

# *Statistical Literacy as an Aspect of Media Literacy*

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## **SUMMARY**

*Statistical literacy represents an aspect of media literacy, especially due to a growing share of the statistical information in media reporting. Being statistically literate means being able to correctly interpret and correctly use statistical information available either through the media or through services of official statistics, for the purpose of personal development and direct or indirect effects on the development of institutions and the state. Statistical information provide an overview of the situation in different domains enabling tracking changes in phenomena during time and should be the basis for decision-making in economic, political, cultural and personal sphere of life. Paper analyse the level of development of segmented approach to advancing statistical literacy through the introduction of new statistical media services for educating and informing citizens in Croatia. Development approach for statistical literacy in Croatia is compared with the situation in other countries in Europe and beyond. Authors examine four approaches to the design of media information services which they consider essential in the development of so-called new statistical media services for citizens: nonlinearity, interaction, contextual design and service's repository openness. Furthermore, authors analyse applications of four development approaches to statistical services for citizens in different contexts thus demonstrating justification of using these approaches for implementation of long-term development strategies of national statistical literacy.*

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## Introduction

Statistical literacy, as a concept, includes the ability to read and interpret statistical data in daily and other media (newspapers, Internet, television channels etc.), and includes the same data shown through, for example, graphs, tables, statements, statistical surveys and studies (Unece, 2012). Statistical information today is all the more necessary for the operation and their interpretation is one of the basic forms of knowledge in certain human activities. Statistical literacy certainly represents one of the aspects of media literacy, especially for a growing share of the statistical information in the media coverage, and because statistics targets the formation of attitudes in society, and hence the decisions-makings that have impact on social reality too. National Statistical Institutes (NSIs) have understood that in order to generate knowledge, it is also necessary that data users have an adequate level of statistical education. This topic is discussed as *statistical literacy* (Zwick, 2013). States interested in the development of national statistical literacy should develop and implement national programs for the development of statistical literacy, and consider actions that will generate long-term positive effects on the development of national statistical literacy. One of the long-term effective actions, i.e. strategies, would be the introduction of the national curriculum for the subject of statistics in primary education, which would allow students to get to know the procedures in the collection and processing of statistical data in statistical surveys, as well as the basic concepts and procedures in handling and processing of data in the official statistics.

The objective of this article is to present a comparative analysis of current services of Statistical Offices available in different countries aimed at developing statistical literacy. For that purpose available documentation from the International Statistical Literacy Project (ISLP)<sup>1</sup>, governed by International Association for Statistical Education (IASE), a section of the International Statistical Institute (ISI) and other materials covering the theme *statistical literacy*, will be analysed and compared with the analysis of services available online at the central portal of Central Bureau of Statistics (CBS) in Croatia<sup>2</sup>. Segmentation of services, according to different user groups, will be a special interest of authors. From there on authors will suggest four approaches for developing modern media services in Croatia for educational, media and general community based on observed available services in other countries and present modern media developments.

## Why is understanding statistics important?

For an average citizen today it is important to be informed about the issues related to public life, which is a personal culture of every man. The development of society and thus the lives of ordinary people are strongly affected by political decision-making. Evidence-based decision-making is becoming increasingly important as governments are publically held accountable for policy outcomes (Unece, 2012). Statistical development in developing countries is faced with a double challenge of low effective demand for statistics and inadequate supply of statistics. These challenges are responsible for the *evidence gap* in statistics (Kiregyera, 2010) where the demand for statistics far exceeds supply. Certainly,

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<sup>1</sup> ISLP Project, <http://iase-web.org/islp/>

<sup>2</sup> CBS, <https://www.dzs.hr>

statistics should be the basis for decision-making in the global and national economic sphere, but also in the private lives of individuals. New technologies and new media services are certainly essential for the development of democracy in various forms in society, the development of equality and equal opportunities of work and success of all members of society. To enhance sustainable development and democracy, the decision-making should be based on facts and on reliable information (Helenius, 2010). Policy-making in some countries can be purely subjective or ideological and the monitoring of policy outcomes can be constrained (Kiregyera, 2010). Likewise, there is an increasing need for commercial decision makers to be able to interpret statistical information in order to make strategic decisions about investments and the direction of future growth (Unece, 2012). Statistics is recognized as very important for the development of society, since statistical information provide an overview of the state and changes in the society. Therefore, it should be acknowledged as the basis for the adoption of sound national development strategies and development programs, achieving development outcomes and impact or sustained improvement in the lives of people – more children educated, fewer infants dying, families lifted out of poverty etc. Apart from traditional areas, there are emerging policy areas that need to be illuminated by statistics – environment and climate change, gender, energy, human rights and freedoms, democracy and good governance, HIV/AIDS etc. (Kiregyera, 2010). Indeed, statistics has now been elevated from being just a technical issue to a high ground of development issues (PARIS21, 2006). Developing countries and development partners have in recent years adopted and committed themselves to a new development paradigm popularly known as *managing for development results (MfDR)*. MfDR has put statistics firmly on the front burner of development discourse and processes. Good quality statistics, viz. comprehensive, comparable, accurate and timely statistics, are needed more than ever before to guide public policy debate and development, and program / project design, monitoring and evaluation of development policies, programs and projects – in other words, to manage for development results (Kiregyera, 2010).

