Data Democratization and Official Statistics: The Greek Paradigm

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Abstract

This paper explores the strategic initiatives undertaken by the Hellenic Statistical Authority (ELSTAT) in the pursuit of data democratization, with a focus on the dissemination of official statistics to a wider audience through the utilization of social media platforms, infographics, and infovideos. As the demand for accessible and comprehensible statistical information continues to grow, ELSTAT has recognized the importance of adapting to evolving communication trends to make statistical data more approachable and relevant to the general public.

Drawing upon recent experiences from the 2021 Population-Housing Census and various other endeavors, this paper showcases successful examples of how ELSTAT leverages modern communication channels to bridge the gap between complex statistical data and the broader population. By embracing social networks and visual storytelling tools, ELSTAT has not only enhanced data accessibility but has also facilitated a deeper understanding of the significance and implications of official statistics.

This research contributes to the broader discourse on data democratization by highlighting the challenges, strategies, and outcomes of ELSTAT's efforts in Greece. Furthermore, it underscores the potential for similar initiatives in other regions, emphasizing the pivotal role of data democratization and statistical literacy in fostering informed decision-making and civic engagement in the 21st century.

Keywords: Data democratization, data visualization, infographics, data dissemination

1. Introduction

Data democratization is a concept that has gained significant attraction in recent years, marking a transformative shift in the way data are accessed, utilized, and understood by a broader audience. The significance of data democratization lies in its potential to empower individuals, businesses and the whole society, by breaking down barriers to access or comprehend data and allowing for more informed decision-making processes. The notion of official statistical data democratization focuses on the dissemination of official statistics to a wider audience than the traditional users of statistical data. It also ensures that marginalized communities have equal access to valuable statistical information.

Data democratization is a transformative process for National Statistical Offices (NSOs), aimed at making official statistics more accessible, understandable, and relevant to a wider audience. Crafting a strategy following a holistic approach is crucial and consists of many

distinct actions to empower citizens, support evidence-based policymaking, and strengthen the role of official statistics in the society.

In this paper we explore the experience and the strategic initiatives undertaken by the Hellenic Statistical Authority (ELSTAT), since 2016, to make official Greek statistical data fully open, available and accessible to the public by using user-friendly tools and visualizations (infographics and infovideos) utilizing social media platforms.

2. Theoretical Framework

Statistics, as a public asset, should serving the public good so that all users can benefit from them, supporting democracy in our society [1]. Data democratization seeks to make data more accessible to non-technical users. It is an ongoing process of broadening data access to users to find, access, analyze and share data. Removing data silos and providing data access to broader audience is a prime critical success factor for data democratization [2]. Data democratization represents the organizational understanding of FAIR principles (i.e. findable, accessible, interoperable, reusable) [3] and unlock value from data.

In digital era, the new modes of communication have changed the way that users are receiving and sharing statistical information, providing opportunities and challenges to NSOs. There is an increasing need for data visualization of official statistics. Visualization is defined as the mechanism by which visual information are perceived, interpreted, used and communicated [4]. Data visualization is the visual representation of numerical values. Charts and graphs are data visualizations and create a picture from a given set of data [5]. This is mainly because visual information is a more effective form of communication for humans. The main reason is that vision is the strong form of input that we use to perceive the world around us. In his book Brain Rules, developmental molecular biologist John Medina states, "Vision is by far out most dominant sense, taking up half of our brain's resources" [6].

Data visualization is a discovery process which moves from just looking at data to actually seeing it [7]. When consuming a visualization, the viewer will go through a process of understanding involving three stages: perceiving (what does it show?), interpreting (what does it mean?) and comprehending (what does it mean to me) [8]. Based on research into the Picture Superiority Effect when we read text alone, we are likely to remember only 10 percent of the information three days later. However, if that information is presented to us as a text combined with a relevant image, we are likely to remember 65 percent of the information three days later! Infographics is an efficient way to communicate data. Data visualization can be very space efficient by visualizing a large set of data (numbers) in a small space.

Today, the use of the world infographics has involved to include a new definition that means a large graphic design that combines data visualization, illustration text and images together into a format that tells a complete story.

3. Balancing transparency and impartiality in the use of infographics for official statistics

Many NSOs choose to present the results of their statistical surveys, which constitute official statistical data, using infographics. This practice may promote data democratization by making statistical information more accessible to the general public, however, it also raises questions regarding the impartiality of the presentation of statistical findings.

