideas with other disciplines or scientific fields [3, 4]. By forming the core of the e-government, e-demography enables the study of digital technologies impact on demographic behavior and the use of new data

sources for deeper and detailed study of demographic processes [5]. The formation of e-demography is one of the topical issues for the management of demographic processes and the implementation of the purposeful demographic policy. The concept of e-demography is used in research to study demographic processes on the electronic government (e-government) platform. Conducted researches show that e-demography can measure and forecast demographic changes using personal data collected in registers and various databases, as well as determine the demographic behavior of citizens. The main aim of the paper is the development of e-demography system on the basis of a single public register. Existing experience shows that one of the important problems is relating to the integration of public registers. Because in many countries public registers, as well as population registers developed separately in different platforms and software. Development of e-demography system needs integrate of this registers a single public register. We reckon that public registers must be integrated and all data collected in a single register is an important source for demographic research. Note that e-demography has a potential importance for all areas of population research, from social demography to population geography [4]. For example, we can note issues such as the social networks effect influenced to



people's behavior, effect of technologies on intergenerational relationships, or effect of online dating on family formation.

The implementation of effective demographic policy in the country is considered as an integral part of the e-government system and necessitates the creation of centralized register and systems covering demographic characteristics by assessing and analyzing the current demographic situation and making effective decision-making processes. The paper is dedicated to the formation of e-demography system for conducting demographic research on the e-government platform. For this purpose, in section 2. the related work and international experience in the field of demographic research and the conceptual basis for forming an e-demographic have been studied. In section 3. the conceptual views and approaches to the formation of e-demography based on the population register were reviewed. In section 4. the architectural principles of e-demography system and registers integrated into e-demography system in the case of Azerbaijan has been examined.

## 2. EXISTING STUDIES IN E-DEMOGRAPHIC FORMATION FIELD

Historically, demography was first used as a term in the 19<sup>th</sup> century and formed as a science about the population. Close relation of demography to other sciences and the intersection of these sciences has resulted in formation of different research areas such as historical demography, economic demography, population geography, medical demography, family demography, migration demography, etc. The relation of demography with other sciences has allowed for in-depth analysis of demographic processes, the study of causes and the forecasting of trends.

For many years, countries have been conducting censuses to obtain information about the population, its demographic, economic and social characteristics. However, the data collected as a result of the census was statistical in nature, significant for a specific date, and many factors, such as migration, time distribution etc. were not taken into account. Considering these shortcomings, the formation of e-demographic system that allows continuous monitoring of the demographic and migration situation on the e-government platform is very important in terms of building an effective management system. E-demographic system - will allow the government to meet the needs of the population more effectively and accurately determine the strategic directions of future economic and social development [5]. Providing online registration and monitoring will help minimize time for administrative decision-making, increase administration efficiency in government and municipal bodies in general and reduce time spent on public services. The e-demographic system will also

facilitate the abolition of traditional censuses, online censuses and the conduct of various socio-demographic surveys at the macro, regional and individual levels.

At present, anyone can potentially collect information in various forms for their own use or research purposes, and even use mobile phone applications to monitor their health status. Although this process is completely decentralized on the one hand, on the other hand, the use of these new sources, their centralized collection, storage and processing must be carried out through the e-demographic system. Similarly, the Wikipedia platform can be portrayed as a revolutionary form of mass collaboration or collective intelligence that seeks to convey knowledge, surpassing professional scholars. For example, in study [6] was able to analyze lifelong social relationships between parents and children, as well as their spouses using data collected on the *WikiTree* website.

Analysis of the literature shows that recently, various necessary studies have been conducted to study the population, determine demographic behavior and characteristics, and investigate new sources of information [3-5, 7-11]. There are various approaches in the literature to the usage of digital data in the study of demographic events. For example, while the use of Internet data to study fertility potential in the country is still in its primary stage, but it is believed that promising results will be achieved. Research in this area attempts to study and monitor demographic behavior by analyzing search engine queries [3, 12].

E-demography - using all personal data (even insignificant at first glance), can measure and forecast demographic changes by assessing the consequences of the digital revolution, as well as determine the demographic behavior of citizens [5, 12]. The study [4] examines the opportunities and problems of conducting a demographic research based on Internet data. The study shows the methodological aspects of obtaining necessary information from big data generated on a social network platform using intellectual analysis methods.