### **Mission of official statistics offices**

A state has a responsibility in empowering its citizens and official statistics mission usually complies with it. This is evident from stated and proclaimed missions of NSIs in states across different continents. For instance, Australian Bureau of Statistics' (ABS) mission is to assist and encourage informed decision making, research and discussion within governments and the community, by leading a high quality, objective and responsive national statistical service (Taylor P. W., 2008). Similar to the Australian's mission, the Croatian CBS' mission states: The efficient and timely preparation and dissemination of high-quality and reliable statistical indicators of conditions and changes related to economic and social phenomena and processes to enable users to make decisions, undertake measures and develop policies based on facts (Development Strategy of Official Statistics of the Republic of Croatia, 2003). However, CBS' mission doesn't contain a very important word – responsive – proclaimed in ABS' mission, and this is indicative of problems CBS is facing today – lack of resources. In carrying out their activity, Statistical Offices are responsible not only for producing, disseminating and analysing statistical information but also for ensuring that this information is understood as objectively as possible. Statistical offices should pay special attention to user support, statistical awareness and statistical literacy (Helenius & Mikkela, 2011). Statistical literacy is essential for correct interpretation, understanding, and use of available statistical data for self-development or activities on the development of institutions and the state. Statistical users must be provided with tools to decipher the specific language of statistics. The reading of statistical information needs the understanding of the concepts and

methodologies used in its preparation (Unece, 2008). Consequently, statistical education starts in schools (Zwick, 2013).

The ability to increase the statistical literacy of school students requires the engagement of the whole education community – teachers, teacher educators, researchers and curriculum developers as well as academics and government (Unece, 2012). Creating experimental and learning environments based on ICT, namely through the analysis of real data, is an important way to improve the statistical thinking and reasoning as well as technological literacy (Unece, 2008). Through cooperation with educational institutions statistical offices can work within two time spans. In the short-term they can produce inputs to different teaching programs, teachers' further education and research in the educational sector. In the long-term young people are being raised into future information users, decision-makers and data providers in cooperation with educational institutions (Helenius, 2010).

Statistical offices are more and more interested to be part of the university education system in statistics as active partners. In order for official aspects of statistics to become part of the university programs, NSIs have to play an active role in the design of the courses and the degrees, as well as Master or PhD programs. An important step in establishing a network of researchers in Official statistics is ongoing European Master in Official Statistics (EMOS) project (Zwick, 2012). For the data consumer, knowledge of statistics and data producing process is also essential. An increase in statistical literacy and awareness enhances the influence of statistical information and builds and maintains the legitimacy of statistics in the society (Helenius, 2010).

### **Developing statistical literacy in schools**

The field of statistical literacy is not new. For more than 30 years researchers have been discussing this interdisciplinary topic, for instance, in fields such as mathematics, statistics, pedagogy, psychology and linguistics. The discussion is based on the fact that statistical literacy requires many abilities, the most important of which are mathematical and statistical skills, the competency to understand the figures correctly and to distinguish between valid and misrepresented data. Furthermore, it enables people to assess the information that the figures provide and finally to understand what the actual data reveal about society (Unece, 2012).

Analysis of the data as part of the teaching of mathematics includes several tasks:

- collection and organization of data,
- drafting and interpretation of tables and graphs,
- assessment of conclusions and assumptions based on the data,
- developing convincing arguments,
- evaluation of arguments of other colleagues (Kralj & Glasnović Gracinm 2005).

Mathematical skills are the first requirement in order to understand statistics. Statistical numeracy requires a feel for numbers – an appreciation for levels of accuracy, making sense of estimates, awareness of the variety of interpretations of figures as well as a judicious understanding of widely used concepts such as averages and percentages. Moreover, there is a fundamental need to know about statistical approaches and methods. To express it in one sentence, a common sense approach to data is needed in order to support an argument (Unece, 2012).

The inclusion of primary school children in the use of official statistical databases and information does not represent innovation in some states and such programs already exist. Over the past decades, statistics has become integral part of school standards across the world.