The reasoning behind this concern lies on the fact that while the timing of the release of official statistical data is typically predetermined and publicly disclosed through established calendars, the use of infographics does not always follow a standardized and well-documented process. For some statistical findings, infographics are employed, while for others, they are not. This variability can potentially compromise the United Nations Fundamental Principles of Official Statistics [9] regarding impartiality and equal access.

One primary concern is the potential for bias in the selection of statistical data to be presented as infographics. In cases where certain results are highlighted through infographics while others are not, there may be a lack of transparent and predefined criteria for such choices. Often, these selections are driven solely by subjective interests, potentially undermining the overall impartiality of statistical presentations.

Additionally, the use of infographics may lead to an emphasis on specific variables or aspects of statistical results over others. This selective emphasis could unintentionally skew public perception and understanding of the significance of various statistical findings, potentially distorting the overall narrative.

Balancing the benefits of data democratization and accessibility through infographics with the need for transparency and impartiality in official statistics is a complex challenge. Addressing this challenge requires careful consideration of the selection criteria for infographics and ensuring that these choices are made based on objective and predefined criteria rather than subjective interests. By doing so, NSOs can maintain the integrity and credibility of their official statistical data while still making them more accessible to the wider public.

4. The significance of collaboration between Statisticians and Graphic Designers in crafting culturally sensitive (inclusive) Infographics

As regards data presentation, the synergy between statisticians and graphic designers plays a crucial role in delivering information that is not only accurate but also comprehensible to a

wider audience. Statisticians are the architects of data, crafting the narrative hidden within numbers, while graphic designers are the visual storytellers who translate these narratives into engaging and accessible infographics. This partnership between the analytical minds of statisticians and the creative flair of graphic designers is essential for ensuring that data-driven messages are effectively conveyed to the public and the effective democratization of the statistical production.

Statisticians bring to the table a deep understanding of data sources, methodologies, and statistical significance. They meticulously process and analyse data, extracting valuable insights and trends. However, the challenge lies in presenting these insights in a manner that resonates with the intended audience. This is where graphic designers step in, using their expertise to transform official statistical data into visually appealing infographics or infovideos. By collaborating closely with statisticians, graphic designers gain valuable context and insights into the data, allowing them to create visuals that accurately represent the data's nuances and the intended message.

Moreover, this collaboration can help avoid potential pitfalls such as misinterpretation or miscommunication of the data. Graphic designers, armed with an understanding of statistical concepts, can ensure that the chosen visual representations are not misleading or biased. By working together, statisticians and graphic designers can bridge the gap between data complexity and audience comprehension, ensuring that infographics effectively convey the intended message without sacrificing accuracy.

By remembering that Infographics wield considerable power in shaping public perception, making it imperative that they remain inclusive, neutral, and sensitive to various social groups or even nations. The design and content of infographics should be carefully crafted to avoid any potential harm, offense, or marginalization of individuals or communities.

One crucial aspect of cultural sensitivity in infographics is the avoidance of selective or biased data presentation and stereotypes. Every effort should be made to present a complete and balanced picture of the data, avoiding cherry-picking statistics that may serve (intentionally or not) a particular agenda. This requires a commitment to transparency in data selection and representation, ensuring that all relevant information is included, regardless of its alignment with any preconceived notions.

Additionally, infographics should be created with a keen awareness of inclusiveness. Visual elements, colors, symbols and maps should be chosen thoughtfully to avoid inadvertently causing offense or misunderstanding. The inclusion of diverse perspectives and representation in infographics can help promote inclusivity and respect for various social groups.

5. ELSTAT's approach

The Hellenic Statistical Authority (ELSTAT), as the National Statistical Office in Greece, develops, produces and disseminates a huge number of official statistics. In recent years, ELSTAT has crafted a holistic approach towards data democratization. Infographics and other multimedia forms have been used for the effective dissemination of official statistics in a wider and diverse audience, enhancing data democratization.

ELSTAT has set the goal to effectively disseminate the official statistics to the widest possible audience and through a variety of ways and channels (social media, press releases, conferences etc.) to become of value to various types of users. To this end, ELSTAT follows a practical guidance based on three key questions: "Who? What? and How?". Moreover, since 2016, ELSTAT works on extend the audience of the Greek official statistics by engaging more people to the quality standards of the statistical production and the need of accurate statistical data. The target audience is both the general public and the heavy users of statistical data (Academia, Public Sector, etc.).