In many countries, citizens are encouraged to use a variety of tracking devices to reduce health or safety related risks. Daily information on the health and recreation of citizens is collected through monitoring devices and transmitted to the database of relevant organizations [13, 14]. Although there exists a high risk of theft of personal data based on information collected on tracking devices, this information can provide more accurately assess population density, economic growth, poverty or migration in a country. Data related to gender issues, birth, education, family and social relationships, personal interests etc. acquired through tracking devices and social networks can be used in socio-demographic assessments for different groups of the population [15].

Huge Internet projects such as *Facebook*, *Google*, *Twitter*, *Yandex*, etc. are the main sources of information



in e-demography [4, 5]. It is possible to specify the demographic characteristics of the countries using the data collected in the analytical systems of these projects. Many private companies are also trying to make effective use of demographic indicators collected in a virtual environment in order to increase the conversion rate and gather the necessary users. For example, advertising banners sent to user's personal page on *Facebook* are selected based on the user's age, income, interests, gender, employment and free time. These parameters are important for in-depth demographic analysis. The increasing availability of geographic information on Internet sources has been beneficial for migration research. Travel routes, migration routes or maps, as well as maps, nature images and video files obtained using various open virtual projects, including *Flickr*, *Twitter*, *Google* projects (*Google Latitude*, *Google map*, etc.), *Facebook*, *Wikipedia*, *Yahoo* are formed by using geographic location information [12-15].

Obvious that, population statistics, census, population health data, disease statistics, etc. are the sources of traditional demographic research. The main sources of e-demographic research are search queries on web browsers, social media data and data collected in public registers, e-service data, citizen satisfaction indicators, feedback on government-citizen relations, etc. The analysis of big data collected in mentioned sources will allow to complete the existing researches and to generate new ideas and obtain knowledge related to demographic behavior.

In the research [5], the formation of the e-demographic system on the basis of a single public register for demographic research was proposed. The study explores international experience in the use of data collected in population registers to study demographic characteristics. Experience demonstrates that although the data of population registers are currently used in demographic research, there don't exist approaches to the use of data from other public registers and the creation of the e-demographic system. Note that different e-demographic models may be offered depending on the priorities, e-government building models and strategies of the countries. The study proposes to conceptually build an e-demographic system based on a single public register. The advantages of using *Big data*, *OLAP*, *ETL* technologies for demographic data analysis were demonstrated and suggestions were provided.

In [16] creating a linked consumer register for granular demographic analysis was examined. As shown in the study, enormous share of the adult population frequently assents to provide data on their place of residence to local governments when registering for services. The research describes how careful curation, linkage and analysis of sources of consumer and administrative data can resolve many questions of content and coverage, resulting in comprehensive, highly disaggregate, and frequently

updateable representations of population structure. Results illustrate the applicability and value of the resulting unique data resource through the derivation of an annual small area household change index [16]. In study [17] different approaches and improvements in over-coverage estimation using Swedish total population register data were examined. In the study, researchers assess over-coverage levels across migrant groups, test how estimates of age-specific death and fertility rates are affected when adjusting for over-coverage, and examine whether over-coverage can explain part of the healthy migrant paradox. Results of the study confirm the existence of over-coverage and we find substantial changes in mortality and fertility rates, when adjusted, for people of migrating age. Accounting for over-coverage is particularly important for correctly estimating migrant fertility [17].

The study [18] is based on a short review of previous studies and commentaries on the strengths and limitations of Nordic register data with a particular focus on studies of employment and migration. In the periods of institutional and demographic change in the Nordic countries, the assumption of universal register coverage can be challenged. The Nordic registers are an extraordinary resource for public health researchers, but continuous quality control and assessment of validity and completeness will be crucial to maintain relevance in a transitioning society [18].

