Evaluating User Acceptance of the ELENXIS System for Health-related Businesses and Sanitary Inspections of Food & Beverage Enterprises

ATHANASIA KONSTANTINOPOULOU MSc

*PhD Student, University of Peloponnese, Dept. of Economics, Digital Health Applications and Health Analytics Laboratory, Tripolis, Greece,* [*http://digithea.uop.gr*](http://digithea.uop.gr)

ATHINA LAZAKIDOU

*Associate Professor, University of Peloponnese, Dept. of Economics, Digital Health Applications and Health Analytics Laboratory, Tripolis, Greece,* [*http://digithea.uop.gr*](http://digithea.uop.gr)

Address: University of Peloponnese, Dept. of Economics,

Tripoli Campus, GR-22100, Tripoli, Greece

Telephone: 0030 2710-230172

E-mail: athanasias@hotmail.com

**Abstract:** Health-related businesses and Food & Beverage Enterprises are an important sector of the economy. Sanitary inspections of these enterprises are very interesting because of the risks they may pose to public health. The aim of this research is to develop an accepted Geographic Information System to collect data for better inspections and audits by registrars and regulatory agencies through audit management function. The presented study is an evaluation of the self-designed ELENXIS System based on an accepted and reviewed methodology.

**Keywords:** Sanitary Inspections, Geographical Information Systems, Food and Beverage Enterprises, Health-related Businesses.

1. **Introduction**

Financial inspections of these food and beverage enterprises and health-related businesses enterprises are very interesting because of the risks that they may pose to public health. All food enterprises are responsible for complying with the financial regulations. At unannounced inspections, the public food inspectors check, how well the enterprises comply. All shops, restaurants and other enterprises selling food and beverages to the public are inspected on a regular basis, typically one to three times a year.

The regulatory framework for food & beverage in Greece is based on EU regulations and directives that are implemented through national by-laws, namely ministerial decisions and presidential decrees. All food enterprises are responsible for complying with the regulations. At unannounced inspections, the public food inspectors check, how well the enterprises are at this. Sanitary inspections are mainly carried out by the Regional Hygiene Control Directorates. All shops, restaurants and other enterprises selling food and beverages to the public are inspected on a regular basis, typically one to three times a year.

The aim of this research was to develop a Geographic Information System (called “ELENXIS”) to collect data for better inspections and audits by registrars and regulatory agencies through audit management function. A geographic information system (GIS) is a framework for gathering, managing, and analyzing data. Rooted in the science of geography, GIS integrates many types of data. It analyzes spatial location and organizes layers of information into visualizations using maps and 3D scenes. ​With this unique capability, GIS reveals deeper insights into data, such as patterns, relationships, and situations—helping users make smarter decisions. Hundreds of thousands of organizations in virtually every field are using GIS to make maps that communicate, perform analysis, share information, and solve complex problems around the world. This is changing the way the world works.GIS technology applies geographic science with tools for understanding and collaboration. It helps people reach a common goal: to gain actionable intelligence from all types of data.

Potential users of the new system include officials carrying out inspections and site visits within the country's geographical boundaries. The benefits of the new system are to identify, collect, analyze and visualize the data from these enterprises, as well as the results of all their sanitary inspections by geographical area [1].

1. **Method**

During the design process of the information system, all legislation relating to financial inspections and controls has been taken into account [2]. After the collection of the relative legislation took part, the collection of all questionnaires of sanitary control forms by which on-the-spot inspection of health-care businesses is carried out. Prior to the use of the designed Geographic Information System (GIS), inspectors manually marked several categories of critical and non-critical violations on “bubble sheet” pages.

More and more utilities are increasingly being held accountable for their inspection and maintenance management practices. The old standards of hand-written notes and spreadsheet data are increasingly not meeting the latest standards, while more and more regulations loom on the horizon. Among the latest advancements in GIS technology are server-based applications. These server GIS software toolsets provide a base set of functionalities to serve up maps and related data to users through websites or streamlined field applications. The Survey123 for ArcGIS and the Collector for ArcGIS has been used for the data collection and the GIS mapping.