*Statistical literacy* is more than *numeracy*. It includes the ability to read and communicate the meaning of data. This quality makes people literate as opposed to just numerate. The weakness in quantitative skills is summarized under the term *statistical innumeracy*. In particular, among the younger generations and in developing countries there is an increasing need to understand quantitative data and facts (Unece, 2012). Integrating statistical concepts and reasoning from the elementary years through to secondary school should develop a nation of critical thinkers and capable consumers of information that would ultimately benefit social progress – future government and business leaders (Unece, 2012). Developing the statistical reasoning of students consists of incorporating active learning strategies that make it possible to supplement what they have heard and read on Statistics and to actually produce statistics (Unece, 2008). Statistical literacy involves products that use words, numbers and graphs together to communicate messages. It includes skills in making and using these products (Forbes et al., 2011).

It is fundamental that teachers are skilled readers and interpreters of statistical information, especially teachers of mathematics, science and geography. The development of pedagogy to support the teaching of statistics is fundamental to the successful implementation of a statistics stream in the school curriculum. Hence statistical organizations cannot ignore the need to involve teacher educators and address the professional development of teachers (Unece, 2012).

### **Statistics in primary and secondary schools – case of other countries and the case of Croatia**

After analysing the curricula of several introductory courses in Statistics in Portugal it was observed that Statistics is often seen as a branch of Mathematics rather than a problem-based matter (Unece, 2008). However, data collection and analysis is the heart of statistical thinking. Data collection promotes learning by experience and links the learning process to reality (Snee, 1993). The US' standards for teaching mathematics, prescribed by the National Council of Supervisors of Mathematics in 1980, prescribe elements of statistics appearing in all grades in elementary schools. Lower ages of children, by the standards, learn to collect, organize and display data using statistics to resolve minor problems. In the upper grades of elementary school standards recommend expanding the current knowledge of statistics with examples from everyday situations so that students understand how to process information and translate it to usable knowledge for society (Kralj & Glasnović Gracin, 2005). Statistics Portugal is aware of the importance that the teaching of statistics encompasses in primary and secondary schools. It is, in fact, one of the most important instruments in promoting statistical literacy. In Portugal, the teaching of statistics was recently included in the O-level (third cycle of basic level corresponding to 7th, 8th and 9th years of school) mathematics syllabi. The mathematics program of the A-level (secondary level corresponding to 10th and 11th years) already included statistics. Elementary topics such as the gathering and organization of data, data representation and interpretation, measures of central tendency and probability calculation are taught at primary school (first and second cycles of basic level corresponding to 1st to 6th years of school), while secondary level students are introduced to more elaborate concepts such as probability concepts and inductive statistics (Unece, 2008). New Zealand is a small country but has made substantial progress in statistics education, particularly at the school level. Statistics New Zealand believes that official statisticians and statistics educators working together can make an identifiable contribution in this area, with subsequent benefits to both parties (Forbes et al., 2011). Teachers need (and highly value) resources that deliver the learning they claim to come from a reputable and verifiable source.

To teach authentic tasks and use authentic data, teachers must be able to easily find and use these data to deliver authentic statistical learning opportunities. Similarly to other developed countries, the conjoined efforts of ABS and Statistical Society of Australia (SSAI) have aimed to influence the importance of continuity of learning and building of statistical skill and knowledge progressively, rather than learning concepts in isolation and devoid of real world context. The nature of the design of the Australian Curriculum provides a rich and diverse means of incorporating the authentic and contextual teaching of statistical concepts (Mawdsley & Tam, 2011).

By applying the Croatian National Educational standards in the curriculum, a new subject is introduced in mathematics in school year 2006: Display and analysis of data. In Croatia children should start to learn these basic elements of statistics in the 7th grade of elementary school. References, i.e. materials for teaching statistics in elementary schools, are practically non-existent in Croatian language because no one has ever explored the introduction of statistics in the elementary schools' mathematics material (Kralj & Glasnović Gracin, 2005). It would certainly be interesting to research a level of supply of authentic official statistics' materials aimed at teaching statistics in elementary schools currently available in Croatia, in online offerings aimed for educational institutions' use.

### **University-level education in statistics**

At university level, statistics is an element in different fields of study. Social science, economy and medicine all have statistics inside their curriculum. The European Credit Transfer and Accumulation System (ECTS), introduced with the Bologna process, is the ticket for the NSI to be part in minor fields of study. But for this purpose, it is essential to have regular offers in official statistics within the universities. If statistics is the major subject in studies of social science, economics or mathematical statistics, the NSI must take a substantial interest and be involved in the curriculum development because these groups of students become the next generation of stakeholders or professionals in the field of statistics (Zwick, 2013).