The study [7] demonstrates that data collected from Google-based "pregnancy" or "birth" queries can be used to forecast birth potential and birth numbers several months in advance. The most important result of this research is the increase in the forecasting power of the demographic model based on the use of data from a new source, such as web search, in addition to traditional data sources. In study [11] demographic differences in the use of *Facebook* around the world were examined. Data from advertising platform *Facebook* was used to investigate demographic inequality patterns in *Facebook* used in countries. The researched issues include differentiation of *Facebook* users by age and gender, variation of size of friendship networks by age and gender, and determination of the demographic characteristics of specific subgroups of social network users. Obtained results provide new insights into gender inequality in the online environment, and some of the nuances of demographic differences in the adoption and use of digital technologies. In [19] new sources for population research in the digital age were explored. The paper highlights the importance of digitalization and bibliometric databases, digital footprints on social networks, and the Internet of things for demographic research as new sources of information. The technical and ethical challenges posed by these information sources, as well as the opportunities they offer to study traditional and digital demographic dynamics around the world are discussed.



A new approach was proposed to automatically detect the epidemic among the population using web surveys in the study [20]. The study found that analytical processing of disease and drug queries sent to *Google* search server was very useful and successful in tracking flu symptoms and identifying potential epidemics. But at the same time, the analysis of web surveys from time to time has led to miscalculations. This usually occurs when the content of the connection between searches, news, and behavior changes [20, 21]. Information on the citizens geographical location of, natural conditions and economic situation in the area is used for various purposes on social media. Based on these data, population, growth and migration trends are studied at the individual and government levels [21-25].

Nowadays, mobile phone communications and network data are used to determine displacement in the country or migration in a small region, as well as patterns. Studies show that the use of big data for demographic research is increasing [26]. In the future, along with web content, the analysis of big data collected in the e-government environment, public registers and databases of private companies by intellectual methods will create conditions for more in-depth demographic research [27, 28].

Establishment of e-demography system in e-government platform is based on demographic processes, creation of a personal profile, ensuring reproductive health and reduction of morbidity and mortality of the population, improvement of living conditions of the population, sustainable census, regulation of migration and processes, development of human and scientific potential. In the context of demographic development, the sustainability and development of society means optimal population growth and the choice of an optimal path in the management of society. Demographics can be assessed by country, region, region, and district. In this regard, demographic surveys can be conducted at the government, regional and individual levels [5, 15].

E-demography has the potential to explore various areas of traditional demography (social demography, population geography, etc.) using all the capabilities of ICT [1, 3, 4]. E-demography as a field of science can be divided into two main areas: research in the field of e-demography and the impact of e-demography on other sciences [5].

As the monitoring and analysis of demographic processes in the formation and sustainable development of e-government is very important, the issue of creating and coordinating various electronic registration documents (registers) must be addressed first. Works on creation of population registers in various countries began in the 1970s. However, despite the creation of separate information systems, in many countries, creating a single population register for the country for various reasons

such as lack of funding, unfit level of ICT, etc. was impossible [29, 30]. Today, in developed countries, the population register is created not only by government agencies, but also by giant banking systems and insurance companies, and the work is carried out with the pretext of determining the social status and purchasing power of citizens [31].

In recent years, efforts have been intensified to create a single population register. For example, it is noted that a single population register will be created in the Russian Federation by 2025 [32, 33]. The population register to be created will collect information about all people living in the country and will be updated online. During the 2020 census, citizens will be able to freely fill out and submit their surveys through the public services portal. From the moment a person was born, the information will be included in the register. In general, all information available to the authorities will be included in the register and information will be exchanged online between government agencies [33].

### 3. APPROACHES TO FORMATION OF E-DEMOGRAPHY BASED ON POPULATION REGISTER

Historically, government agencies have been the monopolistic party in the collection, management and storage of information while studying the socio-economic situation of the population, conducting censuses and administrative records. The data used in research of demographic processes has been large in each period. The main advantage of demographers in the Scandinavian countries was the use of personal registration data in demographic surveys, and later efforts were made to expand and coordinate individual census data and other registers to countries such as Belgium and the Netherlands [34].

The development of e-government ensures the replacement of the traditional census process with an intelligent system based on big data collected in public registers. Such system is very significant in the management of demographic processes, decision-making and forecasting. In order to manage demographic processes, the building of e-demography platform using modern information technologies is very important. The establishment of national demographic system will provide the analysis of demographic processes, ensure the reproductive health of the population, improve living conditions, strengthen the families, address migration processes and develop human and scientific potential in the demographic field.

