10th International Conference

'The Economies of the Balkan and the Eastern European Countries in the changing World'

Eastern Macedonia and Thrace Institute of Technology, Department of Accounting and
Finance, Kavala (Greece),
Warsaw School of Economics (Poland),
Poznań University of Economics and Business (Poland)

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IMPLEMENTATION OF ISO 14001 CERTIFIED ENVIRONMENTAL MANAGEMENT SYSTEM IN AN INSURANCE SEEKER AND AN INSURED SET AGAINST THE PROCESS OF PROVIDING ENVIRONMENTAL INSURANCE

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ABSTRACT

Environmental insurance and standardised environmental management systems ISO 14001 are environmental risk management instruments. The risk, being a subject-matter centred construct, is perceived differently by the insurer and the entity implementing the system. This is the reason for very narrow applications of ISO 14001 systemic tools in providing an insurance service. Additionally, research findings on systemic management efficiency are rather ambiguous, which, so far, has not become a motivation for insurers to recognise ISO 14001 usefulness in their activities. In 2015 the ISO 14001 standard was significantly modified. Additional requirements were introduced to recognise insurers' interests. This offers a much broader scope of possible applications of systemic tools in providing insurance services in all the stages of the process: from underwriting to risk monitoring in the course of the insurance contract, to loss adjustment. Importance of standardised environmental management systems (EMS) has been identified in two areas: risk level (measured according to the probability of risk occurrence and damage scope indicator) and systems' information potential. Moreover, the analysis of usefulness of systemic environmental management in accordance with ISO 14001 standard for insurance purposes is conducted on two levels: individual and holistic. In the former one, an insurance company uses systemic tools individually to assess the risks before a single contract has been signed and in the course of its implementation as well as to conduct physical inspection of the damage insured. In the other case an insurance company treats the category of organisations which have implemented ISO 14001 environmental management system as a single entity in the process of simplified underwriting. Usefulness of EMS ISO 14001 for insurance purposes can be strengthened by developing the guidelines for system implementation which take the interest of insurance sector into consideration. ISO 14001 standard may also become the basis for the future standard of environmental risk management, including a certification system dedicated to the insurers' needs.

KEYWORDS

Environmental insurance, ISO 14001, environmental management systems

JEL CLASSIFICATION CODES

G22, Q50, K21

1. INTRODUCTION

Importance of insurance protection against environmental risks has been growing along with prevalence of the concept of sustainable development. Although the "polluter pays" principle has been generally established in the legislation, the issue of environmental damage financing reaches beyond the problem of individual cautiousness of directly accountable entities. Due to its significant social adverse effect, environmental damage must be rectified within a relatively short time, regardless of the financial capacity of the perpetrator.

The market of environmental insurance is rather poorly developed. A limited supply of insurance protection is determined by the barriers connected with risk insurability. These in turn are caused by poor knowledge about risk (lack of access to data enabling premium calculation), (Munchmeyer et al., 2009) or relatively high loss burden of environmental insurance products[1]. Growing market experience leads to limitation of the negative impact of previously operating factors on the supply side. However, the attributes of the demand side, such as low environmental and insurance awareness or entities' limited purchasing power, still hinder development. Due to the above state of affairs, it is vital to engage in regular actions aimed at

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[1] It is the reason for relatively high insurance premiums which, in turn, is a demand-related barrier to insurability (Munchmeyer et al., 2009).

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development of products both accessible by the demand side and beneficial to insurers. These products could make it possible to finance remedying activities with regard to environmental damage on the one hand, and could strengthen the prevention system on the other. The latter constitutes the essential and primary task in environmental risk management at each and every level of the economic system. What is more, environmental legal acts clearly establish the regulations concerning environmental damage liability as subordinate to fulfilment of tasks relating to damage prevention[2].

EMS in conformity with ISO 14001 are some of the tools preventing the occurrence and limiting the scope of environmental damage. By influencing environmental awareness, the standards strengthen market demand. Additionally, certain operational attributes of the systems may be used by insurers directly in the course of providing an insurance service. Therefore, on the basis of the analysis of ISO 14001:2015 requirements and the technology of developing insurance products, the present article aims to point at the range of possible applications of systemic solutions (ISO 14001) in the process of providing environmental insurance services.

2. ASSUMPTIONS AND METHODOLOGY

Environmental risk will be presented from the subject-centred point of view of the organisation which has implemented ISO 14001 system as well as from the point of view of its insurer. Environmental risk, however, will be limited to the liability risk concerning primary and secondary environmental damage (Swiss Re, 2007). In turn, the concept of environmental insurance will only refer to liability insurance products.

The research process will be conducted in several stages. Firstly, the ISO 14001:2015 requirements will be highlighted; next, the findings of the research to date in the international literature will be presented with regard to the relation between environmental insurance and standardised environmental management systems; finally, the meanings of particular standard requirements will be assigned to the stages of providing insurance cover.

3. ISO 14001 STANDARD
3.1 Requirements

Standardisation is aimed at obtaining an optimum - in given circumstances - degree of orderly arrangement within a defined scope, through establishment of commonly and repeatedly applicable rules, with regard to existing or probable issues (PN-EN 45020:2009, point 1.1). Implementation of an EMS is an organisation's goodwill initiative, motivated either intrinsically (by factors like genuine care for the environment or the condition of the company itself with respect to its impact on the environment) or extrinsically (be it suppliers' requirements, organisation's prestige or an increase in social acceptance). From the point of view of the system's applicability in the insurance sector, the intrinsic factors present a growing significance. It is the authentic determination of the organisation's management that increases the probability of the system's proper operation. The main point of standardisation, including standardised management systems, is the freedom of their implementation (PKN, 2009). Obligatory regulations regarding implementation of the system might lead to an increased likelihood of artificial creation of implementation-certified entities lacking in genuine commitment to environmental issues.

Implementation process of ISO 14001 certified system starts from evaluation of the organisation's context and primarily, from a study of its stakeholders' needs and expectations. This stage determines the environmental policy of the organisation and drives identification of subsequent, relevant elements of the system. The most recent version of the standard urges the organisation to include commitment to environmental protection along with prevention against pollution in its policy (point 5.2 of ISO 14001:2005). This is a significant development. According to the previous version of the document, it was possible to implement the ISO 14001 EMS in the way which did not consider emissions at all and focussed mostly on e.g. reduction of raw materials consumption in the organisation.

Insurance strategy, determined on the one hand by evaluation of the organisational context and on the other hand, taking the problem of pollution into consideration, affects the process of identifying environmental aspects. Such elements of organisation's activities, products or services interact or can interact with the environment (point 3.2.2 of the standard). In line with the criteria individually set by the organisation, significant environmental aspects, i.e. ones which have a significant impact on the environment, are selected. The last stage of the organisation 'diagnosis' in the process of system implementation involves identification of risks and opportunities (adverse and beneficial effects connected with the company's operations, point 3.2.11) and potential emergency situations which may occur in connection with its activities.

Describing an organisation according to the above structure, especially the significant environmental aspects, compliance requirements as well as risks and opportunities constitute a basis for setting individual objectives and action planning. The objectives should be measureable and, according to the standard's newest version, their accomplishment should be monitored. Special attention should be paid to action planning in case of potential emergencies, in order to prevent or mitigate adverse effect on the environment (point 6.2).

Environmental management system should be documented. Obligatory record keeping with regard to identified environmental aspects, the criteria for identification of significant aspects, environmental objectives and processes of responding to potential emergencies enables insurance companies to assess the extent to which a system is useful for the insurer. The organisation must monitor and maintain records of results with respect to the parameters of environmental operations connected with significant environmental aspects and the parameters referring to legal requirements. Also, the progress in environmental objectives accomplishment should be monitored and properly recorded (Pochyluk, 2015). Systemically managed entities must evaluate environmental impact of their operations through application of environmental

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[2] In the preamble to Directive 2004/35/CE, the "polluter pays" principle was quoted in a straightforward way only once (in point 2). In all the other cases the legislator speaks about prevention and remedying environmental damage.

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effectiveness indicators (Kubista, 2017). The impact of environmental operations should be communicated in and outside of the organisation.

3.2 The effects of implementation of ISO 14001 certified systems – subject literature review

Scientific research does not produce clear, unambiguous findings concerning the effects of implementation of ISO 14001 EMS. Numerous analyses have been focussed on both environmental and economic effects of system's implementation. Most researchers observed a positive effect of the systems' implementation (Standards Council of Canada, 2000; Pun, Hui, 2001; Melnyk et al., 2003; Potoski, Prakash, 2005; Goh Eng et al., 2006), although there were also others who found systems' usefulness to be rather questionable (Welch et al., 2003; King et al., 2005; Christman, Taylor, 2006; Boiral, 2007; Barla, 2007).

Results of the above research have a limited value for assessment of the importance of ISO 14001:2015 certified systems when they refer to the process of providing insurance cover against environmental risk. This is for two reasons: firstly, the research often tackles environmental aspects irrelevant to insurers' liability. Secondly, it is the 2015 modification of the standard which makes all certificates invalid as of 2018, that should constitute the subject of evaluation of usefulness of systemic elements for providing cover in the future. The new version of the standard contains changes which are relevant from the point of view of the insurer, namely, the obligatory declaration, in the environmental policy, of efforts aimed at reduction of environmental pollution[3]. As mentioned above, the environmental policy determines, in turn, identification of the significant environmental aspects, environmental objectives and their measurement indicators. Therefore, one can presume that systems implemented in accordance with the new version of the standard will refer to a broader scope of relevant, from an insurer's point of view, elements of organisation's impact on the environment. Additionally, the standard currently urges organisations to identify stakeholders' expectations and needs. Insurance sector may / should be identified in an organisation's EMS as a stakeholder. Finally, the new version of the standard puts much more emphasis on monitoring the degree of accomplishment of environmental objectives, and, consequently, keeping a record of this process. Such documents may enhance the process of providing insurance cover.

3.3 ISO 14001 and environmental insurance – review of literature

Studies concerning the relation between environmental insurance and ISO 14001 certified systems are infrequent. The first institution to address the issue was Swiss Re. In response to the standard's publication in 1996, as early as in 1998 the reinsurance company expressed insurers' commercial interest in a standardised EMS. It was assumed that as long as insurance companies were not provided with a harmonised interpretation of ISO 14001 standard, certified systems' value for insurance companies would be rather limited (Swiss re, 1998). The basic conclusion remained valid for many consecutive years.

Another milestone in the analysis of the above relation was a research of the British market in the early 2000s. It showed that although insurance sector recognised the potential benefits of EMSs which could be obtained both at the stage of drawing up an insurance contract (setting the terms, premium calculation) and loss adjustment, it was not interested in exploiting this potential. Respondents believed that standard implementation did not guarantee taking measures relevant from the point of view of underwriting. Additionally, insurers were not interested in ISO 14001 due to a generally poor level of underwriting procedure with respect to environmental risk (it was usually simplified, non-technical, based on assessment questionnaires without a site inspection), (Minoli & Bell, 2002a). Instead of developing EMS, they use technical and insurance tools to limit their responsibility (Minoli & Bell, 2002b).

The research carried out in the USA by the Environmental Protection Agency (EPA, 2006) seems to corroborate the above findings. Again, the belief in the potential benefits of standardised EMSs was confronted by insurance sector's scepticism. Although a positive attitude to benefits of systemic management was recognised with regard to the financial sector, EPA indicated the specific needs of insurers (i.e. the necessity to inspect environmental liability of the company) which are not always met. Most insurers however put potential benefits before the uncertainty of the effect of ISO 14001 compliant systems and expressed the intention to incorporate systemic solutions in underwriting process. Until 2006, when the quoted research was conducted, no principles of such operations had been established.

In the very few studies of the Polish market an expectation of a lower insurance premium was identified in organisations which implemented an ISO 14001 systems (Hajduk & Woźniak, 2006). Nevertheless, the studied organisations very seldom confirmed actual discounts being granted by the insurer[4]. It is, however, probable that insurers took implementation of systemic solutions into consideration during calculation of the premium implicitly in the underwriting process, but they did not automatically credit premiums to the system implementation itself.

Despite the scepticism of the above research conclusions, insurance market analysts have been continuously returning to the subject of environmental risk management systems. Development of these systems is currently identified as an important growth factor for this market (European Commission, 2016; FERMA, 2017; European Commission, 2017). Systemic management is currently perceived as a way to overcome barriers both on the demand and supply side. What is more, in selected legal systems of European countries ISO 14001 certified environmental management has become a determinant for the scope of obligatory insurance against environmental liability (Spanish report, 2014; Country Profile: Spain, 2009; European Union Network for the Implementation and Enforcement of Environmental Law, 2016).

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[3] AIG reports that 87% of environmental claims refer to pollution occurrences (AIG, 2017).

[4] In 2007 11.3% of the studied companies declared lower insurance premiums due to system implementation, while in 2009 they accounted for 13% (Matuszak-Flejszman, 2009; Matuszak-Flejszman, 2010).

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4. APPLICATION OF ISO 14001 COMPLIANT SYSTEM COMPONENTS IN THE PROCESS OF ENVIRONMENTAL INSURANCE PROTECTION

4.1 Introduction

Both EMSs and environmental insurance are environmental risk management tools. They act on the same subject (risk) so they cannot remain independent (Lemkowska, 2011). For the insurance sector (which generates supply in order to meet the **need for financial control** of an organisation's risk) efficiency of EMSs which constitute an **element of physical control** of risk is particularly relevant considering the volume of risk contributed to the insurance community. The other aspect of relevance of environmental management systems to insurers refers to their information potential. Both of these factors make it possible to mould premium systems and overcome barriers to risk insurability.

For insurance companies, the usefulness of system implementation in organisations (potential insureds) is based on the knowledge at the insurer's disposal. Such knowledge depends on how familiar insurance workers are with the EMS mechanisms, willingness of the organisation to provide information and the existence and the quality of methods of data aggregation from numerous companies which have implemented the system.

4.2 A holistic approach

A holistic approach consists in relative universality of systems implementation, which enables general categorisation of systemically managed entities. Such entities, when collectively perceived, may be treated uniformly by insurance sector. This approach is based on unambiguous, "binary" information about the system's implementation. Such information i.e. "yes, the organisation has implemented the EMS" or "no, the organisation has not implemented the EMS" is useless to insurer as long as it does not have aggregate, reliable data concerning the impact of EMS on the risk contributed to the insurance community. So far, no attempts have been made to quantify the impact of these systems on the volume of insurance risk. Consequently, measures like the currently used discounts or loosening of the contractual conditions due to EMS implementation are applied rather intuitively or based on individual statistics compiled by particular insurance companies.

Diverse impact of EMS implementation identified in the literature review made the holistic approach rather questionable. Lack of uniform criteria for identification of environmental aspects, for setting objectives or for determining the ways of measuring environmental operations led to immense freedom in EMS implementation. As a result, systemic management frequently remained useless from an insurer's point of view. The turning point for the holistic approach may have come with the modification of standard requirements performed in 2015. The new version presents much stricter rules for establishing environmental aspects and objectives. Additionally, one may expect the volume of information about EMS functioning to grow and give rise to creation of aggregate data bases. Implementation of systems compliant with the new version of ISO 14001 is expected to prevail as of September 2018. It is therefore a perfect time to start obtaining aggregate data referring to the impact of EMS implementation relevant to insurers.

Taking up such an initiative may lower the costs of underwriting in the future thanks to its automatization. Properly implemented systems could likely replace individual examination of an insurance seeker. The involvement of insurance sector may entail preparation of guidelines for implementing systems for insurance purposes.

4.3 Individual approach

Fulfilment of the above proposals must be accompanied by work on proper recognition of environmental management systems. Insurance sector is unable to aggregate complete data as well if it is not fully knowledgeable about the principles of systemic management. The latter is of particular importance in the individual approach. The assumption here is that knowledge about environmental systemic management is used in the process of underwriting, day-to-day risk monitoring or loss adjustment for a particular entity. Flexibility of standards in the 14001 family has led to a varied level of usefulness of systems to insurance companies both from the information-related point of view and the one concerning the level of risk contributed. Individual approach assumes that a single organisation's systemic management is separately evaluated. The entities representing the insurance company could conduct a system audit, a so called second-party audit (Kluze, 2010). It will focus on the insurer's requirements in the process of drawing up and continuing insurance contracts. Second-party audits can hone underwriting techniques and support insurers in preventing negative selection (when the insurance contract is signed) or motivational hazard (in its course).