Young people, in particular, must be helped to overcome their reluctance to deal with this subject and become critical and responsible users of statistics. The co-operation with educational institutes is an important issue to the development of the statistical systems in both the reinforcement of the technical capacity to the production of official statistics and the promoting of statistical literacy (Unece, 2008).

In Portugal the co-operation process with educational institutions includes 35 high schools from different universities and around the same number of polytechnic schools. Some of the most important co-operation projects with the high schools address innovation in terms of methodology and data collection and analysis. With polytechnic schools the co-operation activities essentially support the dissemination of official statistics (Unece, 2008). But in most European countries university programs offer trainings mainly on descriptive and inference statistics. Essential elements of the data production process, e.g. survey methodology, are frequently not part of this field of studies. Data producers, like NSIs, have a very clear interest for official statistics to be included in the qualification of the young researchers (Zwick, 2013). Cooperation with educational institutions is also important for recruitment purposes as statistical offices compete with other employers for skilled labour force (Helenius, 2010). As employers, the NSIs are looking for young postgraduates in sociology or economics with skills in data production and analyses. The NSIs' need professionals in universities, research institutes and as policy advisers with sufficient skills to understand statistical outputs (Zwick, 2013). For example, Statistics Portugal, in co-operation

with one of the Portuguese universities (Universidade Nova de Lisboa), established a new Institute (ISEGI) which aims is to provide university-level education in statistics and information management (Unece, 2008).

### **Training programs for employees in official statistics**

Statistical agencies deal with highly complex information and the data producer business model is based on statistical and mathematical knowledge. For high quality European data, it is necessary that staff in all member states have an adequate level of statistical knowledge (Zwick, 2013). To encourage and assist employees who are prepared to invest in their own development, the reimbursement of tuition fees and related course costs, in whole or in part, should be considered for courses taken by employees outside working hours when these courses contribute to the development of employees' skills and qualifications which are beneficial to the statistical organization (Unece, 2012).

For any employer it is necessary to provide a system of vocational training and especially for a knowledge-intensive organization in a period of drastic changes in information technology. To reach this goal, a coordinated training system is essential. Eurostat has a long tradition of internal training. The current European Statistical Training Program (ESTP) guarantees this task inside the European Statistical System (ESS). This is only one part of statistical education. Eurostat also plays the role of coordinator in the field of training and development (Zwick, 2013).

Another focus for NSOs can be to lead the use of statistical literacy throughout the official statistics sector in their countries. To help achieve this, Statistics New Zealand worked with other official statistics agencies to set up the Certificate in Official Statistics. Several cohorts of Official Statistics' staff have completed or are working through the qualification (Forbes et al., 2011).

Education and advanced training for staff members has played a prominent role within the statistical offices and, in the last decades, statistical training has become more and more relevant, reaching even beyond NSI offices (Zwick, 2013).

### **European Master in Official Statistics (EMOS)**

The European Master in Official Statistics (known by the acronym EMOS) aims at developing a program for Training and Education in Official Statistics. A combination of EMOS and ESTP courses within a credit point system could be developed to offer internal staff a postgraduate type degree in statistics. EMOS is a joint infrastructure project of different stakeholders (NSI, Eurostat, universities and national schools in statistics). It should be offered by a network of National Statistical Institutes and Universities at the end of 2014 (Zwick, 2013).

The quality and vitality of statistical programmes depend on engaging the finest and most talented recruits and investing in continuous learning for employees to build capacity at all levels (Unece, 2012). Some of the objectives set by EMOS are to create a repository of young statisticians having a sound knowledge in statistics but also in other fields related to official statistics (e.g. IT, social sciences, economics), and to improve cooperation between universities and NSIs. EMOS has an additional aim of supporting international higher education. Having a common EMOS program in various universities will promote the mobility of young students across Europe. In broad terms, the EMOS would provide certified

training in methodologies, statistical surveys, statistical production, analysis and statistical law (Zwick, 2013).

### **Long distance learning in statistics**

It is necessary to develop programs that will also educate the current staff in an efficient way with new scientific-based knowledge. The first step could be to plan European eSummer School (EueS) in statistics. By implementing this program Universities of Trier and of Pisa, together with Eurostat, offered long distance learning in statistics. From a central technical hub and using a tested technical network, the course was transmitted to students in Trier, Pisa and Luxembourg. The idea of EueS could be rolled out and offered to all interested NSIs in Europe. EueS could also be integrated in the ESTP, in the different internal trainee programs in the various statistical offices across Europe (Zwick, 2013).

