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**ECONOMIC AND SOCIAL MOTIVES OF USING GEOGRAPHY-RELATED
INFORMATION AND COMMUNICATION TECHNOLOGIES:
A JAPANESE-HUNGARIAN COMPARATIVE STUDY¹**

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Abstract: The Japanese society represents one of the most sophisticated usage of ICT tools and one of the highest level of technological development in the World, therefore it is worth to get a closer look on the application of spatial information tools and spatial data in the everyday life of this country. This paper introduces some examples on how spatial information is used in Japan and in Hungary. Additionally, some preliminary outcomes of a pilot survey are presented, focusing on the comparison of the Japanese and the Hungarian geography-related information societies. According to the results different technological background or different level of development is not the only explanatory factor of the spread of geoinformation services, local circumstances seems to play an important role as well.

Keywords: ICT, information society, information economy, GIS, geographic information, Japan, Hungary, geoinformation business

JEL: L86, L96, O18, O33, O57, R00

Introduction

Theoretical as well as practical experiences of analyses confirmed that spatial processes of the diffusion of information and communication (ICT) technologies largely influenced the economy and society of the 21st century (*Karlsson et al. 2010*). In the last couple of years, a new motive of ICT-based inequalities seemed to appear that could have been connected to the usage of geographical information, since the progression of information technologies influenced also the diffusion of information having geographical content. Recently, significant growth is shown by certain circles of industries and services attached to information technology tools, which provide geoinformation – namely information made up with spatial, geographical substance – to users in a direct or indirect way. The “geoinformation business”, therefore, gained an increasing share in information economy.

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As an affect of the technological change many examples can be cited from location aware smartphones to map services of the Internet, which represent how peoples' opinion on the everyday role of geographical information could have altered. Indirectly geographical information systems (GIS) slowly and invisibly got diffused in everyday life, just think about the spreading of GIS-based web mapping, Google Earth and other Digital Earth solutions, GPS-related activities, location based services or other geographical extensions of virtual reality and augmented reality in cyberspace.

Although the spread of innovations associated with geoinformation services was quite fast and global sized, it seems that market possibilities of this sector is largely dependent on location, not just by the reason of different business environments, but also due to diverse attitude and intention of people of adapting new innovations.

Present research was aiming to test the above-mentioned hypothesis by comparing Japan, an advanced country of information technologies, and Hungary, a member state of the EU with different backgrounds and opportunities of ICT development. As a co-operation between the University of Tokyo, the Ritsumeikan University in Kyoto and the Eötvös Loránd University in Budapest, questionnaire surveys were made to compare how Japanese and Hungarian people are using map-information based personal applications and what is their relation to geoinformation services.

The Japanese society represents one of the most sophisticated usage of ICT tools and one of the highest level of technological development in the World, hence it is also expectable to offer wide range possibilities to access the information stores of the modern age. The almost everywhere detectable presence of the information economy and society has expanded the possibilities of accessibility in this county, which provide the chance to see the real “working” spatial information technologies. From a European point of view it is by all means instructive to explore an environment, where the usage of spatial information has been made possible by the satisfaction of variant social and economic needs with the most diverse technological solutions of the 21st century.

The Hungarian way of using information and communication technologies (and also the usage of geoinformation technologies) supposed to be slightly different from the Japanese one. Hungary is among those European Union member states, which understood the importance of the Lisbon Strategy, announcing that information technology development, and the enhancement of the information economy and society is an essential factor of the global European competitiveness, and also important for the national development. Since Hungary is not a significant participant of the leading technology-oriented group of countries, but

considered to be a developed country (i.e. Hungary is a member of the OECD), this country is among the second group of the followers of new innovations. It is assumed that Hungary has also high values in indices of using ICT, however, not as high as some advanced countries.

The appraisal of geoinformation business

The discovery of the usage habits of information with geographical content makes it possible to describe the newest demand of the modern age society. One can define geography as the service provider (or vendor) and the society as the customer with formulated demands, thus in line with this approach the task is to explore production and consumption characteristics. By analysing recent processes of the usage and access of geographical information a very up-to-date topic would be possible to understand. Nothing better can illustrate the actuality and usefulness of the topic than that a couple of years ago the relevant terms and technological handholds of this question were almost unknown in professional circles, and knowing that technology is changing rapidly the understanding of ongoing processes is perhaps urgent and vital. We could just think on that the number of selling of geo-application equipped smartphones is becoming larger than that of traditional mobile phones both in Japan and in Hungary, resulting that mobile phone manufacturers like Nokia – which has a large assembly factory in Hungary – lose markets, or should restructure production activities both technologically and geographically. The understanding of the guiding principles of a new technology that is significant for the future makes it possible to forecast development paths and processes. The practical market usefulness of the research can be seen mainly in the recognition of international trends and in the determination of national possibilities, since it is assumed that “geoinformation business” would be a dynamically developing and increasingly important service.