An audit of an ISO 14001 certified system often diagnoses its uselessness for insurance purposes. It is because either the system does not generate data required by the insurer or it does not have any effect on the environmental risk factors relevant to the insurer. In the future efficiency of an audit may be enhanced by means of the guidelines set by the insurance sector with regard to management systems implementation. The audit could then become a quick tool for evaluation of risk and prevention profiles in the protection seeker / insured. The guidelines should consider two aspects: risk level (measured according to the probability of risk occurrence and loss volume indicator) and systems' information potential. Probability of risk occurrence and potential loss volume from the point of view of the insurer are defined differently, according to the type of insurance product. If environmental insurance should be defined as products offering protection in case of entity's liability for adverse impact on the environment, the probability of risk occurrence should be connected with frequency of occurrences causing damage to the environment[5] and the frequency of claims against the polluter. The extent of damage will, in turn, refer to the scope of liability connected with primary and secondary loss rectification. A properly implemented ISO 14001 compliant management system may significantly modify the probability of an occurrence which generates insurer's liability. It partly determines the extent of damage as well. Systemic management may potentially modify only one determinant of

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[5] Damage to the natural environment is understood differently in various legal systems, and also within the same system, on the grounds of different legal acts (Lemkowska, 2013).

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liability scope: the range of the occurrence which affects the extent of damage to the environment (e.g. the volume of pollutant emissions or the range and impact of a blaze). Thus, usefulness of environmental management systems for insurance purposes is contingent on whether the organisation takes action (within the system) to prevent occurrences which generate potential liability and to limit damage volume if preventive action proved insufficient. The problem of environmental pollution should be broadly considered in the system, not only declaratively, as the standard requires. All the areas of the entity operations which generate the threat of environmental pollution should be taken into account when environmental aspects are defined, significant environmental aspects selected and the objectives are set. A significant threat of environmental damage should also give rise to identification of potential emergencies and drawing up action plans to respond to them in conformity with the standard. The insurers should be identified as the organisation's stakeholders, as well.

Planning the operating structure of environmental management systems as well as performing actions according to systems' assumptions affects the first area of their usefulness for insurance purposes, i.e. the risk level. In turn, decision on the methods of monitoring the degree of the set objectives accomplishment, the choice of measurement indicators, a way to keep a record thereof and finally communication of these figures in and outside of the organisation determines the other area of systems' usefulness i.e. their information potential. It is based on accessibility to EMS documents. Although in general the new standard puts less weight on some system's documentation (documents should be mere tools for achieving objectives), it still emphasises the importance of keeping a record of system's outcomes.

The standard's new version, by broadening the scope of records-related duties, increases the usefulness of systemic management for insurance purposes. It simplifies and accelerates the process of environmental risk assessment, leads to individualised premium level calculation as well as makes the monitoring of risk within duration of the cover much easier. Also, loss adjustment is additionally fostered by a monitoring and record-keeping system for results of environmental impact measurements as well as by regulations referring to identified inconsistencies and action taken to correct them[6]. However, it would be advisable to establish a range of indicators valid for insurers and to include them amongst publishing tasks of system-implementing organisations.

5. CONCLUSIONS

The usefulness of ISO 14001 compliant environmental management system is primarily contingent on its assumptions and the method of its implementation in an organisation. From insurers' point of view, the paramount criterion regarding identification and selection of significant aspects, identification of potential emergencies, setting environmental objectives and finally selection of indicators of environmental impact to be reported, will be the likelihood of environmental liability arising in a given area of company operations. Such a criterion facilitates proper risk management regarding insurer's liability. Therefore, one can set forth a hypothesis that a company based on this criterion reduces the **risk contributed to the insurance community**, which, in turn, may result in more favourable terms of insurance (individual approach). Verification of this hypothesis and its quantification *en masse* (holistic approach) appears to be much more difficult. Firstly, the hypothesis proves to be true only if actions taken in connection with selected environmental aspects or operations planned to deal with emergencies are perceived as effective by the insurer. Secondly, assessment of this effectiveness requires a comparison of the situation before and after the implementation of the EMS, followed by a juxtaposition of systemically managed companies against the ones which have not implemented an EMS. Although effectiveness assessment must be included in an EMS, it refers to the requirements mentioned in the standard or the ones set by the organisation itself. Therefore, the data necessary to insurers will be available only if insurance companies' interests have been considered strictly at the initial stage of establishing general and specific objectives of the system. It can be pointed out here that the available research of EMS' effectiveness mostly focuses on identification of actions taken by the organisation, which, in the opinion of its executives (the executives' point of view, as opposed to insurers' perspective), should contribute to enhancing the systems' effectiveness. Possible effectiveness assessment is also conducted only on the basis of respondents' mere declarations, and without proper verification of the system data (Matuszak-Flejszman, 2010). Finally, the volume of risk contributed to the insurance company is determined not only by internal factors of the entity (like the implementation of EMS), but by external factors as well (i.e. the location of operations), what eliminates the possibility to assume the correlation between the ISO 14001 implementation and the risk profile of the insured.

Besides, one should be sceptical about **informative virtues of environmental management systems** as well (both in their individual and holistic sense). EMSs do not require data compilations for certification or registration purposes which would be useful directly to insurance companies. Internally and externally circulated information is closely correlated with the requirement of systems' effectiveness assessment, and consequently, results from the individual system implementation. The ISO 14000 family indeed comprises the standard regarding impact of environmental operations (PN-EN ISO 14031:2013) which proposes a systematised set of indicators. However, first of all, they are only indirectly useful to insurance companies[7], and secondly, so far they have not been treated as absolute guidelines for organisations implementing EMS. A remarkable change in this area may be brought about by implementation of systems in conformity with ISO 14001:2015, which places much more emphasis on measurements and reporting their outcomes internally and externally. From insurance companies' point of view, the largest information potential of the systems refers to the area of premium calculation as well as the area of damage adjustment. For insurance purposes, establishing a damage ledger as part of

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[6] A list of obligatory, documented information items in the ISO 14001 compliant system (PN-EN ISO 14004:2016)

[7] Indicators suggested in ISO 14001 standard comprise indicators of environmental activity impact and of the condition of the environment, but they disregard the issues of environmental liability. Insurer's liability, on the other hand, depends not only on absolute volume of environmental impact but also on social awareness, legislation and the judiciary in terms of environmental liability.

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environmental management system is called for, especially containing details with respect to the type of damage and its description, the date of occurrence, the claimants and the cost of damage remedying.

Meeting the conditions of EMS usefulness for insurance sector turns out to be quite difficult. The first of the problems appears as early as in establishment of standards, due to a rather poor involvement of insurance circles in the internationally performed processes of standardisation, which leads to lack of consideration for insurers' interests in the standards. Other difficulties can be identified at the stage of standards' application, i.e. the functioning of EMSs. Recognition of their attributes requires the staff to have specialised skills. Additionally, individual assessment of a particular organisation's system generates considerable costs of second-party audits. Furthermore, regardless of meeting the above conditions and insurance sector representatives' qualifications, a doubt arises concerning the ability of an insurer to evaluate credibility of the data available in the system (Kosch, 2011)[8].

There is no doubt that the key to applicability of management systems (in any form) in insurance processes is full involvement of the insurance sector. It may take an advanced form of direct involvement in standardisation, compilation of guidelines for EMSs implementation for insurance purposes, or – less active - building data bases out of information made available to insurers according to insurance contracts with companies which have implemented EMS. Thus compiled statistics present a limited research value (they only comprise systemically managed companies which are also protected by insurance cover). However, they eliminate the difficulties connected with data aggregation from all the implemented systems and hence, generate lower processing costs. This is mainly due to a motivation factor: the data is collected and aggregated by insurance companies directly interested in the findings, with a minimum, almost unnoticeable involvement of systemically managed organisations.

One can assert that if systems should meet the requirements of their usefulness for the insurance sector, they would have to function within a certain obligatory framework. It seems rather harmful to the idea of organisational standardisation and to prioritising flexibility. Consequently, it would have an adverse effect on non-insurance usefulness of standardised EMS. Therefore, a need appears to create a standard purely for insurance purposes, based on cooperation between standards and insurance-related organisations. This would provide the basis for certification required by insurers for environmental insurance contracts. Application of such standards and the insurance sector playing a quasi-regulatory role (reflected in the ability to encourage organisations to implement systems) would depend on the intensity of demand for environmental insurance. The latter, in turn, is contingent on the amount of environmental regulation, execution of environmental obligations and other factors of environmental awareness.

Considering all the above analyses, especially the remarks concerning limitations and impediments connected with usefulness of EMSs for insurance sector, a question arises why – despite the above – insurance sector should be interested in these systems and where their added value lies with respect to all the other, non-standardised, ventures. It seems that the essential value is placed, firstly, in the certification mechanism, i.e. evaluation of the system by independent entities; secondly, in the rather well-recognised (in theoretical and practical terms) mechanisms of standardisation and standardised management systems functioning in organisations. Organisational standards and standardised systems implemented on their basis may become the foundation for creating a systematised model for insurance purposes.

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REFERENCES

AIG, 2017. Environmental regulators flex their muscles. *Claims Intelligence Series*.

Barla, P., 2007. ISO 14001 certification and environmental performance in Quebec's pulp and paper industry. *Journal of Environmental Economics and Management*, No. 53, pp. 291 - 306.

Boiral, O., 2007. Corporate greening through ISO 14001: a rational myth? *Organization Science*, No. 18, pp. 127 – 146.

Christmann, P., Taylor, G., 2006. Firm self-regulation through international certifiable standards: determinant of symbolic versus substantive implementation. *Journal of International Business Studies*, No. 37, pp. 863 – 878.

Country Profile: Spain, 2009. *Willis International Allert*, June.

Directive 2004/35/CE of the European Parliament and of the Council of 21 April 2004 on environmental liability with regard to the prevention and remedying of environmental damage (OJ L 143, 30/04/2004 P. 0056 – 0075);

EPA, 2006. Financial Incentives from Environmental Management Systems (EMSs), Project Findings from Phase I, U.S. Environmental Protection Agency.

European Commission, 2008. Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee - Towards an increased contribution from standardisation to innovation in

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[8] Setting the problem in the context of analysis of ISO 14001 or EMAS -compliant systems it must be stressed that EMAS puts more weight on data credibility than ISO 14001. Credibility of data included in an environmental declaration is verified within EMAS registration process (Matuszak-Flejszman, 2009).

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Europe, Brussels, COM/2008/133.

European Commission, 2016. REFIT Evaluation of the Environmental Liability Directive, Commission Staff working document, Brussels.

European Commission, 2017. Multi-annual ELD Work Programme (MAWP) for the period 2017 – 2020: "making the Environmental Liability Directive more fit for purpose, version: 28/02/2017, Brussel.

European Union Network for the Implementation and Enforcement of Environmental Law, 2016. Financial Provision Protecting the Environment and the Public Purse.

FERMA, 2017. Environmental Liability Directive: FERMA's views on the Multi-Annual Work Programme for 2017-2020. *Position Paper*.

Goh Eng, A. et al, 2006. A study on the impact of environmental management system certification towards firms' performance in Malaysia. *Management of Environmental Quality*, No. 17, pp. 73 – 93.

Hajduk, M., Woźniak, L., 2006. System zarządzania środowiskowego według normy ISO 14001 jako stymulator ekoinnowacyjności – oczekiwania i korzyści wewnętrzne przedsiębiorstw. *Przedsiębiorczość i innowacyjność. Wyzwania współczesności*, ed. Kaleta, A. et al., Prace Naukowe Akademii Ekonomicznej we Wrocławiu, No. 1116, Wrocław.

Kubista, M. et al, 2017. *ISO 14001:2015. Zmiany – wszystko, co warto wiedzieć*. Quality Austria – Polska.

King, A. et al, 2005. The strategic use of decentralized institution: exploring certification with ISO 14001 management standard. *Academy of Management Journal*, No. 48, pp. 1091 – 1106.

Kluze, T., 2010. Wartość dodana z auditu. *ABC Jakości. Badania. Certyfikacja. Notyfikacja. Quality Review*, No. 3-4, pp. 33 – 38.

Kosch, J.A., 2011. *Eliminating Environmental Fraud, The Truth is the Only Option*. http://www.corporatecomplianceinsights.com/2011/eliminating-environmental-fraud-the-truth-and-nothing-but-the-truth-is-the-only-option/, from 18th January 2018.

Lemkowska, M., 2011. System zarządzania środowiskowego ISO 14001:2004 a ubezpieczenia ryzyka środowiskowego – próba oceny relacji. *Rola znormalizowanych systemów zarządzania w zrównoważonym rozwoju*, ed. Łańcucki, J., Wyd. UE w Poznaniu, Poznań.

Lemkowska, M., 2013. Ubezpieczenie odpowiedzialności administracyjnej za szkody w środowisku – problemy prawne. *Prawo Asekuracyjne*, No. 1, pp. 58 - 60.

Matuszak-Flejszman, A., 2009. Benefits of Environmental Management System in Polish Companies Compliant with ISO 14001. *Polish Journal of Environmental Studies*, Vol. 18, No. 3, pp. 411 – 419.

Matuszak-Flejszman, A., 2010. *Determinanty doskonalenia system zarządzania środowiskowego zgodnego z wymaganiami normy ISO 14001*. Wyd. UEP, Poznań.

Melnyk, S.A. et al, 2003. Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management*, No. 21, pp. 329 – 351.

Minoli, D.M., Bell, J.N.B., 2002a. Composite insurer consideration and attitudes on environmental management systems concerning public liability policies for pollution risks. *Journal of Environmental Assessment Policy and Management*, Vol. 4, No. 3, pp. 329 – 347.

Minoli, D.M., Bell, J.N.B., 2002b. Insurer perception of environmental management systems regarding insurance for pollution. *Journal of Environmental Assessment Policy and Management*, Vol. 4, No. 3, pp. 349 - 366.

Minoli, D.M., Bell, J.N.B., 2003. Reinsurers Opinions of Environmental Management Systems Concerning Insurance for Pollution. *Journal of Environmental Planning and Management*, No. 46(5), pp. 771 – 780.

Munchmeyer, T. et al, 2009. Implementation Effectiveness of the Environmental Liability Directive (ELD) and related Financial Security Issues. Bio Intelligence Service, *Report for the European Commission (DG Environment)*.

PKN, 2009. Polska normalizacja – jaka jest?, Warszawa.

PN-EN 45020:2009. Standardization and related activities - General vocabulary.

PN-EN ISO 14004:2016, Environmental management systems - General guidelines on implementation, third edition, 2016-03-01.

PN-EN ISO 14031:2013, Environmental management — Environmental performance evaluation — Guidelines.

Pochyluk, R., 2015. *Nowa norma ISO 14001:2015. Czas na zmiany*. Stowarzyszenie Polskie Forum ISO 14000.

Potoski, M., Prakash, A., 2005. Green clubs and voluntary governance: ISO 14001 and firms' regulatory compliance. *American Journal of Political Science*, No. 49, pp. 235 – 248.

Pun, K.F., Hui, I.K., 2001. An analytical hierarchy process assessment of the ISO 14001 environmental management system. *Integrated Manufacturing Systems*, No. 12, pp. 333 – 345.

Spanish report, 2014. Questionnaire on the experience gained in the application of the Directive pursuant to Article 18(1) in conjunction with Annex VI of the ELD, Brussels.

Standards Council of Canada, 2000. Management System Standards: The Story So Far, Ottawa.

Swiss Re, 1998. Environmental management systems and environmental impairment liability insurance. Two areas in strained relations or in harmony?

Swiss Re, 2007. Insuring environmental damage in the European Union. Technical publishing, *Casualty Swiss Re*.

Welch, E.W. et al, 2003. The promises and pitfalls of ISO 14001 for competitiveness and sustainability: a comparison of Japan and the United States. *Greener Management International*, No. 44, pp. 59 – 73.

WHAT ARE THE EFFECTS OF INDUSTRY 4.0, WITHIN THE LIGHT OUT FACTORY DISTRICTS FOR INDUSTRIAL PLANT LAND CHOICE?