Based on Andy Kirk [8] audience theory, the following three basic types of users have been identified. The first and oldest type of users is the "Miners". They are data experts and mostly experienced users. They need volumes of detailed information for experienced and scientific use. The second type of users are the "Harvesters" they general have a good understanding of their data need. Usually interested in the same type of information, looking for big amount of data for professional and personal use. Last but not least comes the "Tourists", they are infrequent users, they need small amount of information on a general everyday topic mainly for personal use.

ELSTAT's strategy is multi-layered and aims to cover all the main factors for a successful data dissemination, as well as at the wider cultivation of a data democratization culture. The following aspects play an important role in the way of developing a data sharing culture.

- **Needs Assessment**

A thorough assessment of the data ecosystem is considered as the first step in identifying the specific (statistical) information needs of citizens, enterprises, policymakers, researchers and the users of statistical data in general. At the same time, an evaluation of the statistical literacy of the general population is also crucial.

- **Quality Assurance Framework**

Ensure data accuracy, reliability, and consistency. Implement rigorous quality control measures and adhere to international statistical standards. Transparency in data collection and processing is key to building public trust.

At European Statistical System (ESS) has been developed a common quality Framework, which has as a cornerstone the European Statistics Code of Practice (CoP) [10]. NSOs members of ESS are committed to CoP, which is a set of Principles for addressing the above-mentioned quality aspects of official statistics.

- **Data Accessibility**

Establish a user-friendly, online platform that hosts official statistics. Ensure that data is available in open, machine-readable formats, and use metadata to assist users in understanding datasets. Using technology and fostering a data sharing culture are important factors that supports the data democratization [2]. ELSTAT disseminated the statistical information through 3 main channels: Printed, digital and social media, providing information in many different types such as editable excel, editable and non-editable pdf files, books and e-books, editable infographics as well as animated infographic videos. In this way, the users have access and they can reuse this material.

- **Data Visualization**

Develop a robust data visualization strategy. Create interactive infographics to make complex statistics more comprehensible. Invest in user-friendly data visualization tools to enable easy exploration of datasets.

- **Data Literacy Programs**

Statistical literature is a multidimensional concept that goes beyond understanding and analyzing statistics and requires communicative skills, in order to disseminate statistics effectively [11]. Launch data literacy initiatives targeting schools, universities, and the general public. Collaborate with educational institutions to incorporate data literacy into the curriculum. Conduct workshops and training sessions to enhance citizens' ability to interpret and use data effectively. In recent year, ELSTAT has developed a specific project for fostering Statistical Literacy in Greece. The purpose of this project is to introduce, in an educational and recreational manner, pupils and students into the world of Statistics and help the to understand the practical application of statistics in their daily habits, as well as informing them for the role of official statistics [12].

- **Communication Strategy**

In order to disseminate statistical information effectively and engage all types of audience (general audience, heavy users etc.) it is crucial to perform a holistic communication strategy with aligned targeted audiences with the appropriate communication channel. Since 2016 ELSTAT chose to follow the "#GreekDataMatter" strategy as it is presented in the Table 1.

Table 1: "#GreekDataMatter" strategy

	Social Media	Announcements / Press Releases	Seminars	Publicity Actions	Cooperation
General Public	x	x		x	
Politicians	x	x		x	
Journalists	x	x	x	x	
Heavy Users		x	x	x	
Enterprises		x		x	
Public Sector		x	x	x	x
Academia				x	x
Schools	x		x	x	

- **Storytelling**

One of the many possibilities to communicate with wider audience is storytelling, transforming raw data into compelling narratives. There is always a story behind the data. ELSTAT uses designers with visual affordances to indicate to the audience how to use and interact with the infographics through the story telling. Create data-driven stories in a form of infographics and animated infovideos that connect statistics to real-life situations in Greece. Storytelling techniques are used to illustrate the impact of data on policy and daily life.

In Universal Principles of Design [13], it is recommended that at most 10% of the visual design be highlighted. Highlight may help the audience and indicate the start of the story or even emphasize some of the key data. Using the power of typography, color and the size, the designer may drive the audience's eye and create the timeline of the story. While the designer highlights the important data at the same time, he eliminates distractions. When it comes to data visualization the decision of what to cut or no-emphasize can be even more important than what to include or highlight. The data are not equally important and also not every detail is needed, based on these, the first and second roles as well as the extras are subconsciously created.