Although geoinformation business is known already for some decades (*Frank 1997*) it gained a new momentum in the last couple of years by the revaluation of GIS, webmapping, GPS, navigation, LBS and other popular applications and technologies. Since it is a rather technology oriented issue, primarily the regions and countries have taken the chance to enter the markets, which had apparent advantage in the production or consumption of the related goods, and hereby had a rather adaptive and innovative society and economy. Japan could be mentioned among these countries, however, certain regions, especially the United States was well ahead of Japan in the segment of geoinformation business. The nowadays most well-known online mapping services like Google Maps, Bing Maps etc. or the leading GIS

software companies (e.g. ESRI, Mapinfo) and many others are all located in the USA, while Japan has not many globally known GIS enterprises. It is typical that Japan is an adaptive country in this sense, however, it has many innovative geoinformation companies as well, which have brand new geoinformation solutions for the market. The Japanese geoinformation business is preferably focusing and concentrating on domestic demands, which is rapidly increasing and giving new chances for entrepreneurs and investors. An interesting and successful example of the domestic geoinformation business is Navitime, a company, which provides “all-in-one route search” services for mobile phone users. Since the majority of mobile phones in Japan is equipped with positioning devices (GPS), the popularity of such integrated navigation-information services is quite large. This reflects that in a society, which got accustomed to technological thinking, it is easy to disseminate a geoinformation related innovation.

In Hungary the popularity of mobile phones is quite high. At the moment there is larger number of mobile phone subscriptions in the country than people. Following Japan also the same trends are observable in this country: the number of smartphones is rapidly increasing, making it possible to disseminate smartphone-based geoinformation applications for all. On the other hand there are measurable inequalities in the society and the economy in the context of geoinformation business. It is assumed that GIS and geoinformation are still mysterious words for the ordinary people, while some have already discovered the opportunities in this field. The company Nav N Go (NNG) is a prosperous geoinformation company, with many services and products for mobile phones and car navigation systems, additionally this company has business connections with various automotive companies, which reflects that geoinformation business can be successful in this country as well. This is however not the typical case: Hungary is usually adapting technologies from abroad.

The usage of spatial information in the Japanese society – from a European perspective

The spatial information culture of Japan, namely the disclosure of data enabled with spatial information is built upon the widespread usage of information and communication technologies. In this society the usage of ICT is specifically developed not just because of the broad and internationally well known supply side (just think on the several brands of electronic products), but also due to the observable and manifested demand side of its local population. Indeed one criterion of the “active” information society is that the society itself puts up for information, content and services, which seems to be a real demand generating

factor in Japan.

According to data of the International Telecommunication Union (ITU) 86% of the Japanese population, that is 109 million subscribers had mobile broadband access, with that Japan has the second largest consumer group after the United States, which has 123 million subscribers (39% of the population). A definite character of the Japanese ICT usage is that Japanese population applies information services mostly through mobile phones. Interestingly the usage of PCs, and the access to internet with desktop computers and notebooks is less frequent than expected, although still favourable in a global context. The annual ICT development index of the ITU accordingly takes into account more aspects when estimating the development level of the information society (see *ITU 2010*). According to the rankings for 2008 Japan has the 8th highest index among the 159 observed countries. In the top 10, where only European countries are taking place, the only exception is South-Korea (3.), which has an ICT profile much like Japan (with also significant mobile broadband subscriber shares). In this ranking Hungary is at the 34th position. In case of Japan the consideration is probably true that the high volume of using information tools, or in other words the regular usage of computers by wide circles of the population and especially the large numbers of mobile devices, just because of its volume had stimulated the economy and society, more precisely the supply side participants to develop abundant and adequate quality services, with satisfactory profile and content. After all it is not surprising that Internet technology makes it easy to manage everyday matters, and widely assists shopping or entertainment activities.