### **Statistical literacy as an aspect of media literacy**

The media have a versatile role related to NSIs. First, the media are interested in the activities of NSIs as a public organization. Second, the media are important redistributor of statistical information. Third, the media are large-scale users of statistical information – NSIs’ output is raw material, i.e. input to media production processes and activities (Helenius, 2010). Statisticians are well aware of how the media can sometimes misinterpret statistical data (Unece, 2008). Numerous misunderstandings and misinterpretations of (official) data can be observed in media reports, in daily newspaper articles and in direct contact with the users (Unece, 2012). A cornerstone of traditional journalism has always been its commitment to truth. However, even with “solid facts” there can always be different ways of slanting them, giving them different significance by using different news frames, narrative structures, value premises, vocabularies, and so forth (Vobič and Dahlgren, 2013). Indeed, to understand the meaning of a text, we need to be able to do more than just spell out the words it contains in the same way that in the reading of statistical information we need to understand concepts and methodologies used in its preparation. We need to improve statistical thinking, or in other words, we need to know how to “read” the data (Campos, 2008). In Statistics Portugal a training program has been introduced and internally conducted in order to improve the writing style of the office, aiming at increasing the clarity and the objectivity of the statistical message (Campos, 2008). Classic virtues of journalism (Vobič and Dahlgren, 2013) account to accuracy, transparency, accountability, and impartiality with contemporary participatory dynamics in the news environment. Another important objective to all statistical agencies should be to promote *statistical literacy* of the media workers (Unece, 2008). The journalism of traditional media institutions is often flagrantly failing to live up to its accredited fundamental obligation, that is, to link people to public life (Vobič and Dahlgren, 2013). It is especially true on the terrain of online media upon which the future of journalism is being established (Hirst, 2011).

Statistics Canada no longer tries to beguile journalists with formal training courses. Instead, the agency has strengthened its media relations program and is active in providing user friendly service for journalists (Helenius, 2010). Since 2001, The Daily, Statistics Canada’s official release bulletin, has been published on the home page of their website<sup>3</sup> every working day providing journalists with immediate access to all new releases with links to supporting publications, concepts and definitions. In the case of special news releases, Statistics Canada

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<sup>3</sup> Statistics Canada, <http://www.statcan.ca>

invites media representatives to assist them in planning the coverage and potential story lines in advance. Additionally there are special services (Media Hotline) for responding to journalists' queries and Media Room with a set of useful links for journalist (Helenius, 2010).

### Developing segmented statistical media services

In its remote origin, a NSO's mandate was to measure the State. To do that, data were produced and summarized for those who needed them in government and research. The media did not play as big a role then as nowadays, and the Internet did not exist. But all this has changed. In contemporary society, everybody is exposed to official statistics and can make use of them to make decisions. Creating data and summary statistics only for government is no longer enough (Sanchez, 2008).

The different user groups impose different expectations, needs and wishes on statistics and statistical offices. However, the skills of the users vary considerably. The diversity of the targets, contact points and expectations of the users makes it necessary to have a variety of arenas, too (Helenius & Mikkelä, 2010). Statisticians only recently started to reflect on the fact that the ability to understand statistics is the prerequisite for a successful communication with users (Unece, 2012). If statistical agencies create user support for a better understanding of the data producing process and the results of official statistics, it is helpful to segment the different user groups. Teachers require different information than their pupils, journalists need different information than researchers (Zwick, 2013).

A statistical office is expected to identify different types of users of data and their needs. Targeting given user groups and focusing on serving their needs does not serve equal dissemination of information or the objective of promoting the use of information widely in the society. Educational institutes and the media redistribute statistical data and “educate” their own customers, i.e., ordinary people. It is vital that they receive support from national statistical offices in this task (Helenius, 2010).

From Statistics New Zealand's perspective there are three main types of groups to work with in statistics education: schools and universities (formal education sector), government employees (the state sector), and business and community groups (the informal sector) (Forbes et al., 2011).

The *statistical literacy* strategies of the ABS identified five target groups on the basis of the content and context of their statistical literacy needs as presented in Table 1 and different level of statistical literacy needed in each different user group (Taylor P. W., 2008).

Table 1: Example of segmenting users of statistics (Tam & Cross, 2009)

	Basic literacy	Intermediate	Advanced
<b>School Students</b> (both primary and secondary)	•	•	
<b>Tertiary Students</b> (including University and Vocational Education students and teachers/lecturers)		•	•
<b>Opinion Leaders</b> (including journalists)	•	•	•
<b>Decision Makers</b> (including politicians, political advisors and government employees)	•	•	•
<b>General Community</b> (including small business/community groups)	•		

## Different services for different user groups

One of the challenges statistical offices face is how to release statistical information as clearly and understandably as possible, and how to include elements that promote its understanding in the release practices. These features are of growing importance as the “self-service” use of statistics increases in this era of growing use of the Internet (Helenius, 2010). Effective dissemination depends on understanding the needs of the diverse user groups and then matching this with the appropriate medium and level of detail (Unece, 2012).