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ABSTRACT

In 2010, cyber-physical systems, internet of things and smart factory-based production were introduced as beginning of the fourth industrial revolution. This revolution is defined as Industry 4.0 is based on the use of robotic technologies, artificial intelligence on production mechanisms and this revolution has shaped manufacturing facilities which are defined as light out factories that do not need any work force and light in the factory. The light out factories will bring about a significant reduction in energy saving and labor cost costs, and the widespread adoption of global competitiveness will lead to a transformation in the land choice for industrial sites. This study is based on the assumption that the existing production facilities areas will be relocate from urban centers in the process of industry 4.0 and will change the location selection criteria in the direction of new requirements and this will change the urban plank by creating light out factory districts with different plan schemes. The determination of new site selection criteria for the light out factory districts will become important for urban planning discipline, decision-makers and entrepreneurs in terms of providing a conservation-use balance in urban and rural areas and will become important in terms of spatial and productive use. The study aims to determine the location selection criteria of production facilities in urban-rural areas, which will be transformed in the process of Industry 4.0. As a result of the study, conceptual solutions about how the new location selection criteria will transform the urban macro form have been made and the effects of the new location selection criteria on entrepreneurs, urban planners and decision makers have been discussed.

1. INTRODUCTION

The world economy maintains three different industrial revolutions in the form of global production based on mechanical production based on water and steam energy, serial production based on electric and work parts, circuit boards and automation of production processes (Alcacer et al, 2016:500). The driving force of cheap labor to reduce costs at the beginning of the 2000's, industrial production in Europe was directed to China. In recent years, Europe's inability to reach the desired growth in industrial income and concerns about competitiveness with China have led unmanned production in order to reduce labor costs to the lowest in developed industrial countries. This trend is found in the case of Industry 4.0. In the fourth industrial is based on quick presentation to the market in production activities, flexibility in production lines, increasing productivity, change and development of work pattern (Can & Kıymaz, 2016: 109). The 4th industrial revolution, which started in 2010 with the leadership of German Siemens, cyber-physical systems, the internet of objects and intelligent factory-based production. With the rapid development of these

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technologies, light out factories have brought the developed countries to the agenda (Hermann et al, 2015:15).

The concept of light out factory was first described in the 1980s (Null & Caulfield, 2003:1) within robotic technology, artificial intelligence, which is defined as production facilities where production is carried out entirely by robots and therefore labor is not needed. In the light out factories, the transmutation of the system into fully robotics automation not only increases the working hours but also improves the efficiency of the plant by reducing the proportion of defective parts (Fernandes & Assuncao, 2017:50). The use of robotic automation reduces manufacturing energy per product and provides great productivity as it increases labor productivity with reduced labor costs. For this reason, the light out factories can be regarded as a new generation production facility with high environmental friendly efficiency. The productivity increase in the light out factories, while in the advanced factories, offers the great advantages of recreation with other factories, the light out factories have been preferred since 2010. The most spectacular example of this tendency is that Adidas's factory in China prefers to use robotic technology instead of cheap technology. The company relocated its first factory back to Germany in 2016, transforming it into a light out factory that only works with robots, and moved the second light out factory to the US city of Atlanta in 2017. Similarly, the fire extinguishing vehicle in Japan produces 24 hours of work per day without the need for human power.

In the coming years, according to Industry 4.0 and the German National Academy of Science and Engineering, the productivity of new production processes will increase by at least 30%. The reduction in energy savings and labor costs demonstrates that light out factories, which we have seen in developed countries, will also spread in developing countries and that industrial plants will bring about a change in land choice (Roblek, Mesko & Krapez 2016:3). It is presumed that this transformation in the choice of location of industrial facilities will not be needed either in the production campus nor in the social facilities needed by the employees in close vicinity. it is expected that land values will be cheaper and the accessibility of the infrastructure needed by new technologies will be moved out of the urban area, which is easy and high.

A similar transformation in the Industry 4.0 has been seen since 1960, when mass production facilities scattered throughout the city were gathered outside the city and spatialise the Organized Industrial Zones (OIZ). The locating of OIZs has brought about the use of common infrastructure and has change understanding of planning. As a result, OIZs have supported specialization for their production facilities, reducing service and production costs and becoming more competitive (Piore & Sabel, 1984:54;Scott, 1988:68; Scott & Storper, 1989:25; Pyke et al, 1990:105; Harrison, 1992:98).

This study is based on the assumption that the existing production facilities in industry 4.0 will be moved from city centers as it is in the case of OIZ transformation and will change the selection criteria in the direction of new needs, changing the plan schemes and changing the urban liquor by creating light out factory districts. The sustainability of this transformation in a healthy way for the cities and the economy will be based on the determination of the location criteria of light out factories. The land choice criteria of light out factories will become an important issue in terms of entrepreneurs, decision makers and urban planners. In this context, this research is aiming to determine the criteria for the selection of the location of the ligt out factory areas coming to the city agenda with the case of industry 4.0. Study design with the aim to identify new land choice criteria were discussed in three stages. In the first stage, industry 4.0 and light out factory concepts are defined. In the second stage, literatures about OIZ location selection criteria were carried out by carrying out the reading of the OIZs that caused spatial change in the city during the previous industrial periods. In the third part, the concept of light out factory is defined and the differences in the current situation are discussed by determining the selection criteria of light out factory districts.

2. THEROTICAL FRAMEWORK

In order to understand Industry 4.0, it would be fit the purpose of making a historical reading of other industry periods and to examine their causes and implications of change:

The world economy has experienced so far in three different industrial revolutions (Alcacer, 2016:501). The first industrial revolution began with the development of the steam engine in the years 1765-1850. The discovery of electricity by Michael Faraday in 1831 initiated the second industrial revolution period from 1850 to 1975. During the period of the second industrial revolution, which was defined as Industry 2.0,

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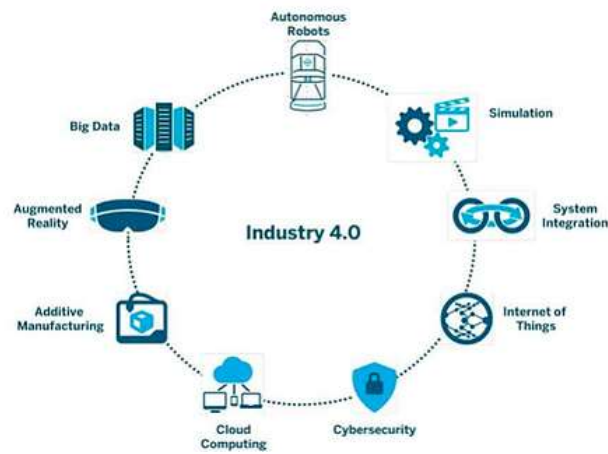
production facilities became more efficient with mass production based on electric energy and work space produced in coal plants instead of steam energy. Between 1969 and 1988, countries shifted to information technology-based sectors and turned to produce high value-added products in their production processes. In this period, defined as Industry 3.0, the use of electronic circuits has improved automation systems (Günay, 2002:9). Up to industry 4.0, the provision of common infrastructure services for OIZs production facilities is becoming a priority in terms of competitiveness. The development of communication and transportation technologies, the discovery of the internet has revealed the concept of post-fordist production system, knowledge has become the most important means of labor and production. The innovations that have arisen in the storage, processing and transmission of information in various forms have brought about a zero-cost production mode (Dağdelen 2005) and the location of production facilities has been directed to overseas countries where cheap labor is available. During this period, the city has been shaped within the framework of spatial functions such as logistics, logistics park, urban and regional transport networks such as railways ports, airports. Rapid population growth in the metropolitan cities and the growth of the urbanization spot have taken place out of town at the time, but nowadays, urban pressure is exerted on the OIZs located in the settlement spots of the cities. Pressure such as overpopulation, traffic congestion, environmental pollution, high land values cause OIZ companies to choose places outside the city (Yüzer, 2003:121).

The following the syllabus of the industrial revolution in Turkey, the first production facility was established during the Ottoman Empire in the early 1800s. During the reigns of Selim III and II Mahmut, industrial initiatives have military needs at the core (Erdem, 2016). In 1842, the Ottoman Empire as a contemporary was designed an "industrial park" containing industrial production and agricultural zone complexes similar to those of England. Zeytinburnu is planned as the first industrial center to be found in foundries and machines that produce iron pipe, steel rail, plow, plow, sword, knife, stirrup and other iron works (Clark, 1974:66). The Ottoman state was introduced to Industrial 2.0 with a thermal power plant with a power of 15 MW installed in Istanbul Silahtarağa in 1913. The use of electricity and the spread of motorized benches have been realized with industrialization of the Republic since 1924. Until the 1960s, the industrial production of this character was shaped by the transition to intense freeway relations and capital concentration in the 1970s (Tekeli & İlkin, 1977; Boratav, 1989, 1997; Öniş, 1991; Duruiz & Yentürk, 1992; Şenses, 1994; Ansal, 1994; Eraydın, 1994; Kaytaz, 1994; Yeldan, 1994; Kazgan, 1995). The years 1980-84 are referred to as the period of transition and maturation to automatic computerized workbenches (Erendil, 2000). Since the 1980s, there have been changes in the way products and services are produced. The 20th century industry was regarded as a transition from 2.0 to the industry 3.0 and was followed in Turkey as it is all over the world. With the growth of the metropolitan city, the rapid increase in the land prices in the center has made it inevitable for industrial investments to move out of these centers (Yüzer, 2003).

It is not possible to say that the objective of the industrialized society inherited from the Ottomans and continued with the Republic is the widespread influence of today. The inability of electric power to reach all production facilities is the greatest reason why the industry cannot have a widespread effect. Today, the digital maturity level of Turkish industry is between industry 2.0 and industry 3.0 (Tübitak Report, 2016). When the causes and consequences of the transformation are examined, a similar transformation will inevitably occur with industry 4.0 as well. This study is based on the assumption that the current production facilities will be transformed into a light out factory in industry 4.0 in theoretical framework. Turkey is lagging behind the industrial revolution a hundred years will be removed from the historical reading. In this context belated industrial revolution to other industries Turkey should enter the 4.0 transmutation.

In accordance with the aforementioned, the fourth industrial revolution will radically change the forms of production, such as the second and third industrial revolutions, and will directly affect the morphology of cities. The Industry 4.0 phenomenon that brings with it many innovative features such as monitoring the system, being sustainable, achieving high efficiency, increasing flexibility in production, reducing costs and developing new service and business models. In addition to this, in the production process, it aims to decrease the error rate to near zero by reducing the human factor to the minimum (Daneshjo, 2017). To achieve all of these goals, industry 4.0 components, which are defined as big data, autonomous robots, horizontal and vertical integration, internet of things, cyber security, cloud computing, dimensional roduction and virtual reality need to be effectively used together (Rüßmann et al, 2015) [Figure 1].

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Figure 1. Industry 4.0 Components

These components, which are used in the light out factories produced by Industry 4.0, will change production patterns and play a strong role in determining the location factors of light out factories. The internet of things provides the services on the internet and the smart factories communicate with each other and fulfill the principle of interoperability. In the next generation factories virtualization technology is used to manage the sensor data in the factory remotely via virtual plant and simulation models. Intelligent systems give factories the ability to make their own decisions. Sensors used in intelligent factories allow real-time decision making by collecting data in the production process and evaluating them with instant analysis methods (Liu, 2017). It is aimed to manage the processes in the factory in an efficient manner in a full-time manner by providing remotely services to the managers through virtual systems to use the internet of the services in the production processes. The modularity component provides flexible production possibilities in smart factories and aims at reducing the human intervention to the greatest extent possible. Industry 4.0 will change the patterns of production as well as changes in traditional manufacturing factors (labor, capital, land, entrepreneur) used in production processes [Table 1].

In previous industrial periods, entrepreneurs are investing in the production of goods and services. In the process of gaining the importance of information, the possibility of being able to survive by receiving support from an ideological angel investor produced by the individual radically changed the entrepreneurial factor.

The reporting of the data obtained in the production process ensures the sustainability of the associated information production. It is vital that this information is used effectively during the decision-making process in the production process. This change adds technology and knowledge factors to the four production factors. The technology factor is inevitable in order to obtain fast, productive and high added value products in production processes.

Table 1. Exchange of production factors after the industry 4.0

Production Factors	Pre-Industry 4.0	Post-Industry 4.0
LABOR	The physical and mental efforts people make in a job	Mainly mental labor Automation and capital-intensive production goods Specialization in workforce
CAPITAL	Physical production tools such as machines, tools, hardware and buildings used in production	Patents, intellectual property and the company's knowledge

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RESOURCE	Provide enough raw material for production plant	Allows raw material to be transported at lower cost and easier
	Top for location selection	
ENTERPRISE	Organizes capital, natural resources and workforce	Individuality
		Angel Investor
TECHNOLOGY		Being able to produce products quickly and efficiently
		To produce high value added products
KNOWLEDGE		Reporting and associating data
		Information production

After estimating the changes that will be made in the urban space of the Industry 4.0 after monitoring the changes in the industrial period through the production factors, it is necessary to follow the reflection of the urban space of the OIZ that shaped the urban space and to identify the elements that are effective in the land choice.

The decision to establish an organized industrial zone is made by decision makers if they meet certain criteria. For this reason, in order to establish a city organized industrial zone, it is necessary to select a region that meets the OIZ regional land choice criteria. When the land choice criteria are examined, there are macro scale factors such as land situation, potential of work force, capital accumulation, transportation, inter-industrial economies, urban economy. In addition, there are micro-scale factors such as the agricultural character of the land, the area being suitable for construction, closeness to basic transportation networks, energy, communication and water needs, the development reserve area of the area, topographic structure (Yaman, 2005).

Along with the development of information and communication technologies, changes in the way manufacturing facilities are produced directly affect the choice of location of industrial facilities. In three different industrial periods, there are differences in the selection of the industrial sites within the city. In the period of industrial 1.0, steam engines, production facilities are locally intertwined. In cities before the industrial revolution, transportation is predominantly pedestrianized, intensive construction for the walls, clear rural-urban separation, no functional separation of the pavilion, no work-house separation, or no significant class separation in the walking distance (Enlil, 2006). In those years' factories that operate with production steam power are also being realized (Günay, 2002). In this period, the factories of agriculture working factories to leave factory in place started to work and started migration to the city. For this reason, workers' houses were built in the city and infrastructure was provided for these houses.

With Industry 2.0, plants have made their choice in the city walls to provide environmental pollution, inadequate urban infrastructure and raw materials. Along with this, new settlements and neighborhoods started to form around the factories that went out of the city. With the development of transportation vehicles, the urban area has begun to expand.