The surveys for the control of the businesses were designed with Survey123 for ArcGIS, which is a simple and intuitive form-centric data gathering solution for creating, sharing, and analyzing surveys in three simple steps: ask questions, get answers, and make better decisions [3].The Survey123 of ArcGIS is a great tool to get started on field data collection with a smart phone or tablet. For the experienced desktop GIS user, provides a mechanism for field data gathering and populating GIS attributes tables. For the individual in the field, offers easy to complete template-based forms that require no GIS experience. For areas that lack mobile connectivity, gathered data can be temporarily stored on the device and then easily uploaded when service is available. GIS technology applies geographic science with tools for understanding and collaboration. It helps people reach a common goal: to gain actionable intelligence from all types of data. Maps are the geographic container for the data layers and analytics you want to work with. GIS maps are easily shared and embedded in apps, and accessible by virtually everyone, everywhere. GIS integrates many different kinds of data layers using spatial location. Most data have a geographic component. GIS data includes imagery, features, and base maps linked to spreadsheets and tables. Spatial analysis lets you evaluate suitability and capability, estimate and predict, interpret and understand and much more, lending new perspectives to your insight and decision-making. Apps provide focused user experiences for getting work done and bringing GIS to life for everyone. GIS apps work virtually everywhere: on your mobile phones, tablets, in web browsers, and on desktops.

Once the ELENXIS information system was created, permissions for evaluation of the information system, through adequate questionnaires, were collected. The purpose of the evaluation was to assess the value of the information system created.

The technology acceptance literature with a key representative of the TAM technology acceptance model (from the Technology Acceptance Model initials) can predict use by linking attitudes and beliefs (ease of use and utility), considering their consistency with time, purpose, and content, with behaviors toward using the system. In a study by Davis et al. the influence of extrinsic and intrinsic motivation on intention to use and actual use of computers in the workplace is studied [4]. This research attempts to extend the Technology Acceptance Model, as perceived utility is considered an extrinsic motivation and perceived enjoyment as endogenous, which affect and shape perceived ease of use. Subsequently, Venkatesh & Davis (2000) attempted to extend TAM by adding social influence and cognitive processes as determinants of Perceived Utility and Intention to Use [5]. This model was called TAM2. Although user satisfaction and technology acceptance have advanced as two parallel research paths, these two approaches could and should be integrated. To support this view, a model has been developed that distinguishes beliefs and attitudes toward objective data from the literature on user satisfaction with beliefs and attitudes toward behaviors from technology acceptance literature.

Using a combination of Davis TAM and Delone& Mclean's IS Success, the following model has been used [6-8]. An electronic survey was used to achieve the objectives and to investigate the hypotheses of this research. In order to formulate the sample needed for our research, users of the system (Financial and Health Auditors of the relevant departments) were asked to answer some questionnaires in which the questions were selected based on the physiological characteristics of the designed system, but also the needs of the processing model we chose. So, the sample of the survey was the responses of 40 users of the system.

The survey contained some questions on technical issues, such as the accuracy of geo-location, the trouble-free operation of software and instruments, and others. Initially the respondents completed their degree of familiarity with the use of the information system. It also contained questions related to respondent’s satisfaction with the use of the system and the quality of the services offered. The Likert scale with five ratings was used for answering the questions, ranging from "1 = completely disagree" to "5 = completely agree".

1. **Results**

Analysis and statistical analysis are performed using SPSS 21.0 for Windows (Statistical Package for Social Sciences) using inductive statistics as well as regression analysis to verify the results.

Inferential statistics: uses information derived from samples to predict and interpret population characteristics and determine the relationships between variables [9]. The most commonly used indicators of determining these relationships are:

• Kendall-tau\_b Correlation

• Spearman Correlation

• Pearson Correlation ή Correlation Coefficient (r)

• Pearson Chi-Square (X2)

• Coefficient of Determination (R2)

By studying the above indicators, we derive data on the relationship between two or more variables at three levels:

• Relationship strength, that is, if the relationship is valid, as defined in the research hypotheses of a model.

• Statistical significance, that is, whether the results can be traced as the results of a real relationship or refer to a random event.

• The proportion of variation in one variable that can be attributed to its linear relationship with the second variable, that is, the percentage that both variables have in common.