In Statistics Portugal (SP) many efforts have been made in last years with the aim of improving statistical literacy. The Local Action of Applied Statistic (ALEA) was set up for the specific purpose of providing tools related to the understanding, using and teaching of statistics. ALEA won the Best Cooperative Project Award conferred for the very first time by the International Association for Statistical Education (IASE). This project is a joint idea of the SP and Tomaz Pelayo Secondary School, bringing together the Portuguese Ministry of Education and the statistical office (Unece, 2008). The ALEA is aimed at primary and secondary schools, but it is also an important resource for supporting interdisciplinary projects being simultaneously of benefit to many other groups of people (Campos, 2008).

ALEA, the network learning material produced by SP, has served as an inspiration to several corresponding services including Statistics Lithuania’s *Statistics for Schools* and Statistics Finland’s *eCourse in Statistics*. Also, Statistics New Zealand’s *School Corner* and Statistics Canada’s *Learning resources*, targeted at teachers and students, have served as a basis for corresponding services developed by other countries’ statistical offices (Helenius, 2010).

Statistics New Zealand has a number of products designed to support statistics learning, and a larger number designed for public and/or professional audiences. To ensure that these data products are accessible, interesting, valued and engaged with requires that official statistics agencies and statistical literacy educators work together to inform the education community about these products and how to use them effectively. Products available on the Statistics are shown in tables 2, 3 and 4.

*Table 2: Segmentation of statistical services in Australia*

Product	Type	Target group
The ABS Education web page	An entry page to a range of free educational resources, i.e. materials outlined in the new Australian Curriculum.	Students and teachers
CensusAtSchool (C@S)	It is an online questionnaire with Random Sampler access to the real, raw data about Australian school students.	Students, free for all Australian schools
The Statistical Literacy Competencies	The description of the competencies by levels of statistical literacy.	General community
Run That Town	ABS Census application, i.e. an online game, using real 2011 Census and Population and Housing data to support development of general capabilities.	Students
Portal for small business	Aimed for helping small businesses in effectively using ABS materials that are relevant for them.	Small businesses
'Statistical Language!'	Basic statistical terms and concepts explained in plain English to support basic statistical literacy skills development.	General community
Maths and Stats by Email (MaSBE)	Free fortnightly e-newsletter.	9-13 year old children

Table 3: Segmentation of statistical services in New Zealand

Product	Type	Target group
Schools Corner	Webpage with classroom activities	Primary and secondary school students
StatZing!	2 newsletters containing activities and a 'Teachers Page' with information, tips and solutions to questions in activities.	Primary and secondary school students
Census education resource	Census related online resources and activities	Primary and secondary school students
CensusAtSchool	Internet based survey, students participate and make use of real data.	Late primary and secondary school students
SURFs	Synthetic unit record files (data sets)	Primary and secondary school students
TableBuider	Software for creating tables with OS data	General public
Infoshare	Easy access to time-series data for OS data	General public
Hot Off The Presses (HOTPs)	First release publications of OS with links on relevant materials	General public
QuickStats	Quick overview from 2006 Census data of NZ with facts, tables and graphs	General public

Statistics New Zealand's website allows students to investigate their local area, make comparisons with other areas or with the national population. A mapping facility (interactive boundary maps) is available that allows students to zoom onto a small area, and then link to statistics about that area. QuickStats can also be used to extract data about a place and import it into packages with a mapping function to compare regions (Forbes et al., 2011). The ability to support geospatial data analysis comprises more than just an ability to produce and interpret maps. It is possible to think in terms of data discovery, data visualisation and data analysis (Unece, 2012).

The ABS website forms a focal point for assisting state and local government in their awareness, understanding and use of statistics. Website portals for each Australian State and Territory and for local government provide targeted communication and support for these groups. The statistical literacy framework (Tam & Cross, 2009) of ABS includes the segment of general community. ABS has noticed that collaborations with other government departments have been an effective way to reach targeted groups within the general community (Helenius, 2010).