Over time, it has been determined that there is a tendency to move out of the city when the land choice criteria of industrial plants are examined. Based on these findings, the literature was examined to determine the land choice criteria for the light out factories and the land choice criteria of the organized industrial area were reviewed in detail. In this context, Demirdöğen & Bilgili conducted a detailed literature study on OIZ

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land choice criteria and aimed to determine the factors affecting the place selection decision of the alternative OIZ and the importance levels of these factors in Erzurum. Data were collected from the facilities located in OIZs by questionnaire method and analyzed in statistical methods. Order of importance of the variables are analyzed by factor analysis (Demirdöğen & Bilgili, 2015). The study aiming to determine OIZ land choice criteria in urban planning has been separately determined at macro and micro scale and Kütahya OIZ has been applied to land choice (Yaman, 2005). Another study is the new regulatory strategies in industrial areas that examine the changes in the criteria of location selection in industrial areas under the influence of developments in information technologies. The study also found that the economic growth potential and market factors are the most preferred factors in the preference choices of industrial establishments. It has been determined that the labor force factor is the less important factor in industrial establishments than the other factors (Yüzer & Giritlioğlu, 2003). In another study, the use of multi-criteria decision making techniques for free-zone location was implemented on the Eastern Anatolia region. In the study, the most suitable place was selected by using AHP, TOPSİS, VİCOR and ELECTRE methods from multi criteria decision making techniques (Ağaç et al, 2015). Geographical information systems and remote sensing methods have been used in the study for facility selection in the food The most suitable place was determined according to the criteria determined in the study (Hazini et al, 2015). It is anticipated that the need for labor will be reduced with light out factories. In this context, what kinds of movements or migrations of workers in industrial facilities will be of great importance in urban planning. Yiğit made an assessment of immigration as a choice of location for his work, which refers to this issue in 2017. It refers to the way in which emotions move through monolithic narratives and discusses them through the dynamics of industrial societies (Yiğit, 2017). A study of the location of small and medium-sized enterprises in Poland also found that; 42.8% of the enterprises are located in the places where the employees live, and the closeness to the city center is second with 32.4%. In this context, the company wants to make the choice of the location near the center due to the human factor (Martyniuk-Peczek et al, 2017). Among the factors affecting the land choice decisions of industrial plants are carbon emission costs. A related study has also established a new theoretical model that examines the relationship between product demand, production cost, and carbon emission levels (Wu & Shyu, 2017 The effects of electricity costs were investigated in European companies' new location selection. When the results of the study are examined, it has been determined that electricity costs and firms' location preferences are directly related (Pahhans, 2017). With the fuzzy analytical network processes of high-tech manufacturing companies, the land choice study has been carried out. Factors influencing the selection of high tech firms in study were examined according to the regions. Factors have been examined in the heading of cost, human, law. Transportation, land value, raw material costs were examined costs heading. Infrastructure, housing and education, innovation and research and development clusters, production and service concentration, connection with other industries, market relations are examined in human beings, Finally, under the heading of the legislation, tax reduction, foreign investor support and financial support titles were discussed. Sensitivity analysis was performed on all these factors at 5 different locations (Wang et al, 2017). Another study which examines the factors that the companies in the Netherlands have taken place according to the decision of change is also examined under three main headings as internal factors, location factors and external factors of the firm. The human factor and the infrastructure are at the forefront in the selection of the place of study (Dijk & Pellenbarg, 2000). In China, the biotechnology industry has examined what factors it takes into account when choosing a new location with market expansion. Cost, need, macroeconomic, socio-political and strategic factors were examined in the study. Salary, raw material cost, market size, potential growth, qualified human power has been found to have a high effect (Wang & Lestari, 2015). Discrete selection analysis was conducted to determine the land choice criteria for new production facilities in Japan. Factors such as market size, infrastructure capacity, people, land, energy costs, employee quality and policy incentive measures have been considered in the selection of the place (Cheng & Stough, 2006). 50 countries and 6 sectors have been examined on how foreign investors have decided to choose a location for direct investment. When the results of the study are examined it is clear that investors have invested in technology, transport and electronics sectors (Kunal & Chaitali, 2017). Investigators of Vietnam from outside the land choice criteria were examined to determine the appropriate investment locations according to the sectors (Chih-Hai et al., 2017). Changing business patterns with Industry 4.0 also changes the criteria for selecting an industry location. In this context, firstly the existing criteria of industrial land choice are examined.

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3. LIGHT OUT FACTORY DISTRICT LAND CHOICE CRITERIA

With Industry 4.0, real factory life is replaced by virtual reality. In the coming years, robots working together in factories will acquire new abilities in the robot learning process, with the internet of things and machine learning technologies. Intelligent robots will be able to make their own decisions by using big data and co-learning technologies through the cloud. In addition, small and medium sized companies will start to use industrial robots. Robots are able to make dirty jobs easier and faster in environments that are more dangerous than humansIn the past decade, industrial robot market has grown threefold; 191.3 thousand robots were sold in total, including 191,000 in Asia, 56,000 in Europe and 41,000 in the United StatesIn 2020, robot sales are expected to reach 521,000 in a yearBy the end of 2020, the number of industrial robots is expected to reach 3,053,000 rounds. 74% of robot sales are made by developed countries such as China, South Korea, Japan, USA and Germany the automotive industry is at the forefront as the largest buyer of industrial robots with 35%. The second industry is the electronics industry that produces computers, TVs and communication devices with 31%. Followed by plastic industry (5%) and food industry (3%) respectively (Executive Summary World Robotics 2017).

Again in 2020, the number of interconnected computers, called the Internet of things, will increase from 13 billion to 29 billion. The economic size of industrial robots will be $ 1 trillion annually, and 15-25% of the manufacturing processes in developed countries will be based on automation (Tübitak Report, 2016). When the results of the survey conducted by Tübitak with companies that received institutional R & D support in June 2016 were examined, it was revealed that only 22% companies have heard industry 4.0 til now (Tübitak Report, 2016). The three sectors with the highest awareness are; software, electronics, materials. Half of the companies will set out strategies to integrate relevant technologies into their systems over the next five years. Within the context of the conversion of industrial plants to the light out factory, autonomous robots, large data, simulations, integrated systems, internet of objects, cyber security, cloud computing, layered manufacturing and virtual reality technologies will be used as the components of the industry 4.0. These technologies will shape light out factories and will change the land choice of light out factory locations. It would be appropriate to explain the components that will be the land choice criteria for the light out factories during the Industry 4.0 period:

Big data and cloud computing

Applications will be developed for the remote control, maintenance and updating of production lines with the use of big data and cloud computing technologies in the light out factories. It is aimed to minimize the breakdowns in the machine manufacturing sector and it is aimed to manage the lines in different places in white goods, automotive and defense sectors from one center. The end devices in production and assembly lines will be guided interactively with each other. Finally, virtual reality solutions will be produced in the manufacturing sector so that operators can remotely manage their machines.

Internet of Things

Systems that will allow the self-adjustment of devices and machines in light out factories will be developed. Mobile based advanced image detection and remote quality control with autonomous quality control systems. Analysis of instant data will be provided with sensors integrated into decision support systems, which provide wireless communication, and the system will be able to make a decision by itself through intelligent systems. Finally, detection and guidance systems will be developed that will allow the production process to be done entirely using robots.

3D print Technologies

3D printing technology has enabled designers to manage processes spatially independent from production facilities and to create prototypes from printers and offices or home-offices. The ordered prototypes are transmitted to the production facilities via communication technologies and serialized by the robots.

Interaction

The development of systems for collecting, analyzing and making decisions in different formats from different machines in the production chain will be provided. The operator will be able to develop applications, software and hardware solutions that can monitor, test, and navigate the production flow with mobile devices. Software will be developed with image processing technologies that can design products in three dimensions and create point clouds. It is aimed to develop systems that enable the unmanned

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movements of the materials in the light out factory and instantaneously follow the material flow on the production line (Tübitak Report, 2016).

All of these technologies seem to be aimed at minimizing the human factor in light out factories and increasing productivity. Light out factories do not need work power and need not be close to work power (Calitz, 2017; Robla-Gomez, 2017; Bodrow, 2017; Longo et al, 2017). In this context, in the light out factory district location selection criteria, the work force criterion, which has a significant place in OIZ location selection criteria, will be removed. This process, together with narrowing the spatial needs of production facilities, allows white-collar workers to be employed during free-working hours in urban centers, and home offices. In terms of transportation, the relationship between workplace and residence will be weakened, urban spatial organizations and functional networks will be shaped with different patterns. The proximity to residential areas, proximity to schools and health services will lose relevance to the criteria associated with urban goods [Table 2]. It is expected that the residential areas will add to the pressure on the industrial areas near the city center, the light out factories will be located far away from the city center and the areas where the land prices are too low. The decentralization of these industrial facilities makes it important to consider the transformation and post-landing and use in urban centers from one side (Yüzer & Giritlioğlu, 2003).

Table 2. Light out Factory District Land Choice Criteria

Organized Industrial Zone Land Chice	Light out Factory District Land Choice
Qualified workforce (+++++++)	Proximity to Communication Infrastructure (Fiber optic infrastructure)
Proximity to the market (++++)	Energy
Grants (++++)	Grants
Cheap Land (++++)	Ease of Transportation **
Ease of Transportation (+++)	Proximity to raw material
Proximity to residential areas (+++)	
Infrastructure possibility (+++)	Appropriateness of land (Proper slope, cheap land, not suitable for agriculture)***
Proximity to school and health services (++)	
Additional facilities (+)	
Energy (+)	
Water (+)	
Municipality services (+)	
Appropriateness of the Site (+)	
The proximity to the economy (+)	
** Accessibility will change shape, just as it was in previous industrial revolutions. At this point, the ease of transportation will have a context for meeting logistic needs, far beyond the availability of employees' production facilities.	

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> ***The suitability of land is shaped by criteria such as proximity to raw material, closeness to water, proximity to labor, proximity to transportation networks, lack of fertile agricultural land, and proper inclination in previous industrial periods. With the fourth industrial revolution, he will transform increasingly decisive parameters into conceptual change. Proximity to raw materials, energy, water, transportation networks will have a strong or weak relation to the product produced, and closeness to energy and communication technologies will be in absolute relation.

Proximity to housing areas, proximity to school-health services, water, municipal services, close to the economy are most important elements in the literature on land choice criteria of organized industrial sites. With industry 4.0, the light out factory district location selection criteria will not require labor power. On the other hand, energy, proximity to communication infrastructure, ease of transportation will become more important variables for light out factories from the criteria that are effective in organizing industrial land choice. The land appropriateness criterion will change with the type of industry 4.0. The dependence on the concepts of closeness to water and proximity to raw materials will be gradually reduced, and the corresponding access infrastructure and energy access will be more important concepts for the land appropriateness title. The concept of transportation in this framework will be dealt with as the logistics services focused on transporting raw materials and final products, rather than the transport network of the business force with the industry 4.0. In sum, the changes and transformations that take place in the selection criteria of places will undoubtedly change the spatial preferences in cities and the trends in urban systems.

4. CONCLUSION

In the past decade, industrial robot market has tripled. The largest economists of industrial robots estimate automotive, computer, communication and communication devices, plastics and food industry, the economical size of industrial robots will reach to $ 0.6-1.2 trillion annually and industrial processes in developed countries will be based on automation by 15-25%. Industry 4.0 will be the main mechanisms in the light out factory evolution of production facilities such as autonomous robots, big data, simulations, integrated systems, internet of things, cyber security, cloud computing, tiered manufacturing and virtual reality technologies. Today, industry 4.0 is inevitably approaching, and countries that could not complete industry 3.0 will not be able to move to industry 4.0. In this context; Turkey's digital maturity between 2.0 and 3.0 should be completed as soon as possible. These new technologies will shape both the light out factories and the light out factory land choice. The existing organized industrial zones are located in the urban areas and development zones. Increasing populations in metropolitan cities and the expansion of the city into the periphery have left organized industrial zones (OSB) within the cities. For this reason, the OIZ areas within the cities are starting to attract investors attention. The study argues that the areas constructed for production functions in cities today are unable to provide suitable conditions and lose their competence. While Industry 4.0 increases the competitiveness of cities and firms, it will change the spatial preferences of the city as well as radically change the production processes. Industry 4.0 will be seen as environmentally friendly with low and high technology renewable energy usage but will also reduce the residential-workplace transportation burden that industrial workers bring to urban transport systems. These developments should be seen as an opportunity to prevent the suppression of settlement, which is seen as a problem in recent years, in urban and rural areas, and to ensure the sustainability of agricultural lands and natural resources. It will bring about the restructuring of the spatial organization of the production facilities especially in the cities that have passed the industry 4.0. Light out factories are expected to push industrial plants out of the city. In this way, transformation is expected for the areas vacated by the production facilities that are idle in the city. It is necessary to take into account the debates about the dynamics of urban dynamics that will create an unprecedented effect when constructing the future of cities in the transformation process.

Until the fourth industrial revolution, cities have always directed the spatial development of industrial plants according to location selections. In this development, the proximity to the work force and transportation networks became the main actors. Industrial areas have shaped not only their own functional-

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spatial design but also the functional constructions such as housing, social facilities and the urban systems such as transportation and infrastructure brought by the work force. The emergence of the labor force in the new era will overthrow all this urban fiction and reshape the urban planning chain. In this context, urban planners will have to deal not only with the light out factory land choice but also with idle industrial sites in the city center, the transformation of urban systems working with these areas, the urban residential areas to be reshaped by the transformed work force and the social-reinforcement and green circulation systems. It is also possible to say that these radical transformation central decision-makers may lead to the renewal of laws and regulations related to the spatial order. In this context, it is certain that the light out factories will be included in the development plans of the land choice. The transformation of old idle industrial sites in the city center, the revision of the urban infrastructure systems brought about by the transformation in the city center, and the rethinking of spatial fictions in rural areas will become the current topics of urban planners.

It is envisaged that light out factories can make the land choice in rural areas that are not easy to live because natural conditions are difficult for people and far from the city center, in regions where available transportation and energy infrastructure and cheap lands. It is certain that the production areas will increase pressure on the fertile fields of agriculture in rural areas. For these regions, decision-makers need to establish the legal infrastructure for the land choice of the production facilities in rural areas, and determine how the light out factory sites will be addressed and displayed in the environmental scheme and development plans. Urban planners will also need to set new criteria for the elements of rural area planning.

In the industry 4.0 process, it is possible to say that entrepreneurs will invest in production facilities primarily in the light out factory districts. Robotics, information technology, software development will be the primary investment areas, while automotive, communication and communication, plastics, food and food industries will be the priority investment areas. In the direction of location selection criteria, completed energy and communication infrastructure, available for specialization, logistics infrastructure exist areas with stable economies are investment areas are available for light out factory areas for entrepreneurs.

The fact that factories do not need the labor power of one of the transformations brought by the light out factory districts will therefore place great responsibility on central decision makers in urban employment transformations and in the framework of education and employment policies. Reducing the need for qualified workforce as well as the non-qualified workforce currently working in production facilities points to the need for new approaches and workforce strategies. On the other hand, regulations on new concepts in spatial laws and regulations must be completed and the necessary incentive policies must be established. It is necessary to carry the digital maturity of 4.0 and make brand for upgrade Turkey's competitiveness, without losing the global trend. At this stage, the necessary renewable energy and communication infrastructures must be completed quickly, and digital maturity supports (business plan, road map, et al) must be provided to companies and firms. Furthermore, the creation, management and monitoring of databases and city plans, legislation, regulations, information technology, industry sector and systems need to be integrated. Determining the decisions of the light out factory areas at three different levels as strategic level decisions in the city, region and country scale will be important in terms of planning hierarchy and in terms of spatial strategic management. In the future studies, it is expected that for the light out factory districts, location selection inquiries will be made on actual data sets in accordance with the criteria determined within the scope of the study.

REFERENCES

Ağaç G., Baki B., Peker İ. ve Ar M., (2015). Çok Kriterli Karar Verme Tekniklerini Kullanarak Serbest Bölge Yer Seçimi: Doğu Anadolu Bölgesi Örneği. *Dokuz Eylül Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 30(1), 79-113.

Alcacer J., Cantwell J. ve Piscitello L. (2016). Internationalization in the information age: A new era for places, firms, and international business networks*? Journal of International Business Studies*, 47(5), 499-512

Armatli Köroğlu B., Özelçi Eceral T. ve Varol Ç., (2012). Sanayi Kümelerinde Ağların Mekansal Örüntüsü: İstanbul Kuyumculuk Sektörü Üretim Ağları. METU JFA, 29(1), 119-138.

Ansal, H. K. (1994). International competitiveness and industrial policy: The Turkish experience in the textile and truck manufacturing industries. *Contributions In Economics And Economic History*, 175-175.

Bodrow, W., (2017). Impact of Industry 4.0 in service oriented firm. Advances In Manufacturing. 5(4), 394-400.

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Eastern Macedonia and Thrace Institute of Technology (Greece), Warsaw School of Economics (Poland), Poznań University of Economics and Business (Poland)

Borata K. (1989). *Türkiye İktisat Tarihi*. Gerçek Yayınevi.

Bozdemir, M., (2011). *Osmanlı'dan Cumhuriyet'e Endüstriyel Mirasımız*, İstanbul, İstanbul Ticaret Odası Yayınları.

Calitz, Ap., Poisat, P. Ve Cullen M., (2017). The future African workplace: The use of collaborative robots in manufacturing. *South African Journal of Human Resource Management*. 15.

Can A.V., Kıymaz M. (2016). Bilişim Teknolojilerinin Perakende Mağazacilik Sektörüne Yansimalari: Muhasebe Departmanlarinda Endüstri 4.0 Etkisi. *Süleyman Demirel Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, CİEP Özel Sayı, 107-117

Cheng, S. Ve Stough R., (2006). Location decisions of Japanese new manufacturing plants in China: a discrete-choice analysis. The Annals of Regional Science, Cilt:20-2, ss.369-387.

Chih-hai C., Chung-yueh C. Ve Meng-wen T., (2017). Locatıon Choice Of Multinational And Local Firms In Vietnam: Birds Of A Feather Flock Together? *Japanese Economic Revıew*. 68(1), 95-114.

Clark, Edward C., (1974). "Ottoman Industrial Revolution", *International Journal of Middle East Studies*, 5, 65-76.

Dağdelen İ. (2005), Post-fordizm. *Mevzuat Dergisi*. 8(90).