The development of services based on information and communication technologies notably enlarged the range of spatial information solutions as well. The Japanese “mobile society” is getting familiar with the usage of spatial information by the application of new smartphones and related technological achievements, thanks to different positioning equipments (e.g. GPS). Since the disclosure of location information has become technically simple and daily, the range of services and applications based on it has considerably been enlarged. One of the most interesting services, which applies spatial information, is attached to the solutions of the personal or pedestrian navigation systems (see *Arikawa et. al. 2007*). This service is eventually a public transport based navigating and route guiding system for mobile phones that was built upon sophisticated usage of spatial data besides geographical positioning. The background of the system is supported by the accurate and precise Japanese transport system, in which spatial information of schedules and networks are available in large amounts and in an authentic form. In an imperfectly operating system itineraries and other spatial information derived from the schedules are ultimately useless, in predictably

operating systems, on the other hand, fast growing user demand might appear. The popularity of the service is already incontestable in the last years, which resulted sometimes the change of habits in using space, or occasionally even the formation of partial dependence from spatial data. In a country, which was organized in a relatively complicated system of spatial orientation, spatial data collected from the ether of information are very useful for the users, and it is often the case that users are fully entrust themselves to this device. An important part of the spatial data culture, therefore, the alteration of using space and the change of using spatial data.

An other nice example of spatial information management is connected to the refinement of the Japanese transport system as well. The research team of the Center for Spatial Information Science of the University of Tokyo created a transport modelling system to examine commuting and space-using habits and flow trajectories of local residents based on data of transport schedules and traffic information (People Flow Project)(*Usui et. al. 2010, Nakamura et. al. 2010*). The model is really interesting because of its spatial information basis. On one hand it is constructed from large amounts of published data of public transport schedules, on the other hand the project tried to involve direct and individual spatial data of the participants. Among others one solution was to use spatial digital footprints of people. The transport system in the Tokyo agglomeration is operated by an electronic payment system, which records with the user's chip-card the place and time of entry in the transport network, and also the moments of passing through transfer points in the system. Hence the electronic transport payment system collects huge amount of spatial information on the transport habits of the population. By the combination of different spatial data the above mentioned modelling system became aware to create spatio-temporal data sets making it possible to analyse spatial trajectories and the peoples' habits of using space. The digital footprints left behind the clientele are typical examples of the information society's newly emerging and spatially relevant information. The utilization of these chances is a big task for regional scientists. It is a new tool for understanding the spatial behaviour of the society, which was already and initially been applied in Japan.

The serving of the society with information of spatial content and the accessible information's spatially interwoven nature is often invisible from the user's point of view. Solutions of location aware computing and location based services are already widespread, regardless of whether the user knows or not the possibilities of positioning. It does not really matters, since the transmission of location information is often automatic; what more important is the quality of information the customer might have access to at a certain spatial

point or in connection with a given regional object. The range of such location based services is rather wide (e.g. information on the local neighbourhood of the user, or access possibilities of the nearest post office etc.), furthermore the circle of service users is considered to be also broad, which also reflects the relatively advanced level of using spatial data. And in order to manage location based services a lot of place-based information or in other words spatial information is required. The increased needs for information is partially fulfilled by modern data-collection technologies of public or private companies, and also by the population itself, when local people or local communities play the role of information providers. Volunteered geographical information (VGI) systems are built up from information uploaded by the users, and if a system could have many enough users in the background, then sooner or later an alternative or supplementary version of the accurate professional systems might develop. Compared to the spatial data sets of traditional geographical information systems the quantity of volunteered geographical information can be many times higher, which can result significant improvement of the observed phenomenon's spatial resolution. In Japan many examples can be found, of those the services in relation with local weather conditions are among the most common ones. The virtual community service of "weathernews.jp" collects and provides in addition to the official weather information also volunteer based innovative weather information, quasi-individual weather reports, measurements, cloud images and other data useful to the community organized on a regional basis. The system is used and eventually managed by approximately 10 million people, making it possible to operate with much more spatial data than the majority of the usual weather services have. Obviously many question the authenticity of data, but on the one hand the users are aware of the reliability of the published information, and on the other hand it became clear that the system can only operate for long, when disclosed information are effectively not far from truth and reality. In spatial data culture, just like in Japanese culture, "honesty" is important and typical, so that reliability of data in virtual communities is noticeable among given limits.