According to the UN Demographic and Social Statistics Report, almost all registers used for statistics in Northern European countries in 2008 applied the Personal Identification Number (PIN) [35]. There also exists PIN system available for other registers, such as commercial, address, housing, etc. Currently applied technologies



allow connecting all existing public registers in a short period of time using only the PIN. As noted in the UN report, one of the reasons for such successful development of administrative registers in Northern European countries is the small, compact and homogeneous population of these countries. In big countries, the creation of government-level administrative registers seemed more problematic due to technical, organizational and other limitations. Currently, e-government platforms successfully implemented in countries have a wide range of opportunities and tools for the integration of registers and the creation of a single infrastructure [32, 35].

The PIN system was first introduced in the Scandinavian countries, in 1947 in Sweden, in 1961 in Norway, and in 1964 in Finland [5, 35]. One of the main factors that enable using the data collected in public registers statistically is the existence of a single identification system or a single identification number for different sources and resources. In the absence of a single identification system, to coordinate and integrate different registers is very difficult. From this viewpoint, it is apparently possible to conduct statistical analysis on the basis of data collected in the registers. As a minimum requirement, at the individual level a single identification number for the base registries is accepted as the basis. It is analyzed in different registers based on the PIN, thus creating a virtual "cloud" of each citizen. Different clouds can be combined in accordance with different criteria (education, medicine, migration, etc.). The data in the registers constitute Big Data, and the PIN allows a large number of data to be linked and the relationships between them to be identified.

Recent studies have examined the use of data collected in population registers as a new source of information for demographic research and statistics [30, 36, 37]. For conducting demographic statistics, national statistical offices have implemented a number of initiatives for the transfer of demographic data from population registers [8, 36, 37]. Although the history of population registers dates back to ancient China, the creation of centralized registers began in the second half of the twentieth century. Population register is less well-known and documented than other demographic information systems (civil status acts, censuses, surveys, etc.). If we take a look at world experience, population registers are not available in every country, but they are used in many developed European

countries [8, 19, 36]. The use of population register data in statistical research is very important in terms of assessing the population and socio-demographic structure over time, as well as changes in number of population and the assessment and analysis of its individual indicators.

Population register is based on the exchange of both aggregated data and individual data between integrated databases [38]. In the register of civil status acts, registration of birth and death, registration of marriage and divorce, registration of change of name, patronymic and surname, etc. data are collected. Using the personal identification number, the population register connects the register of civil status acts with the data of various administrative registers (for example, social welfare, taxes, education, etc.) [38, 39]. Table 1. provides information stored in the population register based on the experience of various international organizations and countries.

Thus, the population register is constantly updated to include birth, death, marriage, divorce, change of address, change of name, citizenship and migration and other information and allows the government to store updated and reliable information including tax, voting, immigration, etc. to perform specific administrative tasks. The population register has many advantages, allowing economic and efficient exchange of information between databases belonging to different government agencies on the basis of personal identification numbers. The population register can provide dynamic and updated statistics on the situation of the population, as it continuously links a wide range of population data. This also allows obtaining statistics on various indicators of the population, such as age, gender and region. For example, in Azerbaijan and many other countries, information on education and employment is usually unregistered in the population register, but the PIN-based integration of population register with other public registers makes this information accessible and allows for more detailed analysis and research. The effective functioning of the population register allows individuals to use services more easily and efficiently while maintaining personal security. So the integration of the population register with other registers is based on the coordination of limited information of one person in each register. According to international practice, various government agencies can be integrated into the population register are shown in Figure 1 [40-43].

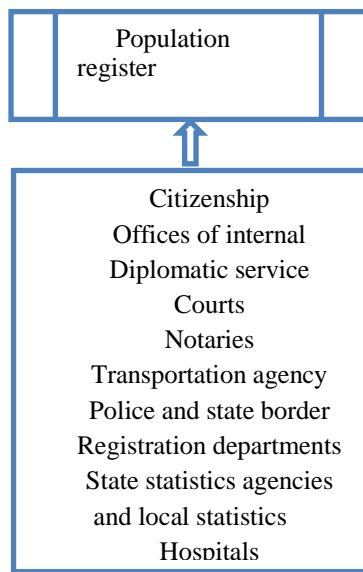


Figure 1. Government agencies integrated in population register

The application of the population register requires the use of PIN for individuals. In many cases, these PINs were identified before the registry was introduced. The main purpose of the introduction of a single code number was to eliminate duplication in the calculation, improve coordination between different public registers and improve tax collection procedures. Currently, the usage of unique identification numbers in all countries with a population register is necessary, and this number is used to update anonymous personal data.