Daneshjo, N., Majernik, M. Ve Danishjoo, E., (2017). More Exact Approaches to Modernization and Renewal of the Manufacturing Base. Tem *Journal-Technology Educatıon Management Informatics*. 6(3), 445-449.

Demirdöğen O. ve Bilgili B., (2004). Organize Sanayi Bölgeleri için Yer Seçimi Kararlarını Etkileyen Faktörler: Erzurum Örneği. *Atatürk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*. 4(2), 305-324.

Dijk, J. ve Pellenbarg P., (2000). Firm Relocation Decisions in The Netherlands: An Ordered Logit Approach. 39th European Congress of the Regional Science Association, Dublin, Ireland

Duruiz L. ve Yentürk N. (1992). *Facing the challenge Turkish automobile, steel and clothing industries responses.* Nadir Kitap

Eraydin, A. Y. D. A. (1994). Changing spatial distribution and structural characteristics of the Turkish manufacturing industry. Contributions in Economics And Economic History, 155-155.

Engin, V. (2011). *Osmanlı Ticaret ve Sanayi Albümü*, İstanbul: İstanbul Ticaret Odası Yayınları.

Enlil, Z. (2006). Modernleşmenin 1. Kuşaği: Sanayi Devrimi Ve Kentler, YTÜ Mimarlık Fakültesi Şehir ve Bölge Planlama Bölümü, Kent Planlama Tarihi Ders Notları.

Erdem E. (2016). Sanayi Devriminin Ardından Osmanlı Sanayileşme Hamleleri: Sanayi Politikalarinin Dinamikleri ve Zaafiyetleri, *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 48, 17-44

Eyüboğlu, D. (2005). 2000'li Yıllarda Organize Sanayi Bölgelerimiz. MPM, Ankara.

Executive Summary World Robotics (2017). Industrial Robots 2017

Fernandes, I., Assuncao, E. (2017). Industry 4.0: Training for Automation in Europe. *Weldıng Journal*, 96(7), 50-52

Giritlioğlu, C. (1998). *Şehirsel Mekan Ögeleri ve Tasarımı (The design of Urban Space and its Elments)*. ITU, Istanbul, Turkey.

Günay D. (2002). Sanayi ve Sanayi Tarihi, *Mimar ve Mühendis Dergisi*, 31, 8-14

Harrison, B. (1992). Competition, thrust and reciprocity in the development of innovative regional milieus, *Papers of Regional Science*. 71(2), 95-105.

Hazini, S., Hashim, M., Rokni, ve K. Shafaghat A. (2015). Identifying the Optimum Locations for Food Industries in QaemshahrIran, Using GIS and Image Processing Techniques. *Jurnal Teknologi*, 74(4), 153-158

Hermann, M., Pentek, T., ve Otto, B. (2015). Design principles for Industrie 4.0 scenarios: A literature review (Working Paper No. 01). Technische Universität Dortmund.

Kaytaz, M. (1994). Subcontracting Practice in the Turkish Textile and Metal-working Industries. Contributions in *Economics and Economic History*, 141-141.

Kazgan, H. (1995). *Osmanlida Avrupa Finans Kapitali*. YKY.

Kunal S. ve Chaitali (2017). The location choice of US foreign direct investment: how do institutions matter? *Journal of Institutional Economics,* 13(2), 401-420

Liu, C. ve Xu, X. (2017). Cyber-Physical Machine Tool - the Era of Machine Tool 4.0. Manufacturing Systems 4.0, 63, 70-75

Longo, F., Nicoletti, L. ve Padovano, A. (2017). Smart operators in industry 4.0: A human-centered approach to enhance operators' capabilities and competencies within the new smart factory context. *Computers & Industrıal Engıneerıng*, Vol.:113, ss.144-159

Martyniuk-Peczek, J., Martynuik, O., Gierusz An. ve Peczek G. (2017). Determinants of SME location in a suburban area: Evidence from the Gdańsk–Gdynia–Sopot metropolitan area. *Urbani izziv*, 28(1), 122-134

Null C. ve Caulfield B.., (2003). Fade to Black the 1980s vision of "lights-out" manufacturing, where robots do all the work, is a dream no more. Business 2.0 Magazine.

Ozlu F., (2017). The Advent of Turkey's Industry 4.0. Turkısh Polıcy Quarterly, 16(2), 29-38

Öniş Z. (1991). The Logic of the development state. *Comparative Politics*. 24(1), 109-126

Panhans, M., Lavric L. ve Hanley N. (2017). The Effects of Electricity Costs on Firm Re-Location Decisions: Insights for the Pollution Havens Hypothesis? *Environ Resource Econ*. 68, 893-914

Piore, M., Sabel, C. F. (1984) *The Second Industrial Divide*, Basic Books, New York.

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Pyke, F., Becattini, G. ve Sengenberger, W. (1990*) Industrial Districts and Inter-Firm Cooperation in Italy*, International Institute for Labour Studies, Geneva

Robla-Gomez, S., Beccerra, VM., Llata, JR; Gonzalez-Sarabia, E; Torre-Ferrero, C. ve Perez-Oria J. (2017). Working Together: A Review on Safe Human-Robot Collaboration in Industrial Environments. IEEE ACCESS, 5, 26754-26773

Roblek, V., Meško, M., ve Krapež, A. (2016). A complex view of Industry 4.0. SAGE Open. 1 (11).

Rüßmann, M., Lorenz, M., Gerbert, P., Waldner, M., Justus, J., Engel, P., ve Harnisch, M. (2015). Industry 4.0: The future of productivity and growth in manufacturing industries,https://www.bcg.com/publications/2015/engineered_products_project_business_industry_4_future_productivity_growth_manufacturing_industries.aspx (02.03.2018)

Şenses, F. (Ed.). (1994). *Recent industrialization experience of Turkey in a global context*. Greenwood Press

Scott, A. (1988). *Metropolis: From the Division of Labor to Urban Form*, Berkeley, London, 67-86.

Scott, A.J. ve Storper, M. (1989). *The geographical foundations and social regulation of flexible production systems, The power of geography: How territory shapes social life,* ed. J. Wolch and M. Dear Unwin Hyman, Boston, 21-40.

Tekeli İ., İlkin S. (1929). *1929 Dünya Buhranında Türkiye'nin İktisadi Politika Arayışları*. Bilge Kültür Sanat.

Türkün-Erendil A. (2000). Mit ve gerçeklik olarak Denizli Üretim ve iş gücünün değişen yapısı: Eleştirel kuram açısından bir değerlendirme. *Toplum ve Bilim Dergisi*, 86, 91-117

Tübitak Rapor (2016). *Yeni Sanayi Devrimi Akıllı Üretim Sistemleri Teknoloji Yol Haritası*, TÜBİTAK Bilim, Teknoloji ve Yenilik Politikaları Daire Başkanlığı

Yaman M. (2005). Kent Planlamasında Organize Sanayi Bölgelerinin Yeri: Kütahya Örneği. Ankara Üniversitesi Sosyal Bilimler Enstitüsü Yüksek Lisans Tezi.

Yeldan, A. E. (1994). The economic structure of power under Turkish structural adjustment: Prices, growth and accumulation. *Contributions in Economics and Economic History*, 75-75.

Yiğit E. (2017). Emeğin Mekânda Yer Seçimi Olarak Göç Hakkında Tekeli Üzerinden Bir Değerlendirme. *Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi* 9(19), 301-313

Yüzer A. ve Giritlioğlu C. (2003). Sanayi alanları yeni düzenleme stratejileri - İstanbul örneği. *İtü dergisi/a mimarlık, planlama, tasarım*, 2(1), 119-127

Wang K., Lestari, Y. ve Tran V. (2017). Location Selection of High-tech Manufacturing Firms by a Fuzzy Analytic Network Process: A Case Study of Taiwan High-tech Industry. *International Journal of Fuzzy Systems*. 19(5), 1560-1584.

Wang K., Lestari Y. ve Yang T. (2015). Location determinants of market expansion in China's second-tier cities: a case study of the biotechnology industry. *Journal of Business & Industrial Marketing*. 30(2), 139-152

Wu P. ve Shyu H. (2017). The impact of carbon emission costs on manufacturers' production and location decision. *International Journal of Production Economics*. 193, 193-206

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LEADERSHIP ACCORDING TO EFQM MODEL IN TERTIARY EDUCATION: THE CASE OF GREEK UNIVERSITIES

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ABSTRACT

The aim of this paper is to investigate the views of the students towards the Leadership as defined by the first criterion of EFQM Model. Leadership is a key factor in shaping and defining processes and practices that apply to the educational organization. Students are invited to answer whether the Leadership sets the goals, vision and determines the course and the future of the organization, ensures and promotes Continuous Improvement, Creating a Quality Culture and Achieving Operational Excellence. The implementation and implementation of Leadership objectives requires the involvement of all stakeholders, in particular Human Resources. Students' views on whether the University leadership is the inspiration for Human Resources with its organizational skills and culture are also explored. Additionally, it is considered whether the implementation of actions that promote creativity and promote innovation are inspired and guided by an effective Leadership.

KEYWORDS

Leadership, EFQM, Model, Tertiary, education

1. THEORETICAL FRAMEWORK

The leadership (leader) is the essential and most influential aspect, which develops behaviors, actions, formulates visions and advances a business culture, in which the business can do extremely well. Besides, it arouses and funnels total quality, as the foremost process of the institution/ service towards Continuous Improvement (Anastasiadou & Zirinoglou, 2015).

Leaders plan and develop the Mission, Vision and Excellence Culture of the organization. They are responsible to put it write with clarity the organization' values, standards, principals, ethics, priorities and actions (Ancrum, 2007). Mission statement is unique for ever organization. Leadership sets the goals, vision and determines the course and future of the organization, ensures and promotes Continuous Improvement, Creating a Quality Culture and Achieving Business Excellence. The implementation and implementation of Leadership objectives requires the involvement of all stakeholders, in particular Human Resources. It is the inspiration for Human Resources with its organizational abilities and ethos. The implementation of actions that highlight creativity and promote innovation are inspired and guided by an effective Leadership (Anastasiadou, 2017).

According to Sufi and Lyons (2003) the mission statements components should take into account customer focus, communication, organization survival, value, employee care, quality and innovation, public image, business, location and self-concept.

Anastasiadou and Zirinoglou argued (2015) that it is the leadership's role to examine how the mission, the vision and the values are developed and materialized by the leading business executives within the institution/ service and how they make certain with their measures the achievement of the administration system and all this is of paramount significance. Moreover, the role of leadership is to support Total Quality, by providing the right sources and empowerment (Anastasiadou & Zirinoglou, 2015).

According to Dubrin (1995) the leader (leadership) is characterized by his/her ability to develop his/her vision and values which are required for a long and successful function of the business. Vision is related with

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statements that are not real at the present. Vision is related to organization dreams, ambitious targets and grand goals that planed to be achieved in the future. As Strange and Mumford (2005) stated organization vision is connected with future plans aimed to be achieved and strategies for these goals to be efficient ones. The leadership (leader) is the basic and most determining factor, which formulates visions and promotes a business culture, in which the business can excel. Moreover, it inspires and guides total quality, as the main process of the institution/ service towards Continuous Improvement (Anastasiadou & Zirinoglou, 2015). It is the vision which is considered to be the key element for the future organizations direction and orientation (Collins & Porras, 1991).

Georgiades & Macdonell (1998) argued that the leader having at his/her disposal the right means tries to find new opportunities for the business, to update it and differentiate it from the rest competitive businesses of the field.

The abilities and skills of the Leader or Leaders or Leadership in general are of great importance (Martin-Castilla, 2002). Leaders' abilities, actions, actions, ethics, vision, culture, training are strategic points for the organization's progress toward excellence (Martin-Castilla and Rodriqguez-Ruiz, 2008). Their impartiality, the way of managing Human Resources, focusing not only on customer satisfaction but also on the satisfaction of all involved, plays a decisive role not only for sustainability but also for Development and Continuous Improvement of the Organization (Martin-Castilla and Rodriqguez-Ruiz, 2008).

Another perspective, from which we could appraise the leader, is the cooperative values he/she espouses for the organization, and which put in to the accomplishment of the organization. The values refer to inventiveness, innovation, continuous improvement, strong interpersonal relationships, the satisfaction of the client and continuous learning (Dexter & Prince, 2007, Clawson, 2010). The principles and values of each organization create an environment, which leads to the achievement of personal and enterprising targets (Buchko, 2007). Ely et al. (2010) stated that the leader's characteristics and qualities which derive from his/her personality show the degree of his/her influence on the total value and behavior system.

Another important element is the organization' culture. More specifically, the visible role of the leader/ leadership is examined in the development of the mission, the vision, the Total Quality culture and the totality of the values inspiring the development of an enterprising excellence culture in the institution. The positive and collaborative climate (Marin-Cruz et al., 2009), good communication of employees with senior management (Lomgenecker & Fink, 2008), meritocracy and promotions based on objective qualifications (Curtice, 2005), rewards and career development and development (Woodruffe, 2006) lead to the cultivation of that culture in the organization, which leads to the satisfaction of the employees, which in turn maximizes their dedication and thus strengthens and supports the course towards Business Excellence.

2. THE AIM OF THE STUDY

The aim of the study is to examine the views of the students towards the Leadership as defined by the first criterion of EFQM Model. Leadership is an input feature in determining and defining procedures and strategies that apply to the educational organization.

Students are invited to respond whether the Leadership sets the goals, vision and determines the course and the future of the organization, guarantees and encourages Continuous Improvement, Creating a Quality Culture and Achieving Operational Excellence.

The implementation of Leadership objectives requires the involvement of all stakeholders, in particular Human Resources. Students' views on whether the University leadership is the inspiration for Human Resources with its organizational skills and Efforts are in addition investigated.

Furthermore, it is measured whether the achievement of proceedings that hold up inventiveness and promote novelty are inspired and guided by an effective Leadership.

3. THE INSTRUMENT

The European Quality Award (EFQM model) is a widely known model which an institution can apply to implement the principles of Total Quality Management (TQM) in order to achieve excellence. In the present study the first criteria of EFQM model named Leadership, based on international bibliography is recorded.

Then recorded and analyzed the views of students in the light of these criteria reveal the dimensions of Greek educational reality.

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Leadership: The first factor of EFQM model, Leadership is examined, in order to reach the extent to which Leadership develops systematically and perpetually the vision, values, mission and the culture, in general, of the institution aiming at cultivating and promoting the Culture of Excellence on the one hand and continuous improvement on the other.

5. RESEARCH SAMPLE

The research sample consisted of 230 Greek students/ pre-service teachers from 4 Faculties of Primary Education. 156 were females and 74 females. From the 230 students, 57 were first, 68 second, 64 third and 41 fourth year students.

6. RESEARCH METHODOLOGY

The research data were analysed via Factorial Analysis of Correspondences (Analyse Factorielle des Correspondences – AFC). By applying the Factorial Analysis of Correspondences, we achieve an almost global description of the situation aided by a lower number of new composite independent variables, the so called factors. The factors, which take the form of axes, vertical in two, are the factorial axes and are created from the composition of groups of initial variables, resulting in an all the more revealing search of relationships among variables-items in our case. The interpretation of the findings of the Factorial Analysis of Correspondences takes place in the first factorial planes, those namely, which are created by the factorial axes based on the rates of characteristic values λ_κ, where $k = 1,2,3,4\ldots$ for every axis, with values between 0 and 1. The results of Factorial Analysis of Correspondences, extracted with MAD software (Karapistolis, 2010), are interpreted via inertia, which every factorial axis (criterion 1) explains, and finally, via correlation (Cor) and contribution (Ctr). These indices allow us to immediate;y discern the most significant and determining variables or objects, contributing to the creation of factorial axes. Values $Cor \geq 200$ (criterion 2) and Ctr>1000/(numbers of items) (criterion 3) are considered satisfactory (Karapistolis, 2015).

7. RESULTS

Results of the Factorial Analysis of Correspondences (Analyse Factorielle des Correspondences – AFC): Interpretation of the first factorial axis e_1: More specifically, based on the answers of the test takers, and as it derived from the factorial analysis, the first axis – factor e1, via AFC, with eigenvalue 0.2875826 explaining, 77.98% of total variance is constructed from classes HG61, HG51, HG41, HG21, HG22 and HG11 (Figure 1).