Comparative analysis of the usage of map-information services

The usage of information services and especially the application of geographical information services have shown significant increase globally in the last years. Growing number of services and applications appear, which became well known in no time for wider or narrower circles of the society. The usage gives, however, not the same possibilities for everyone, and is not the same important for all. Presumably it is different by countries, social

groups, or individuals. This assumption was in the focus of the research, in which the Japanese and Hungarian population's knowledge and habits of using map-information services were compared in an experimental, pilot-like survey. The small sample comparative survey generally examined how GIS influenced Japanese and the Hungarian people's relation to space, their habits of using space, and to what extent the access to spatial information has changed their daily life.

The survey was carried out in 2011-2012 by evaluating a questionnaire containing a total of 13 professional and 7 supplementary questions. The questionnaires were filled out by both Japanese and Hungarian respondents. The questions were completely the same for both countries, even though certain notions and phrases were locally much more known or even unknown, or had different meaning. The research, however, had directly this aim, namely to find the main motives of content, usage or other differences of geoinformation services between the countries.

The survey has a total of 234 collected questionnaires, of them 134 contains answers of Japanese respondents and 100 of Hungarian ones (this article is based on mid-term results, since additional surveying is still under process). The questionnaires were collected both paper-based and in online form in the two countries. The survey was carried out by the assistance and participation of the Center for Spatial Information Science of the University of Tokyo, the Department of Geography at Ritsumeikan University in Kyoto and the Department of Regional Science at the Eötvös Loránd University in Budapest. Due to the lack of options the research did not aim to create a whole representative sample, but obviously tried to examine the questions from many sides, thus the range of respondents was not narrowed to any social groups. The largest group of the respondents was formed by pupils/students, so they were occasionally worth to analyse as a separate group.

The constructed questionnaire was focusing on three major issues. Firstly we examined what knowledge the respondents have on map-information applications and services. According to the results there are similarities as well as dissimilarities between Japanese and Hungarian respondents (*Figure 1*). In general, Hungarian respondents marked the answers with larger standard deviation. Both groups mentioned car navigation applications with the highest rate, while augmented reality (AR) applications happened to be almost unknown. Hungarian respondents mentioned more dominantly the mobile compass applications or the knowledge of real time traffic information services, the latter result can probably be originated from the unequal Hungarian and Japanese interpretation of this term. The Hungarian category may cover broader ranges of applications, while Japanese people

interpret public transport and road or rail traffic information separately, since the latter ones are usually considered to be an integrated part of the navigation services, they mark it perhaps at that category.

As for the results of the first question, among the answers of the Japanese respondents a significantly larger awareness was shown in connection with geolocated searching, local pollen information or various digital tracking services. These answers suggest that location based services are unambiguously more common in Japan, though for example local weather information services are well known in both countries.

The second group of questions examined what kind of services have ever been tried or used by the respondents (*Figure 2.*) and how those were applied. The results show that among Hungarian respondents many people have used car navigation and real-time traffic information services, while the Japanese have mentioned digital tracking applications, pollen information services and especially the geolocated searching applications with higher proportions, which coincides with the results of the previously mentioned knowledge analysis.

Figure 1. The knowledge of map-information applications and services according to the Japanese and Hungarian respondents