One of the most important elements of a successful story is the setting and the atmosphere. With the first look the audience has to understand the theme, without even reading the titles or the numbers. The designer uses all the visual tools, visual marks (point, line, area, form), visual attributes (position, size, angle, quantity, pattern, color, symbol/shape), as well as basic laws governing visual communication and psychology (similarity, Pragnanz, closure, proximity, continuity) in order to build the story visually.

The designer taking into consideration "if it's hard to read, it's hard to do" from the research undertaken by Song and Schwarz at the University of Michigan in 2008 [14]. The more complicated it looks, the more unlikely the audience spend time to understand it. Based on that principle, the story has to be designed in a way that will be easy to read; the final visual

will be a clean image consisting of straightforward visual language. Following these rules, principles and guidelines, ELSTAT achieves to shift from simply showing data and communicating numbers to storytelling with data.

- **Focus on Data Disaggregation**

Recognize the need of disaggregated official statistical data since disaggregated data allow the identification of non-obvious trends, highlight the visibility of vulnerable groups and assist policymakers and stakeholders in their evaluations of measures taken by the State. At the same time, the recognition of regional disparities leads to regional and effective actions.

- **Statistical Confidentiality and Data Protection**

Every NSO is obliged to establish stringent data protection measures to safeguard personalized statistical information while maintaining transparency about data handling practices. The statistical work of ELSTAT relies on the confidence of the statistical units, since through this confidence every NSO can collect primary data for the production of the official statistics. On the basis of the above confidence, ELSTAT protects, in all the stages of statistical production, the secrecy of personal data collected from the statistical units. The provisions on statistical confidentiality issues stipulated in the Greek Statistical Law, the Regulation on the Operation and Administration of ELSTAT and the Regulation on the Statistical Obligations of the Hellenic Statistical System (ELSS) Agencies strengthens the protection of statistical confidentiality in the Greek territory by all stakeholders. ELSTAT puts particular emphasis on the communication of its commitment to ethical and legally compliant personal data processing. Information on how ELSTAT uses personal data of respondents and users is available on ELSTAT's website [15]. Moreover, ELSTAT enriches its web portal with time series of statistics produced public use files, develops standardized scientific use files for the needs of researchers, with pre-defined criteria for anonymization of the microdata of its relevant statistical surveys.

6. Paradigms of data visualization

As mentioned above, ELSTAT seeks to make maximum use of digital means to bridge the gap between complex statistical data and the broader audience, by displaying selected statistics using infographics, with a view to presenting them in a way that is easily understandable to the general public and suitable for reproduction on the social media. Infographics provide a visual snapshot of the highlights of the publication. The press and other users can download a high resolution copy of the graphic or browse the publication itself by clicking on the image. A gallery of infographics used in ELSTAT's publications is available at ELSTAT's website [16]

In this paper, it is selected the most recent publication based on the power of the image to be presented as case studies. The first is "2021 Population-Housing Census Results" and the second is "Sustainable Development Goals 2030 - SDGs". It is believed to be the type of communication that people rely on most and it includes signs, graphic designs, images, typography, pictograms and countless other formats.

6.1. The "2021 Population-Housing Census Results" case study

The Census has long been considered as the most complex and large-scale statistical work, covering the entire inhabited territory of the Country. In order to announce the main results of the first digital Census of Greece [17], ELSTAT chose to communicate those data with two publications (in printed and digital format), the first published on 17/03/2023 [18] and the second published on 31/08/2023 [19]. These publications drive the general public to look closely on the data and see the outcome of the statistical task they had to participate few months ago.

For the "2021 Population – Housing Census Results" the designers created a brand manual based on two main axes "human" and "diversity". There are 14 main colors selected and 2 different typefaces chosen carefully in order to serve the best legibility both in printed and digital applications.

In the first publication ELSTAT published the results regarding the total population, men and women, and is analyzed at a geographical level, in comparison with the previous Census (2011). These types of data are provided for the entire country, also by region, by regional unit and by municipality. ELSTAT used visual elements such as maps, icons, charts, symbols and graphs so that the data will be quickly perceived and understood.

In the second publication ELSTAT provided more detailed results regarding the age groups, citizenship, place of birth, legal marital status, size and composition of households. These types of data were provided for the entire country, as well as by region. Visual elements such as maps, icons, pyramids, bar charts, pie charts, pictograms, symbols and graphs had also being used so the data were quickly perceived and understood. With the use of infographics there is a story telling about the age, the legal marital status and the number of households. This publication is a characteristic example of how infographics may help the data communication and reach a broader audience.