#### 4. STRUCTURAL PRINCIPLES OF E-DEMOGRAPHY SYSTEM DEVELOPMENT

Government register-based demographic surveys are the surveys conducted by government agencies and other organizations that allow analyzing the data chain for each person on the basis of records and stored information. Registers may contain information about the entire population or about a person who has certain characteristics and an incident. In this case, the cataloged, classified information is stored in the register. The collected data can be used to respond to inquiries or to analyze data in the example of any person selected over a period of time. In this regard, the rich experience of the Scandinavian countries in the field of national registers, in particular, creates new opportunities for research. For example, Sweden has a tradition of creating population-based registers or research registers by government agencies or other organizations. Sweden is also one of the few countries with a unique PIN that allows you to link data collected in different registers of a particular person.

The registry service created for research purposes provides a list of all registers and allows you to obtain statistics and individual data for research.

Experience shows that despite the data of population registers are currently used in demographic research, there don't exist any approaches to the use of data from other public registers and the creation of the e-demographic system. For this purpose, the paper examines the structural principles of creating the e-demographic system based on public registers. The proposed approach is based on building the e-demographic system on the e-government platform. We should note that different e-demographic models may be proposed depending on the experience of countries, government structure, national priorities, e-government building strategy and integration of electronic systems.

Conceptually, it is proposed to build the e-demography system on the basis of a single public register. In this case, all public registers, databases and portals must be transferred to the e-demography platform. We believe that if we are talking about an e-government platform, all public registers must be integrated, and all the data collected in the register is an important source for demographic research. If we look at the architecture of the e-demographic system in the example of Azerbaijan, we see that the e-government is more in line with the eastern model. This model includes developing countries, various CIS countries, including Azerbaijan. Separate public registers are integrated into or transferred to the e-government portal. Figure 2 shows the registers and databases that can be integrated into the e-demography system in the case of Azerbaijan.

Experience shows that the creation of public registers model on different platforms using different software, results in various difficulties during their integration, for example, the problem of integration on different platforms, security, not using the PIN number in all registers, etc. Note that among all information collected about citizens on the e-government platform, even the most insignificant data should be taken into account in the system and considered important for demographic research. The proposed conceptual model is based on the analysis of public registry data and is not directly related to the functions of e-government.

Currently, there exists the e-government portal in the country and separate public registers are gradually being integrated into the portal. In this case, after the completion of the integration process of public registers or after the formation of a single public register, establishing the e-demographic system based on it may be proposed.

Whilst the capabilities for demographic analysis are partially expanded and the registry provides biographical data on a person's life cycle and events over a period of time, this information is very limited. From this viewpoint, the analysis of not only the population, but also other public registers, in other words, to create the e-demographic system is important. The transfer of all public registers to the e-demographic system on the basis of the PIN creates ample opportunities for the study of individual characteristics.



Table 2. shows the individual characteristics of the registers and databases transferred to the e-demographic system in the case of Azerbaijan. Creation of an e-demography system has the potential to better understand demographic processes, to conduct more in-depth research, to conduct analyzes at different levels and sections from socio-demography to population geography and medical demography. For example, as shown in Table 2, if we take information about a person as a vector on the basis of PIN (t) depending on time, at different levels and sections, data on indicators such as education, medicine, property, etc. can be analyzed. Let us examine some scenarios to explain which individual characteristics or register data needs to provide demographic research.

*Scenario 1.* Identify the specialties preferred by citizens and age groups who have left the country for educational purposes in the last 5 years. This case using individual characteristics base on PINs from a single public register can be identify the persons as who migrated for educational purposes last 5 years, age groups, gender balance, preferred specialties and so on (as highlighted in Table 2.).

*Scenario 2.* Analysis of demographic processes to study demographic characteristics, ensure gender balance and form an individual profile. This case using PINs can be analyzed as the demographic process, individual characteristics, demographic behavior, regulation of migration, the formation of a personal profile.