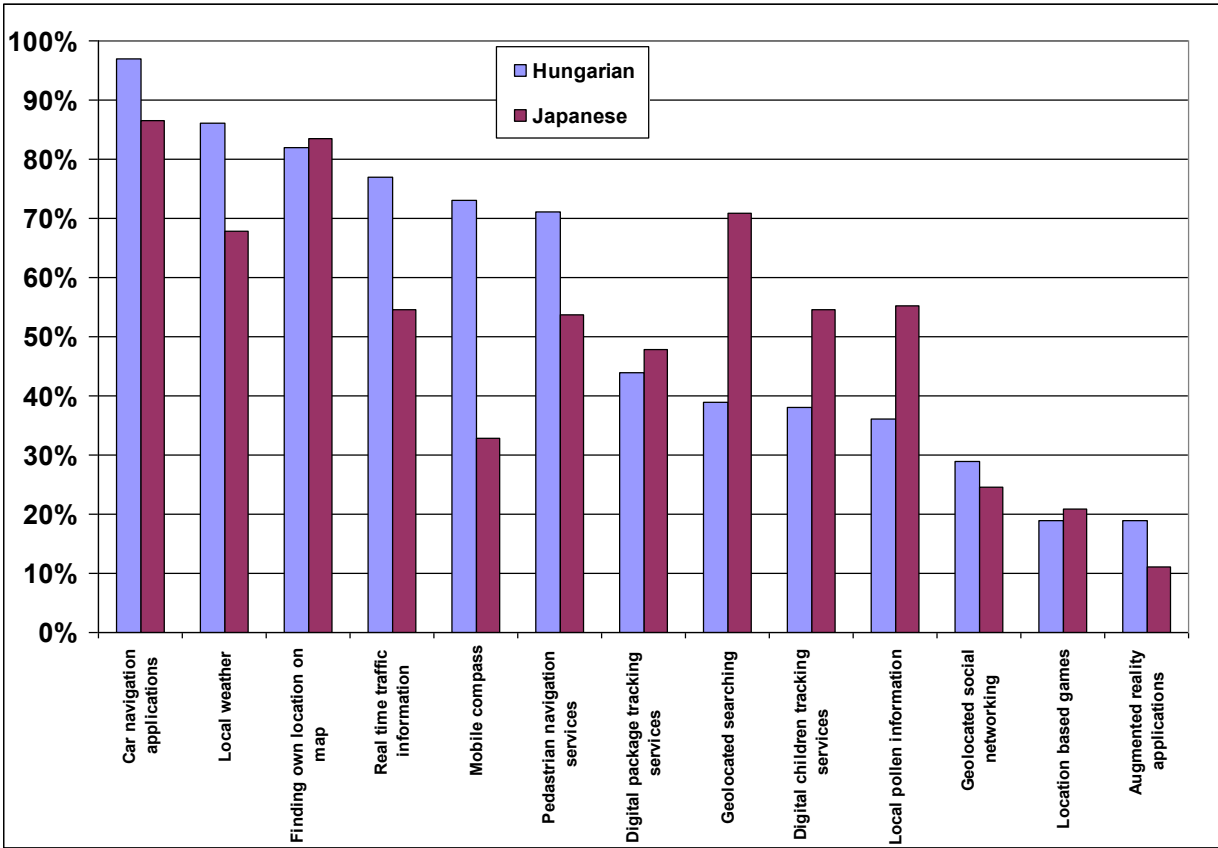
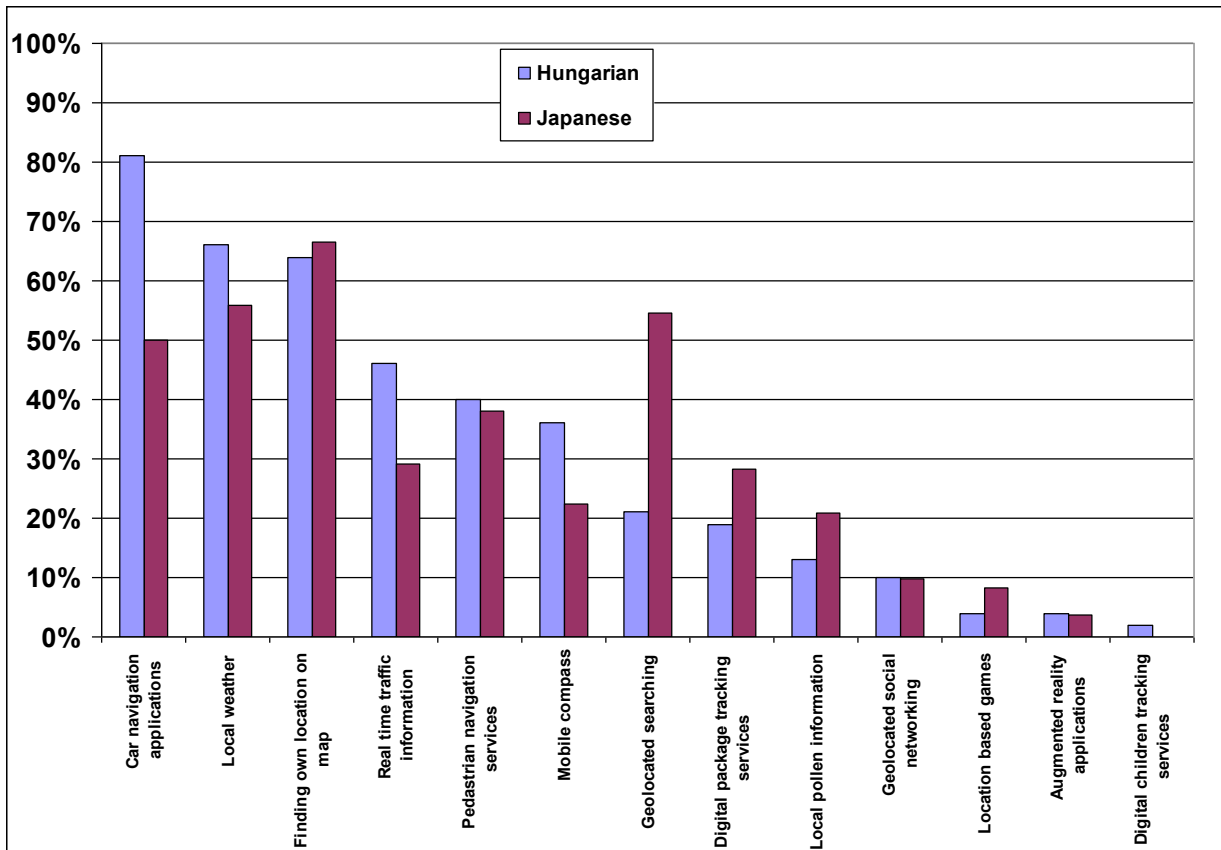