The ABS established the education services unit aimed for enabling access to and use of digital and equitably accessible resources by Australian teachers and students. It consists of educational and other professionals who create and publish free teaching and learning materials that align with statistical (and other) components outlined in the new Australian Curriculum. The ABS products are aimed to support deeper statistical understanding. An effort is put also to increase the online "discoverability" of education services and other ABS products. As a key strategy, ABS education services is constantly challenged to meet the wide ranging needs of teachers spread across remote, rural, regional and metropolitan areas. Training can be presenter-based in a face to face setting, short self-help online tutorials or e-learning course modules but need to match user requirements to be effective. "Just in time" training can also be built into online data access tools to provide users with key information at critical points in time (Unece, 2012).

Training services and learning materials are produced by a number of statistical offices. Producing *School Corners* and similar training courses takes a great deal of resources. It would make sense to put existing methods and methodologies to a new use as well as to learn of other organizations' best practices (Helenius, 2010).

*Table 4: Segmentation of statistical services for media workers in Canada*

<b>Product</b>	<b>Type</b>	<b>Target group</b>
Workshops, trainings, guidebooks and handbooks	Support for formal training courses for media workers and other interested groups.	Media workers and others
Media hotline	Help for media workers; responding to media queries (for finding or interpreting data), booking interviews with statisticians etc.	Media workers
Daily	Statistics Canada's official release bulletin published on the home page <a href="http://www.statcan.ca">www.statcan.ca</a> every working day.	Journalists
Media Room	Popular theme-based links, definitions and regular topical stories or calendar based events.	Journalists

### **Segmented services for users – the case of Croatia**

The recognition of the importance of statistics to national and international development should be translated into predictable and substantial investments (Kiregyera, 2010). However, a problem is that while statistical organizations acknowledge the importance of having statistically literate data users and the social and political benefits this confers, the development of statistical capability is not their primary function (Unece, 2012). Having departments dedicated completely towards statistical education and raising statistical literacy, by preparing statistical lessons available online and similar materials, even online games with statistical themes, is a needed prerequisite for having a contemporary statistical office with segmented services for different groups of users. However, that prerequisite is a relatively expensive one. The ABS is looking at ways to free up resources in order to put in place more specific strategies to improve the statistical literacy (Taylor P. W., 2008). At the same time Croatia is a transitional economy facing shortage in resources available in government agencies, similar to Armenia, which has an NSO with publications that could be used in a statistics class to illustrate some statistical and probability concepts to students. Numerous stacked bar graphs, time plots, population pyramids and tables can be used to illustrate concepts of empirical conditional probability and multivariate data analysis (Sanchez, 2008). Croatian CBS provides a range of quality materials, statistical documentation and datasets to users. However, these materials are not segmented according to different user groups in Croatia. Media, i.e. journalists, are a special group of users and some of the services for them include online conferences with especially important releases prepared for journalists as well as a dedicated department for cooperation with media workers. Other materials presented online are available to everyone who has a need for them, but in the same way for all groups of users. Statistical information is present in Croatian national news on television and in the other media channels on the daily basis and public is referred to contact CBS' web page for additional information. Consequentially, CBS is very much acknowledged for its part in informing the society in Croatia. A useful contribution in promoting official statistics' products were introduced recently on the national television, a quiz show called "Volim Hrvatsku", i.e. "I love Croatia", an entertainment and educational series, hosting Croatian celebrities and presenting statistical facts as a main topic of questions set to upon contestants. Raising statistical literacy by dedicating resources for development of segmented services for users in Croatia is certainly something worth considering. Hopefully there is a good will in responsible authorities and enough resources available to support these needs. Besides arenas for information producers and users, inter-organizational arenas are needed. Examples of existing arenas include cooperative networks and groups, steering groups of projects, shared projects, seminars and other gatherings and meetings. The challenge is how

to make most out of these opportunities to enhance statistical literacy and awareness, and how to motivate stakeholders into participation. New ways and forums are also necessary, especially ones taking advantage of the possibilities of new media (Helenius & Mikkela, 2010). The more versatile an approach statistical offices and statistics adopt in seeking visibility in different sectors of society and arenas where information is used, the more certain one can be that statistics are made accessible to all those who need information. This is likely to contribute to a picture of a reliable, impartial and user friendly producer of information (Helenius, 2010).

### **Conclusion: Approaches to design of new statistical media services – towards profiled services**

There are many strategies that statistical organizations can employ to generate awareness and interest in national statistics and their practical application to everyday life. From increasing exposure of statistics in daily newspapers to producing electronic newsletters, alert mechanisms and blogs for specific target groups, this entails a cultural change for many statistical organizations along with the development of skills for statisticians to market their statistics and present data in ways that are interesting, relevant and accessible (Unece, 2012). One of the tasks of the data producer, especially for NSIs, is to create solutions that enable data users to access the data and metadata in an easy and intelligible way. The user has to be able to draw the right conclusions from the data and it is essential therefore that each data user also has a sufficient level of statistical literacy (Zwick, 2013).