In both publications the designer has used clean tables with numbers and highlighted areas in order to become more legible. The maps are very functional to visualize the division of data so it also becomes a fundamental element for the visual communication and the story telling. The symbols, the graphs and the charts used, are served all the principles for optimal visualization and better communication of the data. All the elements on the pages create clean

vertical and horizontal alignments to establish a sense of cohesion, also important the margins and the white spaces of the pages. As a result, there is a clean, legible and an aesthetic design which communicates data in a broader audience with great results.

6.2. "Greece: Sustainable Development Goals 2030" case study

The Sustainable Development Goals (SDGs) for 2030 are a set of 17 goals adopted in 2015 with Resolution 70/1 of the United Nations General Assembly titled "Transforming our world: the 2030 Agenda for Sustainable Development" [20]. They aim to promote global sustainable development. Through the resolution, UN member states committed to monitoring and evaluating the progress made in implementing the SDGs using a set of national, regional and global indicators. The 2030 Agenda for the SDGs stipulates that progress reports are based on individual targets and indicators, using data primarily generated by National Statistical Systems. The 17 SDGs are broken down into a group of 169 targets for all countries and 231 indicators.

Furthermore, the United Nations Statistical Commission decided that the indicators should be based, to the maximum extent possible, on comparable and standardized official statistics provided by countries in international statistical systems. When other sources and methodologies are used, they should be reviewed and agreed upon transparently by national statistical authorities. Indicators should be disaggregated, as appropriate, by income, sex, age, race, ethnicity, migration status, disability, geographical location, or other characteristics, following the Fundamental Principles of Official Statistics of the United Nations [9].

At European (regional) level, in December 2016, the Statistical Office of the European Union (Eurostat) proposed, in line with the 17 Sustainable Development Goals, a complementary set of indicators based on statistics already produced by the European Statistical System in full accordance with the Code of Practice for European Statistics [10]. The EU set of indicators consists of 100 indicators and is open to annual reviews for the incorporation of indicators from new data sources, as well as for the consideration of new goals according to the priorities of the European Commission, such as the European Green Deal and other initiatives.

ELSTAT, as the coordinator of the Hellenic Statistical System (ELSS) and responsible for statistical coordination of the SDGs, is in close cooperation with the General Secretariat of Coordination of the Presidency of the Government which has the political coordination. ELSTAT actively participates in all methodological meetings of the statistical community and maintains continuous communication with the Custodian Agencies responsible for monitoring the indicators of the SDGs. Through this collaboration, in addition to providing statistical data, new statistical surveys and new data sources (administrative, geospatial, etc.) are explored, and new variables are added to existing statistical surveys.

Moreover, ELSTAT played a crucial role in shaping, in 2019, the National Set of Indicators for Greece, where the selection of the included indicators considered national priorities and data availability. ELSTAT's website contains a section dedicated to the Sustainable Development Goals (SDGs) as the National Reporting Platform [21], where users can have direct access to data for each goal and find publications and visualization tools related to the SDGs in Greece and abroad.

In June 2023, ELSTAT published a special publication entitled "Greece: Sustainable Development Goals 2030" [22] presenting mainly the National Set of Indicators, based on the most recent statistical data for Greece complied by ELSTAT within the framework of the United Nations 2030 Agenda.

Following the above mentioned dissemination strategy, the publication contains a great amount of data displayed in an effective visual way, using a lot of tables with the extended information where was needed.

 For the tables clean lines and a clear typeface is used so the result is legible and elegant. The alignments and the margins are designed so that the readers easily get through the numbers that the tables include. The colors and the logos are used with respect and taking under consideration the "Guidelines for the use of the SDG Logo including the color wheel, and 17 icons" available from the United Nations Department of Global communications [23]. Some data from the tables are presented with infographics in order to be emphasized and approach a broader audience. Each individual goal is represented with the proposed color and the icons are used to emphasize the theme of each goal. Many different charts have been used in order to visual display their information, all of them have been chosen according to their type of data. Line graphs with one or multiple series, bar charts horizontal or vertical, stacked bars, pies or donut charts, pictograms, images present the most important conclusions and facilitate the comparisons without misleading the user.

But at the same time, it was underlined the story for each "goal" keeping the colors, as well as the theme of the goal. For every Goal there was a carefully selection of images in order to highlight the most important conclusions and facilitates the comparisons without misleading the user. This publication uses a more effective way to attend the trackway of an index with a line chart accompanied by a distinctive thematic image instead of reading a line of numbers in a table.

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