Figure 2. The share of tried or used map-information applications and services according to the Japanese and Hungarian respondents



In the third group of the questions we tried to reveal what opinion the respondents have on the importance and application possibilities of this issue (Table 1.). According to the results Hungarian respondents mentioned traffic and navigation services among the very important map-information applications, while location-based games, AR applications, geolocated social networking applications and digital children tracking services are considered as not important ones. Japanese respondents had roughly the same opinion regarding the non-essential applications, while mentioned local weather, navigation and other location based services as important applications.

Alongside the above mentioned questions the research analysed many further details of the characteristics of using map-information services and applications in Japan and Hungary. Generally speaking it can be assumed that Japanese users are somewhat more related to applications, which have relations to private usage or directly serve their own needs, while they are less recline upon community information. In contrast, Hungarian people use more services, which provide information not personally and not only for themselves only, although naturally the other services and applications are also among the used ones.

Table 1. The importance of map-information applications and services according to the Japanese and Hungarian respondents

Map-information based services and applications	Not important at all		Preferably not important		Preferably important		Very important		No answer	
	HU	JP	HU	JP	HU	JP	HU	JP	HU	JP
Pedastrian navigation services	30%	12%	37%	24%	25%	29%	7%	20%	2%	16%
Local weather	3%	3%	22%	12%	63%	44%	10%	25%	2%	17%
Location based games	73%	37%	23%	35%	0%	8%	0%	5%	3%	17%
Geolocated searching	25%	11%	27%	17%	35%	37%	10%	20%	3%	16%
Real time traffic information	7%	7%	20%	20%	45%	40%	28%	17%	0%	17%
Geolocated social networking	47%	21%	37%	40%	8%	17%	2%	5%	7%	17%
Augmented reality applications	55%	30%	32%	37%	7%	12%	0%	3%	7%	18%
Mobile compass	27%	23%	47%	29%	18%	21%	3%	11%	5%	17%
Local pollen information	32%	18%	30%	28%	30%	29%	5%	9%	3%	17%
Digital children tracking services	47%	27%	28%	23%	13%	23%	8%	11%	3%	17%
Digital package tracking services	30%	17%	30%	23%	28%	33%	7%	12%	5%	16%
Finding own location on map	13%	3%	25%	11%	37%	41%	20%	30%	5%	16%
Car navigation applications	8%	5%	15%	15%	45%	35%	28%	29%	3%	17%

Conclusions

It can be already seen from the above mentioned few results that geoinformation technologies and geoinformation business, as well as the usage of map-information related services and applications have some different directions in the two countries. In Japan the usage of location based services is well advanced, and this results that the Japanese society can serve as a good example for the second line developed countries like Hungary. Meanwhile Hungary has also formed its unique character in the geoinformation World, since this country is above-average active in content providing in cyberspace, which can cause that Hungary would have good results in map-information usage statistics.

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