Providing additional and background information is a useful contribution to successful communication. Statisticians should support users in this interpretation process. Good examples include context explanations or links that imbed statistics into a topic of interest to the user, and ranking or highlighting important developments in graphs and tables. Metadata provide detailed information about one or more characteristics of data, enabling understanding of their scope and limitations. Metadata also encourage proper use of information (Unece, 2012).

Authors, based on their work experience in official statistics, believe that four very important approaches for developing communication and information services of official statistics, segmented according to various user groups, are possible: interactivity, non-linearity, contextuality and openness of repositories. These approaches could contribute to profiling of services to specific user needs and interests. *Nonlinear* connections are the basis for hypermedia systems and open up the possibility for differing views on the content and open interaction with the system (Chen 2002). *Interactivity* implies openness, user activity, participation, co-creation of meaning (Chang, 2006) and a multitude of diverse views on the content, while endeavouring to design systems to please the user so that user could, in accordance with his/her capabilities and needs, access and interpret the content. Behind the *contextual* approach the idea is certainly to provide the user with a “smart system” that will be based on contextual information, to automatically draw conclusions and to assist the user in everyday life. For example, to develop systems that will cooperate and exchange information and, based on the conclusions, assist the user in taking further actions. Contextual information can be obtained from the system monitoring, the interaction with the user or from memory of earlier user’s activities (past interactions and query responses of the user) (Victor, 2006). *Open repositories* allow different individuals, with different expertise, to see and access the same content, consider complex interactions in the system, and drawn various different conclusions about content that has interesting and useful meaning to them. This approach allows for multitude of selections in the system thus enabling users to access

different parts of content and therefore have different uses of the system. The introduction of open access to information systems development enables decentralized authorship and maintenance of contents, as well as develops ways of cooperation and communication of people. At the same time the development of these systems is very complex and tedious task and involves a lot of preparatory work and research in the beginning. New media use objects that are not closed (fixed once and for all), but have the ability to change and can exist in different versions (sometimes unlimited number of versions) (Manovich, 2001).

A central question emerges whether activities can be developed for example by networking, cooperation and learning from others. This applies to cooperation with both colleagues and users of information and interest groups. Information sharing, cooperation between different actors and learning from other organizations' experiences are crucial for developing practices for the promotion of statistical literacy (Helenius, 2010).

Statistical organizations need to ensure that networks are established with key client groups to facilitate greater interaction in order to understand their needs and how they operate and to evaluate the impact of the strategies employed. Using other mechanisms and social media platforms such as YouTube, Twitter, Blogs and Wikis to communicate across different target groups and demographic profiles is the key to promoting awareness of data and what they mean (Unece, 2012).

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# *Statistička pismenost kao aspekt medijske pismenosti*

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## **SAŽETAK**

*Statistička pismenost predstavlja aspekt medijske pismenosti, naročito zbog sve većeg udjela statističkih informacija u medijskome izvještavanju. Biti statistički pismen znači biti osposobljen za ispravno shvaćanje i ispravno korištenje statističkih informacija, iz medija ili dostupnih servisa službene statistike, u svrhu vlastitog razvoja i posrednog ili neposrednog djelovanja na razvoj institucija i države. Statističke informacije daju pregled stanja i omogućuju praćenje promjena pojava u vremenu te bi trebale biti temelj za donošenje odluka u ekonomskoj, političkoj, kulturnoj i osobnoj sferi života. Rad analizira stupanj razvijenosti segmentiranog pristupa razvoju statističke pismenosti kroz razvoj novih statističkih medijskih servisa za edukaciju i informiranje građana u Hrvatskoj. Pristup razvoju statističke pismenosti u Hrvatskoj autori uspoređuju sa stanjem u drugim zemljama u Europi, ali i šire. Propituju se četiri pristupa u oblikovanju medijskih informacijskih servisa koji su ključni u razvoju tzv. novih statističkih medijskih servisa za građane: nelinearnost, interakcija, kontekstualnost i otvorenost repozitorija usluga. U radu se analizira primjena četiriju pristupa u oblikovanju statističkih servisa za građane u različitim kontekstima i ukazuje na opravdanost korištenja ovih pristupa u ispunjavanju ciljeva dugoročnih strategija razvoja nacionalne statističke pismenosti.*

*Ključne riječi: statistički medijski i informacijski servisi, statistička pismenost, razvojne strategije nacionalne statističke pismenosti, pristupi oblikovanju medijskih servisa*