Figure 1: Leadership
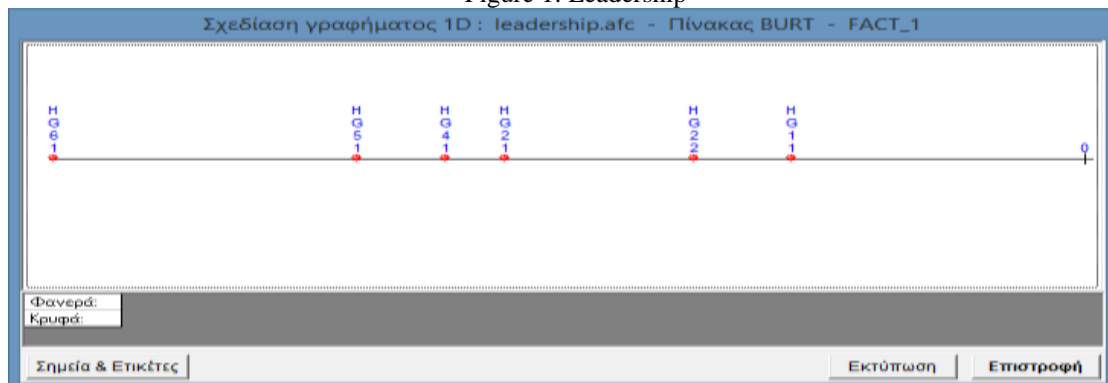
The social subjects of the specific study express a well-built dissimilarity with the statements of the factor "Leadership". In particular, concerning the criterion "Leadership", the respondents did not consider that the leader encourages the contribution of students and staff in improvement actions (HG61) and he/she is in contact with the various participants so that they know his/her expectations and opinions (HG51) and he/she

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does not implement a system of key processes or support activities of the policy, strategy and purpose of the organization (HG41).

According to the answers of the respondents it becomes obvious that for many of them it is not clear whether the leader improves / enhances his/her actions, to meet current and future needs of the organization (HG22) and for others that he/ she does not (HG21).

Finally, the respondents did not believe that the leader clearly communicates to other employees the goals, vision and values of the organization/ university (HG11).

8. CONCLUSIONS

On the whole leadership adversely affects the capability of growth and successful course due to lack of vision, values and ethics. This implies that leaders themselves do not protect the values or are powerless to transfer their vision to human resources and put realizable goals and face all the needs of the institution.

The lack of organization of all parties, staff and students, perchance yet to be paid to the absence or lack of understanding of opportunities, and the lack of improvement actions go ahead to failures and pitiable performance of the institution.

The lack of gratitude of all measures of the parties involved is a limiting issue and also hinders any potential attempt. In conclusion, it enhances low efficiency and minimizes any culture of excellence.

9. RECOMMENTATIONS

Identifying the root roots is necessary since only then school leaders, instructors, teachers will be able to put forward the exact actions to correct or minimize them.

Leadership should enlarge a vision for a well-organized education that meets the needs of all parts of the institution and put the basis of a culture of excellence.

Educational programs, behavior of lifelong learning are some simple actions that could promote excellence and thus the option of high performance of the institution could be maximized.

The encouragement of excellence in research activity could lead to absolute response of the research activities and fulfill the needs and expectations of students, schools and society.

REFERENCES

Ancrum, R. (2007). The principal's principles. *Financial Management,* pp. 57-58.

Anastiadou, S. (2017). *Evaluation of the Implementation of TQM principles in Tertiary Education using the EFQM Excellence Model -Research in Educational Departments of Greek Universities*. Dissertation Thesis, Greek Open University.

Anastasiadou, S. & Zirinoglou, P. 2015. EFQM dimensions in Greek Primary Education System. *Procedia Economics and Finance* 33, pp. 411 – 431

Buchko, A. A. (2007). The effect of leadership on values-based management. *Leadership & Organization Development Journal,* 28(1), pp. 36-50.

Clawson, G. J. (2010). *Level Three Leadership* (4th ed.). New Jersey: Pearson Education Int.

Collins, J. C. & Porras, J. I. (1991). Organizational Vision and Visionary Organizations. *California Management Review*, 50(2), pp. 117-137.

Curtice, J. (2005). *Want to motivate your employees? Keep your company safe and you will.* Handbook of Business Strategy, 6(1), pp.205-208.

Dexter, B. & Prince, C. (2007). Evaluating the impact of leadership development: a case study. *Journal of European Industrial Training*, 31(8), pp. 609-625.

Dubrin, A. J. (1995). *Leadership.* USA: Houghton Mifflin Company.

Ely, K., Boyce, L. A., Nelson, K. J., Zaccaro, J. S., Hernez-Broome, G., & Whyman, W. (2010). Evaluating leadership coaching: A review and integrated framework. *The Leadership Quarterly*, 21(4), pp. 585-599.

Georgiades, N. & Macdonell R. (1998). Leadership for Competitive Advantage. England: John Wiley & Sons Ltd.

Karapistolis, D. (2000). Software Method of Data Analysis MAD.

Karapistolis, D. (2015). *Multivariate Statistical Analysis,* Ed. Athanasios Altintzis.

Longenecker, C. O., & Fink, L. S. (2008). Key criteria in twenty-first century management promotional decisions. *Career Development International,* 13(3), pp. 241-251.

Martin-Castilla, J. I. (2002). Possible Ethical Implications in the Deployment of the EFQM Excellence Model. *Journal of Business Ethics*, 39, pp. 125-134.

10th International Conference
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Eastern Macedonia and Thrace Institute of Technology (Greece), Warsaw School of Economics (Poland), Poznań University of Economics and Business (Poland)

Martín-Castilla, I. J. & Rodríguez-Ruiz, O. (2008). EFQM model: knowledge governance and competitive advantage. *Journal of Intellectual Capital*, 9(1), pp. 133-156.

Martín-Cruz, N., Martín-Pérez, V. & Trevilla-Cantero, C. (2009). The influence of employee motivation on knowledge transfer. *Journal of Knowledge Management*, 13(6), pp. 478-490.

Strange, J. M. & Mumford, M.D. (2005). The origins of vision: Effects of ref lection models and analysis. *The Leadership Quarterly*, 16, pp. 121-148.

Woodruffe, C. (2006). The crucial importance of employee engagement. *Human Resource Management International Digest*, 14(1), pp. 3-5.

10th International Conference
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DESIGNING WEB BASED STAFF MONITORING SYSTEM USING COMPUTER VISION FOR EFFECTIVE BUSINESS PROCESS

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ABSTRACT

In particular, the employees of the state are under constant supervision by their institutions. In traditional monitoring systems, staffs are obliged to perform a number of activities such as signing and informing the manager about arrival and departure times. However, this situation seems quite primitive on the verge of developing social norms. Intelligent staff monitoring systems have been developed as an alternative to traditional staff monitoring systems as a result of the development of computer and internet technologies. Recently, computer vision is one of the most popular contents in academic studies. Generally, computer vision can be defined as gathering data by computers through cameras. Computer vision is interdisciplinary concept that related to artificial intelligence, machine learning, robotics, signal processing and geometry. Computer vision is divided into several subcategories. While creating datasets, software, digital geometry, commercial systems, feature detection, learning, morphology, recognition and categorization, computer vision methods are used widely. There are some computer vision libraries to build computer vision based apps for programmers. MATLAB and OpenCV are very popular and professional software. Both of them have very professional computer vision libraries. It is possible to find many examples especially on human and object tracking systems. This study focused that designing of the web based intelligent staff monitoring system via computer vision method. When the system is designing, various programming languages and programs were used such as MATLAB, PHP, JavaScript, HTML5 and SQL. Database architecture is one of the most important part of the study. All obtained data are stored in the database. MySQL database was used as a database. SMTP (Simple Mail Transfer Protocol) was used as a mail sending protocol. In order to manage and install the system, 64 bit Centos Linux based virtual server, i5 processor, Windows based mini computer and full hd webcams were used to gathering staff' info. Since the system is developed as a web-based, it is very easy to set up every institutions. This system has been developed as an alternative to personnel tracking systems, which are particularly traditional, technologically backward, and management based on human effort.

KEYWORDS

Computer Vision, Web-Based Systems, Staff Monitoring, Advanced telecommunication, Network Based Systems

JEL CLASSIFICATION CODES

C800, D83 , O32

1. INTRODUCTION

According to development of computer technologies, many traditional methods have had to leave their place to new techniques. This situation is a necessary process because the work processes are made more efficient and easier than the old techniques. For example, in thesis or article writing process, the existence of computer programs like Microsoft Word, materials such as paper, pencil, ink, erasers and the raw material and work power required to obtain these materials have been reduced to almost 0. As another example, it would not be wrong to talk about the convenience that mobile phones bring to our lives. Today, people can even complete university education on their mobile phones. Follow-up of student attendance at universities are carried out with mobile phones or electronical cards instead of traditional methods. There are many

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methods and knowledge used in the application of these advanced techniques. Computer vision is one of these techniques. This technique is very popular and it is used some different works such as car monitoring, product operations, count people and more.

In business processes, staff personal monitoring system can contribute to an effective business process. In particular, the employees of the state are under constant supervision by their institutions. In traditional monitoring systems, staffs are obliged to perform a number of activities such as signing and informing seems quite primitive on the verge of developing social norms. Intelligent staff monitoring systems have been developed as an alternative to traditional staff monitoring systems as a result the manager about arrival and departure times. However, this situation of the development of computer and the Internet technologies. Computer vision techniques are used in processes like this very widely. All staff can be monitored by the computers in specific business process effectively.

This work was carried out on the construction of the staff monitoring system. This system mainly consists of two parts. One of these parts is abtain staff data via computer vision. The other part of the system is converting these raw data to information via web programming language and materials. Arrival and departure times of staff, deploying personnel assigned tasks, assessment of staff's attendance can be done by the suggested system. When the system is designing, various programming languages and programs were used such as MATLAB, Php, JavaScript, Html5 and SQL. Database architecture is one of the most important part of the study. All obtained data are stored in the database. MySQL database was used as a database. SMTP (Simple Mail Transfer Protocol) was used as a mail sending protocol. In order to manage and install the system, 64 bit Centos Linux based virtual server, i5 processor, and Windows based mini computer and full hd webcams were used to gathering stuffs' info. Since the system is developed as web-based, it is very easy to set up every institution.

When the literature is examined it is seen that there are different types of studies about staff monitoring. Yerby examined legal and ethical issues about observing someone in the business process. Also he give some advice and employers strategies about improving organizational performance (Yerby, 2013). Enefiok and Uzochukwu develop an android-based employee tracking system. With this program, managers can monitor employee activities in the business (Enefiok and Uzochukwu, 2016). Al-Maadeed et al developed Project and Time Tracking System as a web-based application. With this application, employees can control their project time and missions. One of the main objects is optimizing performance and resource using (Al-Maadeed et al, 2010). Chandran developed software that is used to monitor employee's office cell phones. Chandran says that "All incoming call details, outgoing call details, text details, emails and multimedia messages can be seen and interrupted by the managers, who can also monitor where their employees are, access a history of where they have been and set up alerts if their employees are going outside of the approved geographical zones, are receiving texts from unapproved numbers or calls from banned persons" (Chandran, 2013). Sabale et al developed an application that is used for monitoring employee activity via their official work mobile phones. This application uses GPS technology to monitor employee's activities (Sabale et al, 2015). Singh et al developed an Android based system to monitor employees. This system allows that employee's monitoring process in the organizations (Singh et al, 2018). Dafale et al developed a system, which is used to monitor employees. Every employee in the organization must use an android based mobile phones. According the system, every activity of the employee's record and manager monitors these activities with his/her mobile phones (Dafale et al, 2015). Kasliwal et al developed an application for the business process in the orgranizations. This application is used for productivity of the business process and activity of the employees. In this way, the company mobile phones will be able to communicate more efficiently and on the spot (Kasliwal et al, 2016).

2. METHODS

As mentioned in the introduction, computer vision is very popular content in academical works recently. It provides an inference of the properties of an object's view. Computer vision is the ability of a computer to recognize and interpret the content of an image (Lasky, 2017). Computer vision is a very popular content and growing rapidly for analyzing, modifying and knowledge of an image (Pulli, et all, 2012). Computer vision is interdisciplinary concept related to artificial intelligence, machine learning, robotics, signal processing and

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geometry. Computer vision systems minimize the harmful effects to the environment by reducing the production costs, increasing product quality, ensuring human safety and renewing the production process (Klancnik et al, 2015). There are many different studies on computer vision. Chen conducted a study on the usage of computer vision method as a medical imaging technique (Chen, 2013). Huang et al., studied on agriculture methods such as agricultural products diagnosis, water diagnosis, weed identification, product quality test via computer vision techniques (Huang et al, 2017). Hamrouni, et al propose a automatic method for leaves classification via computer vision technique. The method recognize the type of the plant from the visual features i.e., characteristics which is extracted from a leaf image (Hamrouni et al, 2017). Yao, Zhang and Fu propose a hand motion procedure model to receive the real gesture datasets to establish. The Proposed model integrated into a vision-based hand gesture recognition framework for development of desktop applications (Yao, Zhang and Fu, 2014). Vivacqua, Vassallo and Martins, offer a system related to autonomous car driving in narrow two-way. In this work, they used data fusion algorithms and a low-cost architecture of sensors (Vivacqua et al, 2017).

Computer vision is divided into several subcategories. These categories are listed below:

- Datasets
- Software
- Digital Geometry
- Commercial Systems
- Feature Detection
- Geometry İmage Sensor Technology
- Learning
- Morphology
- Motion Analysis
- Noise Reduction Techniques
- Recognition and Categorization
- Research Infrastructure
- Researches
- Segmentation

There are some computer vision libraries as commercial or open source. MATLAB and OpenCV are computer vision libraries. In MATLAB, with Computer Vision Toolbox, it can simulate and design algorithms, functions, and video processing systems and computer vision. Also, feature detection, extraction and matching, object detection and tracking, motion estimation and video processing, 3D computer vision and camera calibration (Mathworks, 2017). Other computer vision library is OpenCV. OpenCV was launched in 1998 as a research project at Intel. It may be said that the aim is to provide some tools to help solve computer vision problems (Pulli et al, 2012). OpenCV is free of both commercial and academic use. C, C++, Python and Java languages. Especially, users prefer Python and Java languages. Viola/Jones algorithm, feature-checking algorithm, the detection / rejection cascade classifier algorithm, neural networks methods are used for face detection activities. These algorithms have their own advantages and disadvantages. Depending on this situation, the usage areas of these algorithms can be changed.

Other technology that is used in the system, is web-based technology. Web technology is widely using for specific jobs all around the world. Especially, education, health, business and more. Hou and Su worked on integrate the state of the art web technologies with business theories to establish a web based supplier selection process. In this work, they used business theories and analytic hierarchy process approaches (Hou and Su, 2006). Mehmood and Pehserl worked on defining a number of categories of applications on the web and give some example about them. They point out that web is an ideal platform for communication via voice and video (Mehmood and Pehserl, 2015). Ye worked on designing web based integrated system of office and business management. He designed system in three parts. These are presentation layers, business logical layer and data access layer (Ye, 2010). Gallear et al. indicated utilization level of web-based technologies between purchasing and supply management in the UK. Evans and Yen (2006) worked on emerging applications of e-Government in United States and in the International Community. Jannsen, Kuk and Rene (2008) focused that a web based business models in Netherlands. Web is an ideal platform for communication via voice and video (Mehmood and Pehserl, 2015). Also Web-based distance education

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system more effective than the other methods such as Tv or Radio-Based. Web based business management systems are web based software that allow to managers can run their jobs and business on the Internet. These conditions bring them effective business process.

Web based platforms can contain these features:

• Content Management System
• News, Announcement
• Forms
• Photos and videos
• E-Commerce
• Workflow
• Statistics (Wikipedia, 2017)

Suggested system uses computer vision and web-based techniques. The system is designed to monitor staff' daily activity and support him/her via some tools such as send daily activity to his/her email address. The system works like this: Firstly, screen and computer that is using computer vision is located in entry of building. All staff in the building must see this system. While a staff arrived to building every business day, the system says, "welcome to building" to the staff. And then arrive time of staff is sent to database. Every staff' info is collected in this area. And then the system shows daily mission list about his/her business. Also the system sent this list to his/her email. Finally, while the staff leaving the building, the system says "see you tomorrow" and save time of this action and send this info to database. All staff info are located in the database and at the end of the week, evaluate all arrive and exit time of the staff and send report to him/her email about weekly assessment. If there is a problem about enter and exit time of staff at the end of the assessment, the staff is warned about this problem by the system. This assessment report is sent to manager of business in every week. Also every staff's enter and exit times info is sent to manager in daily period. Figure 1 shows this process.