TABLE I. DATA STORED IN POPULATION REGISTER

Data to be included in accordance with UN Security Department (2009) [38, 39]	Data and life events to be included in accordance with OSCE approach (2015) [38, 40]	Data stored in population register in accordance with Poulain and Herm (2013) researchers' approach [8]	Data stored in Estonian population register (2015) [41]	Data stored in Public Register of the Population of the Republic of Azerbaijan (2004) [42]
Name and Last name Date and place of birth Date and place of death Name of parents Marital status Divorce, separation in court Dissolution of marriage Adoption	Name and last name Gender Date and place of death Arrival/Departure date Citizenship Parents Spouse Children	Name and last name Gender Date and place of death Parents Marital status Spouse identification Divorce widowhood Citizenship Death	Name and last name Date and place of death Gender, Personal identification number, Citizenship Registration information Means of communication (post address, telephone, email), Date and place of death (cause of death) Marital status Guardianship right Spouse, Parents, Children, Ethnicity, native language	Personal identification number, Last name (previous last names) and name, Patronymic Date and place of birth Gender Citizenship Marital Status Military service status Registration information Identification card information, Biometric data of a person over 16 years of age, Spouse, Parents, Children Date of death

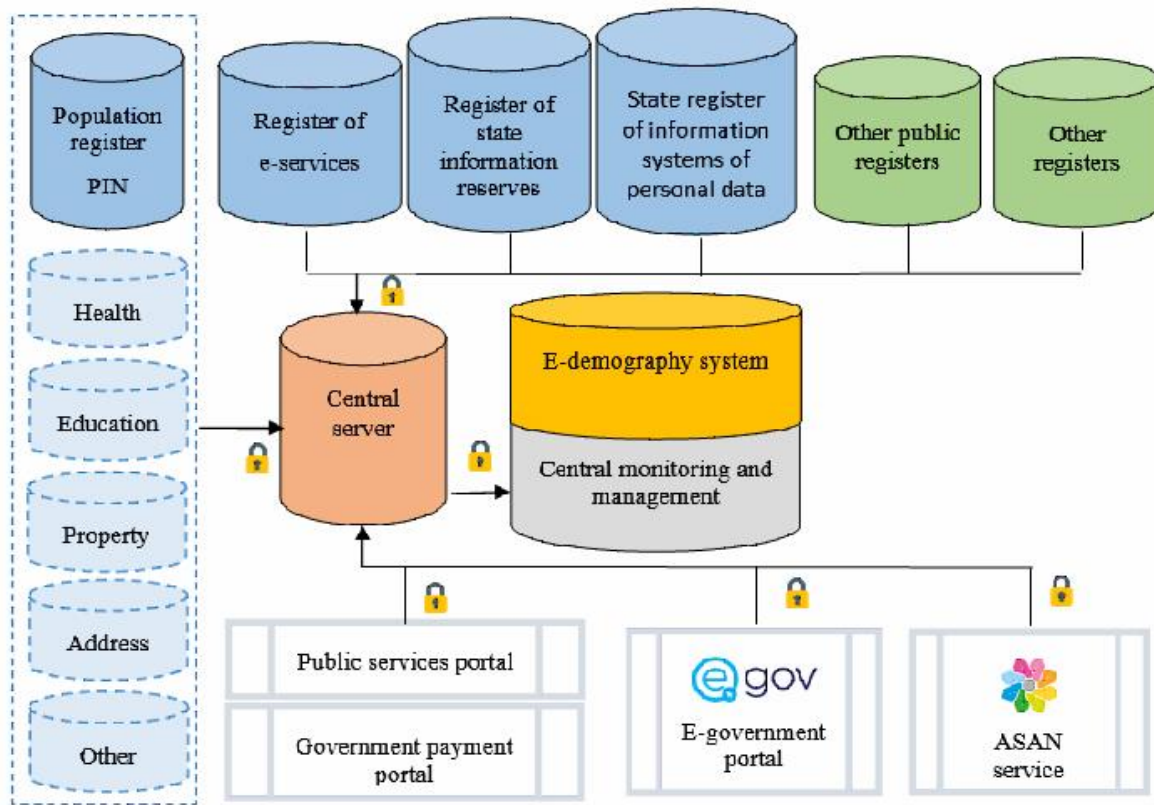


Figure 2. Registers integrated into e-demography system (in case of Azerbaijan)