* Regarding the **quality of the information** produced by the information system, the 'ELENXIS' information system has a very good quality and covers the questions of sanitary inspections (p-value=0,015). The information is provided in a clear and unambiguous manner. The functions provided by the software are qualitative and sufficient to help staff perform the inspections.
* Regarding the **quality of the system** itself as a software, the ability of the system to collect, store and retrieve data is considered quite satisfactory (p-value=0,036).
* About the **utility of the system** as perceived by the users the capabilities provided by the system contribute to the speed of the inspections. Compared to the classic control method, the information system was considered more useful and productive. Platform software and components can improve re-inspections in a store(p-value=0,004). Overall, the review of inspections and the statistical processing of results can be improved as part of the Elenxis application (p-value=0,027).
* As for the **ease of use** of the system, it turned out to be relatively simple and easy to use (p-value=0,049), but it requires additional training in software and its capabilities, as well as more substantial support when using the system. It seems that the staff is not yet fully familiar with the use of the system and its applications. This area needs improvement.
* The attitude of users towards the system and their opinion about the services it offers is very positive. The **intention to use** the information system is high (p-value=0,009).

The following diagram presents the averages of the answers per question and then calculated the score that each variable received from the above model on average.

**Figure 1**: The ELENXIS Average rating of variables.

1. **Discussion**

The use of the designed information system as a control tool ensures **quick and effective control** of the businesses and ensures the health of citizens and the proper sanitary audit of these businesses.

Food safety is of considerable concern in public health. In Greece, food consumed away from home amounts to a quarter of the total expenditure on eating; thus, a substantial amount of tax money is spent on monitoring restaurant food safety. Hygiene inspections are a major component of such policy; accordingly, a key question is how to use inspection tools to effectively induce restaurant compliance. This question is difficult to answer because inspection outcomes are, by definition, a mixture of detection and compliance.

There are two types of inspections. The first type comprises regular inspections conducted at unannounced times, which officials refer to as “initial” inspections. Depending on the results of a regular inspection, a callback may follow to ensure compliance. The time lag between a regular inspection and a callback has modes of one day, one week, two weeks, two months or even more. The disciplinary activity reports specify whether a fine is imposed after each inspection and if so the amount of the fine. Any decisions related to fines are determined by a separate branch of the department and not by individual inspectors.

The findings of the presented study have several policy implications. First, a simple technology can substantially improve the efficiency of detection. Human inspectors are not perfect and have limited attention spans. With the help of a small electronic device that simply shows a checklist in detail, inspectors find significantly more violations, some of which are critical. Second, restaurants do increase compliance in response to higher detection effort by inspectors.

With this application, the inspectors will have the ability to inspect more efficiently and easily with new capabilities. The **data will be encrypted**, and both the field staff and office staff who access it will only be able to log into the system using two-factor authentication. The data they collect will be automatically uploaded to the central repository. The above-mentioned tools put mapping in the hands of the field workforce to **improve the accuracy and currency of the spatial data** and make more timely and informed decisions.

1. **Conclusion**

The new system designed exclusively for sanitary inspections ensures quick and effective control of enterprises and safeguard the health of citizens. Also integrated into the system are functions that help simplify the sanitary inspections of these enterprises. With the new application, inspectors are able to inspect enterprises more effectively and easily improving the accuracy and validity of spatial data aimed at making quickly correct decisions.

**References**

[1] Longley, P.A, Goodchild, M.F., Maguire, D.J., and Rhind, D.W., Geographic Information Systems and Science, 3rd ed. Hoboken, NJ: Wiley, 2011.

[2] Food and Beverage Enterprises and Enterprises providing Health Services, AST books, Athens, July 2017.

[3]<https://www.esri.com/en-us/home>

[4] Davis, F. D., R. P. Bagozzi, P. R. Warshaw. 1989. User acceptance of computer technology: A comparison of two theoretical models. Management Sci. 35(8) 982-1003.

[5] Venkatesh V. & F. D. Davis (2000), A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management Science, Vol.46 (2), pp. 186-204.

[6] Delone W. & E.R. Mclean (2003), The DeLone and McLean Model of Information Systems Success: A Ten-Year Update, Journal of Management Information Systems, Vol. 19(4), pp. 9-30.

[7] Wixom B.H. & P. A. Todd (2005), A Theoretical Integration of User Satisfaction and Technology Acceptance, Information systems research, Vol. 16 (1), pp. 85-102.

[8]<https://dspace.lib.ntua.gr/xmlui/bitstream/handle/123456789/6399/tsigkosa_telemedicine.pdf?sequence=3&isAllowed=y>

[9]Elpez, I & Fink, D, 2006. “Information System Success in the Public Sector: Stakeholders' Pespectives and Emerging Alignment Model”, Informing Science and Information Technology, Vol 3. pp. 219-230.