Figure 1: Staff Monitoring Manager Screen

Resource: Authors, 2018

There are two types of authority in the system. First one is staff authorization and the other one is manager authorization. Staff authority allows the staff to see past arrivals and departures and the old reports obtained. Also the staff can view his/her daily activity or mission list. If he/she wants, all documents are printed by the system.

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The manager authority is more specific than the staff authority. For example, the manager can view all reports about enter and exit times of all stuff in the building. The manager can send an email about staff' enter and exit time. Also the manager can set the threshold value for enter or exit time. And then evaluate this info for specific time period. Also manager can view all staff daily work list. The manager can add new daily activity or mission. The manager can also make inquiries according to time or staff. Also take a report about staff' activity as a pdf file. Figure 2 shows manager authorization screen.

Figure 2: Staff Monitoring Manager Screen
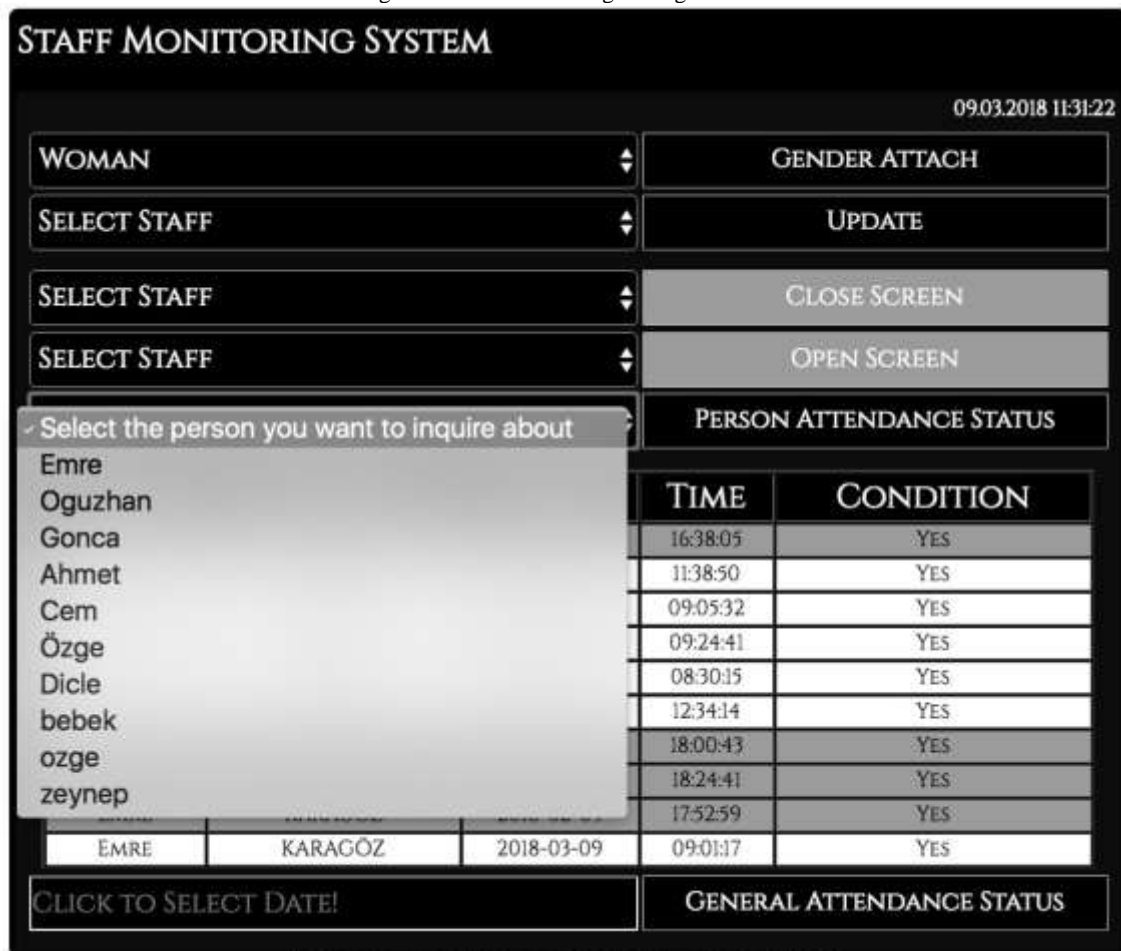
Resource: Authors, 2018

Figure 3 shows main screen of the system. This screen is consisted by 4 parts. Upper left field is staff' individual info such as name, department, mail or picture. Top right field shows staff' daily activity list. This list can contain all business activity of staff. Bottom left field shows staff' work place. And bottom right field shows the list of the hours of arrival of the staff to work. These fields, these areas may perform some actions in response to staff talking. For example, while any staff encounter with the system twice and say, "send me my activity", the system send email contains his / her activity to him/her.

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Figure 3: Staff Monitoring Main Screen for Human Recognition
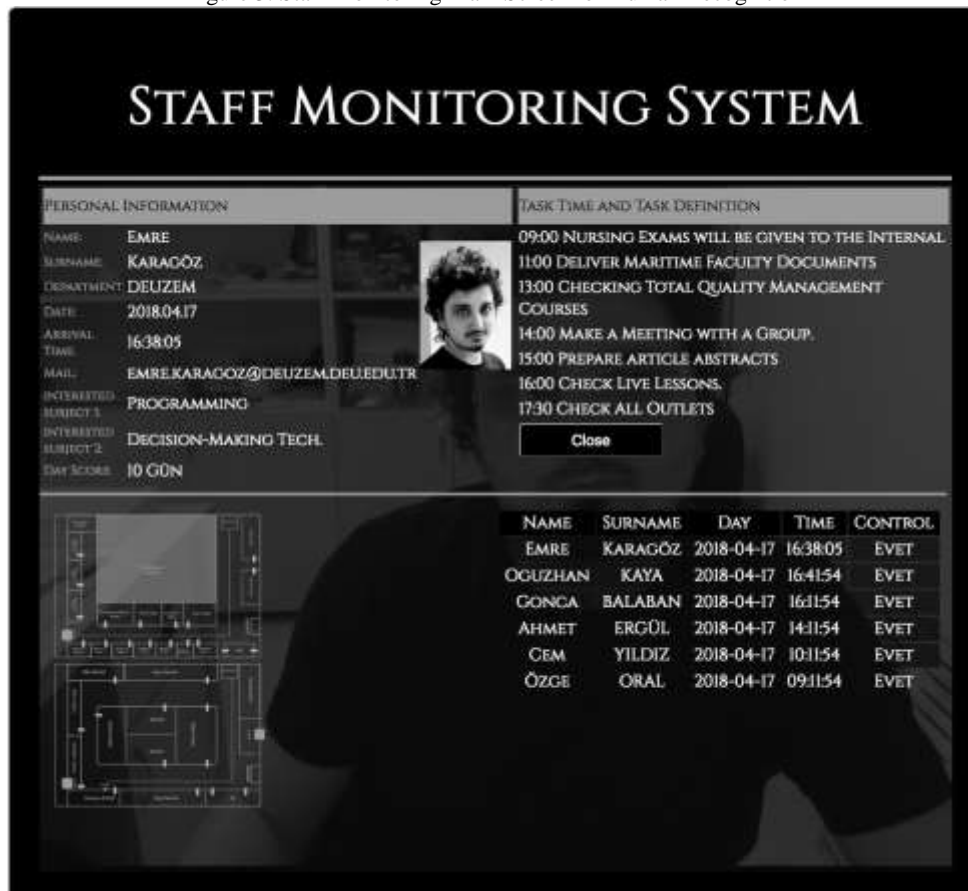
Resource: Authors, 2018

When the system is installed, a number of software and hardware materials were needed. The hardware and software used in the basic sense are listed in Table 1.

Table 1: Using Hardware and Software Tools in The System

Hardware Tools	Software Tools
• **64 BIT CENTOS Operating System Server**	• MATLAB
• **İ5 Processor Microsoft Operating System Mini Computer**	• WinSCP
• **1920*1080 resolution webcam**	• HTML5 (Programming Language)
• **102 inch screen**	• CSS (Programming Language)
	• PHP (Programming Language)
	• Javascript (Programming Language)
	• MySQL (Programming Language)

Resource: Authors, 2018

In order to work the system successfully, the server needs to have enough power. For this reason, select the server has 64 BIT Linux based CENTOS Operating System. There are three important reasons why we choose the Linux management system. First, Linux is open source operating system, second, no need for unnecessary programs to run and to compile the system code files written in languages such as PHP and JAVA, and to work with utilities such as Apache and Tomcat, which are useful for presenting contents to the user on the web. System performs human recognization process with MATLAB computer vision. In order for

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MATLAB to work efficiently, there is a requirement that the installed minicomputer has a certain power. Mini computer that has i5 Processor Microsoft Operating System is used. To perform person recognition, there must be high-resolution webcam. Full hd (1920*1080) webcam is used in the system. And finally, 102-inch screen is used to view the system interface to staff.

As software tools, MATLAB and WinSCP programs were used. MATLAB has very powerful computer vision library. This program was installed in the mini computer. And using webcam, it performed to person recognition. After MATLAB performed person recognition process, this data was sent to the database. For this activity, WinSCP was used. In this case, the data on the local computer and the data on the server are kept up-to-date. HTML5 and CSS programming languages were used for graphical design of the system interface. PHP and JavaScript programming languages were used for all operation function. MySQL database was used to collect all data, which came from the system.

As mentioned before the system is consisted by two parts. In first part, computer obtained raw data about person. In this step, MATLAB computer vision library is used by the system. Obtained raw data are sent to database and collected in the tables of database. Table 2 shows the table and field names.

Table 2: The Table and Field Names in MySQL Database

User_Table	Recognition_Table	Attendance_Table	Activity_Table
Id	Id	Id	Id
Name	User	User	User
Surname	MassageConditon	Day	Activity1
Unit	MailCondition	EnterTime	Activity2
Interest1	SpeakingGender	ExitTime	Activity3
Interest2		Control	Activity4
MailAdress			Activity5
Picture			Activity6
			Activity7
			CloseControl

Resource: Authors, 2018

3. CONCLUSION

This work focused that design of staff monitoring system via computer vision and web techniques. Instead of traditional methods, this system is offered. This system brings especially hardware and software costs during the installation phase. MATLAB program was preferred to use for human recognition. This software is commercial. If the costs are reduced, OpenCV, an open source software, may be preferred. Depending on advancing technology, installing such a system would be more cost-effective in the future. Especially, human recognition technique will be give more accurate result. With 4k resolution technology coming out, the analyze of human recognition may be more detailed via webcam.

In business process, it can be provided that the some business objects are determined by the computer vision method and these objects are directly transmitted to the related persons. For example in a cargo distribution business model, the objects to be shipped and the person who will deliver those objects can be recognized by computer vision techniques and can be matched. The costs for stacking packages can be reduced to zero. The integration of these types of methods with suggested staff monitoring system constitutes the subject of the next study.

REFERENCES

Al-Maadeed, S., et al., 2010. A New Web-Based Project And Employee Time Tracking System For Project Management. European, Mediterranean & Middle Eastern Conference on Information Systems 2010 (EMCIS2010) April 12-13 2010, Abu Dhabi, UAE

10th International Conference
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Eastern Macedonia and Thrace Institute of Technology (Greece), Warsaw School of Economics (Poland), Poznań University of Economics and Business (Poland)

Chandran, A. et al, 2013. Smartphone Monitring System. International Journal of Computer Science & Engineering Technology (IJCSET) Vol. 4 No. 04 Apr 2013 ISSN : 2229-3345

Chen, C. H., 2013. An Introduction to Computer Vision in Medical Imaging. World Scientific Publishing. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/deulibrary-ebooks/detail.action?docID=1578315.

Dafale, P. et al, 2015. Monitoring Employee's Smartphone Using Android Application. International Journal of Soft Computing and Artificial Intelligence, ISSN: 2321-404X Volume-3, Issue-1, May-2015

Enefiok, E. and Uzochukwu, O., 2016. An Android based Employee Tracking System. International Journal of Computer Applications (0975 – 8887) Volume 153 – No3, November 2016

Evans, D. and Yen, D.C., 2005. E-government: An analysis for implementation: Framework for understanding cultural and social impact, Government Information Quarterly, Volume 22, Issue 3, 354-373.

Hamrouni, L. et al, 2017. Plants Species Identification Using Computer Vision Techniques. Revue des BioRessources Vol 7 No 1 Juin 2017

Hou, J and Su, D., 2006. Integration of Web Services technology with business models within the total product   design process for supplier selection Elsevier

Huang, X. et al, 2017. Application of Computer Vision Technology in Agriculture. Agricultural Science & Technology, 18 (11): 2158-2162

Kasliwal, S. et al, 2016. Employee Tracking and Monitoring System Using Android. International Journal of Innovative Research in Advanced Engineering (IJIRAE) Issue 03, Volume 3 (March 2016) ISSN: 2349-2763

Klancnik, S. et al, 2015 Computer Vision-Based Approach to End Mill Tool Monitoring, Int j simul model 14 (2015) 4, 571-583

Lasky, J., 2017 Computer Vision. Salem Press Encyclopedia of Science

Mathworks 2017 https://www.mathworks.com/products/computervision.html

Mehmood, R. and Korica-Pehserl, P., 2015. The Web is Big Business Journal of Computing and Information Technology CIT 23, 2015, 1, 19-27

Pulli, K. et al, 2012. Real-time computer vision with OpenCV. Communication of the ACM

Sabale, R. Et al, 2015. Employee Monitoring System Using Android Smartphone. (IJCSIT) International Journal of Computer Science and Information Technologies, Vol. 6 (6) , 2015, 5130-5132

Singh, P. et al, 2018. Efficient Employee Surveillance System Using Android. International Journal of Recent Trends in Engineering & Research (IJRTER) Volume 04, Issue 04; April- 2018 [ISSN: 2455-1457]

Vivacqua, R., et al., 2017. A Low Cost Sensors Approach for Accurate Vehicle Localization and Autonomous Driving Application. Sensors 2017, 17, 2359; doi:10.3390/s17102359

Yao, Y., et al., 2014. Real-Time Hand Gesture Recognition Using RGB-D Sensors. Advances in Computer Vision and Pattern Recognition

Ye, J., 2010. Design and Implementation of WEB-based Integrated System of Office and Business Management. 978-1-4244-6977-2/10/$26.00 ©2010 IEEE

Yerby, J. 2013. Legal and ethical issues of employee Monitoring. Online Journal of Applied Knowledge Management. A Publication of the International Institute for Applied Knowledge Management Volume 1, Issue2, 2013

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AN IMPLEMENTATION OF ERP SYSTEM IN SMALL AND MEDIUM SIZED ENTERPRISES

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ABSTRACT

An ERP (Enterprise Resource Planning) is a wide information system aiming to integrate and combine all the important business functions of a company. These functions could range from inventory control to sales management and human resources. This thesis aims to explore the basic options of ERP package evaluation in small and medium enterprises. The criteria of ERP selection and implementation are examined in order to measure and to interpret their relevance and their impact on firm's performance. Moreover these criteria are tested in terms of significance in the selection process of ERP package. The research was developed in Eastern Macedonia and Thrace region using primary data from 83 small and medium enterprises. According to the results the most significant criteria in ERP selection are cost, compatibility to firm's systems and ERP matching with the enterprise organizational structure of the firm. Further, project management and implementation duration of ERP have minor but significant impact on firm's performance while there is modest relevance with ERP selection criteria and firm's characteristics.

KEYWORDS

ERP system, SMEs, ERP product.

JEL CLASSIFICATION CODES

M41

1. INTRODUCTION

In the early of 20th century it was created a really competitive environment as far as it concerns the field of firms. Modern enterprises in order to reciprocate to new demands should have the ability to adjust to differentiated conditions of new technologies at speed and flexibility. Enterprise Resource Planning systems after their wide acceptance by large companies are gradually expanded in the field of medium – sized enterprises as well. The basic goal of an ERP system is the integration of individual procedures of various departments (finance department, production, sales) into the enterprise, in order the enterprise to fulfill its main business activities successfully. "Integration" is the key – element since the implementation of an ERP system provides better structures to the enterprise, which allow the employees to work more efficiently and more productively.