TABLE 2. Individual Characteristics Transferred to E-Demographics System

	Registers / Database									
	Education	Medicine	Migration	Social welfare	Finance	Justice	Government services	Population	Court	Others
PIN <sub>1</sub> (t)	Diploma Certificate ....	Diseases Health card	Departures: education health	Pension Salary	Funds Transactions	Change of last name Conviction	E-services Government agencies	Date and place of birth	Court cases Verdicts	....
PIN <sub>2</sub> (t)	Diploma Other	Diagnostics	Arrival to country	Social status	Credits	Notary	Communal services	Parents, children	Sanctions	....
....	....	....	....	....	....	....	....	....	....	....
PIN <sub>N</sub> (t)	Vocational education	Disease history	Arrival of foreigners	Statistics	Tax	Civil status act	Fields	Marital status	Civil, family and criminal cases	....





the functionality and strengthening the infrastructure of health care institutions. In this case, can be analyzed as the population health data, ensure the reproductive health of the population, disease statistics in regions, improve living conditions, develop e-health system and so on.

There also exist broad opportunities for socio-demographic research in different areas, the study of demographic characteristics in one area and the study of demographic behavior. Although the data collected in the separate registers are structured, the intellectual analysis of the big data collected in these sources will allow to deepen the existing research and gain knowledge related to demographic behavior.

Modeling-based approaches are frequently used to forecast demographic processes [44]. E-demography focuses on modeling relationships among specific groups of the population and building strong relationships with empirical data from social networks [45, 46]. The use of demographic modeling can facilitate the use of computational modules for scenario generation and help to overcome the constraints that may arise in obtaining certain data. Modeling can also be used to study how different scenarios can affect an individual's behavior or certain groups. The implementation of e-demographic policy is considered as an integral part of the e-government system and requires the creation of systems and registers for the assessment of existing demographic situations and analysis of demographic processes [45, 46]. The e-demographic system will allow the government to meet the needs of the population more efficiently and make optimal use of human resources. Online registration and monitoring management will help to minimize decision-making time, overall increase governance efficiency generally in governments and municipalities, and reduce time spent on public services.

The e-demographic system can be divided into sectors such as social insurance, health, migration, etc. Such an approach will allow more efficient and rapid analysis of demographic processes. Over time, once fully integrated into the e-government platform, electronic registers can be transferred to virtual clouds. In addition to the online population census, the e-demographic system will provide accurate population statistics, online monitoring, in-depth analysis of demographic processes and identification of demographic problems.

Demographic security and human resource development are key strategic aspects of a country's development. Establishment of e-demographic systems and mechanisms to achieve goals such as forecasting human resources and identifying risks in the development of e-government will help to build a science-based and efficient e-government system in the future, to determine strategic directions for economic and social development.

## CONCLUSION

With the rapid development of ICT and the rapidly changing of socio-political situation in countries, we analyze demographic processes by traditional statistical methods. Implementation of an effective demographic policy in the country is considered an integral part of the e-government system and requires the effective use of registers and systems covering demographic characteristics through the assessment, analysis and effective decision-making regarding the current demographic situation. One of the topical issues is the formation of electronic demography for management of demographic processes and implementation of purposeful demographic policy.

The paper notes that in addition to migration, births or deaths, various diseases, demographic processes are also influenced by military operations, natural disasters, as well as the socio-economic situations, and we should consider these indicators during demographic research.

The main sources of research on electronic demography in the literature are search queries on web browsers, social media data and data collected in public registers, e-service data, citizen satisfaction indicators, feedback on government-citizen relations, etc. The analysis of the big data collected in these sources will allow to complete the existing researches and to form new ideas and knowledge related to demographic behavior. The paper proposes a conceptual model of e-demography system based on public registers. Based on the proposed approach, the sources of important information for demographic analysis were researched and the issues of creating a single register and integrating public registers were reviewed. Research shows that the e-demography system will allow monitoring the population register and analyzing various demographic indicators in the registers integrated into the e-government portal.

The creation of a single population register will lead to abolition of the traditional census and allow virtually uninterrupted online population census and monitoring based on the analysis of data collected in the public register. The population register can be used effectively in various decision-making systems, and most importantly in the e-demography system, to ensure the socio-economic development of the country, which will allow the creation of effective solutions for social research and population data monitoring. Given the urgency of the topic, future research will address the issues of intellectual analysis of big data collected on social media and in public registers in order to conduct various in-depth demographic analyzes.



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