ERP systems combine all systems of various departments into an integrated software system, which uses only one database in order to achieve easier communication and exchange of information among departments. In that way it is created a unique software programme which serves the needs of finance department, department of human resources administration and department of inventory management. This programme has a common database and in that way it is accomplished better dissemination of information into the company and better communication between the departments (Kumar et al, 2003).

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The purpose of this thesis is to explore the importance of a set of criteria that are employed by enterprises in ERP selection. These criteria are relevant to the basic functions of the firms, and determine its efficacy and its effectiveness. In those terms the assignments aims to research the basic options of ERP selection and to correlate them by the basic characteristics of the enterprises. It is notified that the basic hypotheses stated below, of the assignment are integrated in the selection process of ERP by enterprises.

The study uses primary data selected throughout questionnaires that were distributed in 83 firms of Eastern Macedonia and Thrace region in Greece. Following Valsamides et al (2009) the criteria that were employed in order to measure and to interpret their importance in ERP selection are the following: function and effectiveness , technical support, ERP Cost, suppliers assistance, supplier fame surplus, ERP credibility, ERP compatibility to firm's systems, ERP customization, supplier market share, matching in the organizational structure of the firm, supplier technical skills and knowledge, supplier recommendations implementation duration of ERP, supplier technical and methodological assistance, external consultants and project management. These variables were measured and then correlated by a set of firm's characteristics, so to understand their importance and their influence on ERP selection and on firm's effectiveness and efficacy as well.

2. LITERATURE REVIEW

There have been extensive studies paying attention on the implementation of ERP systems and they have come to the conclusion that certain firms have had very successful ERP implementations which can lead to improvements in operational performance (Davenport, 1998). We developed a conceptual framework for investigating how ERP selection criteria influence ERP implementation success. Fifteenth of the numerous selection criteria for the ERP selection process were identified.

The choice of the external consultant is the primary aim of the company according to Brewer (2000), as he is the most appropriate person to identify company's needs and to keep the balances. Due to his experience, he is capable of providing benchmarking services in order to draw up the composition of the standards for the choice of ERP Systems. The ERP consultants primarily possess technical knowledge, whereas the users (clients) possess business knowledge (Palanisamy, 2007).

Much of the source credibility research has investigated how individuals perceive the credibility of human sources (Pornpitakpan, 2004). However, one critical criterion that managers apply in deciding which information to use is the credibility of the information (Petty and Cacioppo 1986; Rieh and Danielson 2007).

Baki and Hakar (2005) concluded that the functionality which is related to the basic functions of the company such as human resources management, project management, production planning, supply chain management or even more, should be examined by a team which will consist of various expertise and the compatibility with other systems will have the ability to be unified or to interact with other software packets that might the company use, in order to cover some special needs.

However, the research which was conducted by Hecht (1997), pointed out that cost is a crucial factor in the process of choosing the proper ERP. Among the elements of this cost are included, software costs, material costs, advisory services cost, training cost, maintenance cost and upgrading cost that in most cases is high enough. Having known its positive consequences, this has as no surprise that the configuration of an ERP system will cost enough and usually it is higher than the budgeted cost.

Another research by Themistocleous et al. (2001), propose the unification and customization as many companies are obliged to customize specific parts of an ERP Systems.

Birdogan & Kemal (2005) in their research highlighted that the implementation time depends on the selected strategy of implementation and the range of the project. Implementation time might be reduced significantly when there are solutions of specified applications for a certain field of business or industry.

Last but not the least, as Vernille and Hallingten (2002) pointed out, it is needed to evaluate the various available suppliers of ERP Systems as it should be taken into consideration the power and the reputation of the supplier, his economic stability and his technical skills and knowledge. We should also have in mind that cooperation with the supplier will be close and in long-term period and from the point of view the company should examine if the cooperation, about technical support and methodological assistance, with a specific supplier might be viable.

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Finally, many studies stressed their interest in the relationship between the implementation of ERP systems and organizational culture as an issue in stating that an ERP system forces the logic programmed into it on the strategic plans, culture and values of a company (Davenport, 1998). Tharp (2009) further clarifies that the overall advantage of having an organizational culture to influence business performance is generally realized when attributes of the culture are matched with and do not hinder the organizational goals.

3. RESEARCH METHODOLOGY

The research process was designed in order to measure and to interpret the ERP effect in the enterprise performance. The key element of the primary research was a questionnaire that was distributed in 120 companies in Eastern Macedonia and Thrace region electronically in the autumn of 2011. The firms' characteristics were received from the Chamber of Commerce of this region. The managers and the executives of the firms were the final recipients of the questionnaire. The questionnaire was responded from 83 companies, a fact that denotes a respond rate of 69.17%. The respondents accomplish the queries in order to issue the basic elements of firm's performance and the impact that ERP implementation had on it. This procedure was the base of the analysis of the results so to estimate the total impact of ERP in firm's performance in Eastern Macedonia and Thrace.

3.1 Descriptive characteristics and Frequencies

In this section the basic descriptive characteristics of the criteria about the ERP selection is studied. Table 1 depicts that the major variable is the compatibility to enterprise's systems (4.31) a variable that has the lowest standard deviation of this set (0.85). According to this finding it is valid to state that ERP is selected in order to improve firm's effectiveness. Thus, the second most valuable criterion is achieved by the supplier fame surplus (4.06) with the standard deviation of (0.88). It is interesting that the fame surplus of supplier is in the top, a result that demonstrates the anticipated quality of an ERP. Additionally, organizational structure of the firms follows with Mean score almost in 4.04. Finally, another important variable is the implementation cost (4.0- 1.05).

The rest of the variables with the positive influence are the supplier recommendation (3.95-1.1), the customization (3.93-1.09), the functional effectiveness of the enterprise (3.93-1.045), the implementation and mainly for the ERP duration (3.83-1.03), the credibility of the system (3.807-1.29), the market share that the supplier enjoys (3.79-1.11), the supplier assistance (3.73-1.2), the level of technical support (3.4-1.11). Technological and methodological assistance to firms' functions achieves an average respond equivalent to 3.78 (1.27), the influence in external consultants operation 3.33 (1.1) and surprisingly project management scores at the lowest one of 3.19 (1.02).

Table 2. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Functional Effectiveness	83	1,00	5,00	3,9277	1,04512
Technical Support	83	1,00	5,00	3,3976	1,11464
Cost	83	1,00	5,00	4,0000	1,05922
Supplier Assistance	83	1,00	5,00	3,7349	1,20045
Supplier Fame Surplus	83	1,00	5,00	4,0602	,88826
Credibility	83	1,00	5,00	3,8072	1,29217
Compatibility to Firm systems	83	1,00	5,00	4,3133	,85437
Customization	83	1,00	5,00	3,9277	1,09079

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Supplier Market Share	83	1,00	5,00	3,7952	1,11267
Organizational Structure of Firm	83	1,00	5,00	4,0361	,98086
Suppler Technical Skill and Knowledge	83	1,00	5,00	3,6988	1,06765
Supplier Recomendation	83	1,00	5,00	3,9518	1,10325
Implementation and Duration	83	1,00	5,00	3,8313	1,03381
Technical and Methodological Assistance	83	1,00	5,00	3,7831	1,27880
External Consultants	83	1,00	5,00	3,3253	1,10551
Project Management	83	1,00	5,00	3,1928	1,02954
Valid N (listwise)	83	1,00	5,00		

3.2 Correlation between firms' characteristics and selection criteria

In the next tables are portrayed the correlations results between the selection criteria and firm's characteristics. Table 2 shows that functional effectiveness has minor positive correlation with the scope of activity (0.275), technical support with the segmentation operation (0.217) , and supplier assistance with annual turnover (0.252). Moreover functional effectiveness is negatively correlated with pilot duration (-0.344), but positively with total ERP cost (0.536). Inverse relevance with the duration of pilot period has the cost variable (-0.307), and positive with the total cost (0.45). Last but not least the supplier assistance and the supplier fame surplus are both positively correlated with the total cost of the programme (0.268 & 0.375 respectively.

Table 2. Correlations results between the selection criteria and firm's characteristics Descriptive Statistics

	Functional Effectiveness	Technical Support	Cost	Supplier Assistance	Supplier Fame Surplus
Scope of Activity	0.275 (0.012*)	×	×	×	×
Segmentation Operation	×	0.217 (0.048 *)	×	×	×
Years of Operation	×	×	×	×	×
Annual Turnover	×	×	×	0.252 (0.022*)	×
Employees before ERP	×	×	×	×	×
Employees Variation After ERP	×	×	×	×	×

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Pilot Duration	-0.344 (0.001**)	×	-0.307 (0.005**)	×	×
Total ERP Cost	0.536 (0.00**)	×	0.45 (0.00**)	0.268 (0.014*)	0.375 (0.00**)

In table 3 is depicted the results between the second selection criteria group and firm's characteristics. Credibility has only statistical significant correlation only with ERP cost (0.332), whereas compatibility with scope of activity (0.256) and with cost (0.376) as well. Supplier market share is positively connected with the scope of activity (0.219) and interestingly customization is negatively associated with annual turnover (-0.283). ERP cost is present and for the case of organizational culture of the firm as positive association is observed (0.231).

Table 3. Correlations results between the selection criteria and firm's characteristics Descriptive Statistics

	Credibility	Compatibility to Firm's Systems	Customization	Supplier Market Share	Matching with the organization
Scope of Activity	×	0.256 (0.019*)	×	0.219 (0.047*)	×
Segmentation Operation	×	×	×	×	×
Years of Operation	×	×	×	×	×
Annual Turnover	×	×	-0.283 (0.010**)	×	×
Employees before ERP	×	×	×	×	×
Employees Variation After ERP	×	×	×	×	×
Pilot Duration	×	×	×	×	×
Total ERP Cost	0.332 (0.002**)	0.376 (0.00**)	×	×	0.231 (0.036*)

Finally in table 4 is depicted the results between the third group of selection criteria and the characteristics of the enterprises. Supplier's technical skills are correlated significantly only with total ERP cost. This is the case for the supplier's recommendations (0.237), whereas implementation duration is positively associated with scope of activity (0.233). It is interesting that the Supplier level of technical and methodological assistance is negatively correlated with the pilot duration (-0.218). Finally the external

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consultant has negative correlation with employee's variation after the ERP implementation and the project management has in contrast positive connection with segmentation operation (0.237).

4. CONCLUSION

As mentioned above the basic aim of this assignment is the research about the importance of different criteria in ERP selection process. The assignment used the responds of 83 different enterprises in Eastern Macedonia and Thrace region, in Greece. These answers were analysed in order to understand the relevance of these criteria with firm's characteristics and their potential influence on firm's performance as well.

In the field of the criteria in ERP selection process the greater importance was appeared in the fields of compatibility to firm's systems, the matching with the organizational structure of the firm, cost and supplier fame surplus. In addition significant influence exercise in the ERP selection factors like the functional effectiveness, credibility, supplier's recommendations, customization, credibility and the duration of ERP implementation. Interestingly the scores of project management were not high enough, but stood in the moderate scale (3.19) and comparatively to the other variables was the lowest one.

There is no doubt that every organization or every enterprise has its own needs and consequently the evaluation degree and the final decision differs. Every company should pay attention to its own criteria and should focus its evaluation on issues like Technology – Functionality – Convenience in usage – Adaptability in company's needs – Easily assimilated by users and company's executives.

One of the most important criteria in the selection of an ERP packet is its flexibility and dynamic towards changes. It should be taken into serious consideration the fact that modern enterprises function in a very competitive and continuous changing business environment. Enterprises should be flexible to current changes in order to survive and in extension to succeed. Another important factor is that Greek market is developed into a highly demanding market as far as it concerns its choices towards applications packets in every field. The crucial reason for this market attitude is that in recent years Greek market had coped great difficulties due to quick decisions and carelessness of the past. Additionally, there is ruthless competition and great need for proper organisation as means of success. The existence of interest is also of crucial importance. In other words, the enterprise's personnel should cooperate successfully and it should also be keen on continuous training and education. Managers of departments ought to have a leading role in order to accomplish their task. As a final conclusion it can be supported that the implementation of an ERP programme is for company's interest.

Conclusively, in order an enterprise to complete successfully the implementation of the proper integrated information system should take into consideration a set of reasons: Management's commitment, availability of essential involved executives, full training of the final users, credibility of the available elements, ensure proper funding, operational plan project, a realistic implementation schedule and effective project management. Last but not least, the selection of an ERP system is not the final goal of an enterprise, but the base line of its course towards continuous enhancement and improvement.

The limitations of the research lie on the relative small number of the firms that were participated. This restriction accrued as a matter of the difficulty to extend the research on the firms that are operated abroad in countries like Romania and Bulgaria. The extension of the research in different countries, would gave the opportunity to explore the different dimension of ERP selection and implementation.

Another one significant limitation of the research is that firms with participation on horizontal and vertical business networks excluded from the sample. The fact that in Eastern Macedonia and Thrace are not exist business networks contribute to this emergence. The research about ERP selection and implementation in vertical and horizontal business networks would reveal significant options of this procedure.

Last but not least the further research should focus in the collaboration fields of small and medium Greek enterprises, in ERP proceedings. The research in fields such as collective action and learning and collective knowledge will shed strong light in the relevance between ERP and enterprise's performance. Thus ERP could be confronted as an input of the effectiveness of business networks and local development as well.

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REFERENCES

Baki B., Hakar K., (2005), Determing the ERP package-selecting criteria: the case of Turkish manufacturing companies, Business Process Management Journal, 11 (1) pp.75- 86.

Brewer, G. (2000), On the road to successful ERP, Instrumentation & Control Systems, 73 (5) p.p..49-58.

Cacioppo, J. T., & Petty, R. E. (1986). Staiking rudimentary processes of social influence: A psychophysiological approach. In M. P. Zanna,,J. M. Olson, & C. P. Herman (Eds.). Social influence: The Ontario symposium (Vol. 5). Hillsdale, NJ Erlbaum, in press.

Davenport, T.H. (1998) "Putting the enterprise into the enterprise system," Harvard Business Review, vol. 76, pp. 121-+, Jul-Aug

Hecht, B., (1997), Choose the right ERP software, Datamation, 43 (3) ,p p.56-58.

Kumar, V., Maheshwari, B. and Kumar, U., (2003), An investigation of critical management issues in ERP implementation: empirical evidence from Canadian organization's, Technovation, 23 pp.793-807

Palanisamy, R. (2007) Capturing Users' Tacit Knowledge in ERP Implementation: An Exploratory Multi-Site Case Study. Journal of Information and Knowledge Management, 6(1), pp.9-23.

Pornpitakpan, C. (2004). The persuasiveness of source credibility: A critical review of five decades' evidence. Journal of Applied Social Psychology, 34(2), 243-281.

Rieh, S.Y., Danielson, D.R., 2007. Credibility: a multidisciplinary framework. In: Cronin, B. (Ed.), Annual Review of Information Science and Technology, vol. 41. Information Today, Medford, NJ, pp. 307--364.

Tharp, B.M. (2009). Defining "Culture" and "Organizational Culture": From Anthropology to the Office http://www.paragonbusinessfurniture.com/documents/DefiningCultureandOrganizationalCulture.pdf

Themistocleous M. , Irani Z. , O"Keefe M. R.. , (2003) "ERP and application integration: Exploratory survey", Business Process Management Journal; 7 (3) pp. 195-204

Valsamidis S. Mandilas A. Nikolaidis M. Polychronidou P. (2009), ERP Package Evaluation : The Case of SME's Kavala's Region, Annales Universitatis Apulensis Series Oeconomica, 11(1), 2009

Vernille Jacques, Palanisamy Ramaraj, Bernadas Christine, Halingten Alannah, 2002. ERP Acquisition Planning: A critical dimension for making the right choice, Long range Planning Vol. 40, Elsevier, p. 45-63.

Birdogan, B., Kemal, C., 2005. Determining the ERP package-selecting criteria: The case of Turkish manufacturing companies. In Business Process Management Journal, 11(1), Emerald Group Publishing Limited, pp. 75 – 86.

APPENDIX

Table 4. Correlations results between the selection criteria and firm's characteristics Descriptive Statistics

	Supplier Technical Skills and Knowledge	Supplier Recommendations	Implementation Duration	Supplier level of technical and methodological assistance	External Consultants	Project Management
Scope of Activity	×	×	0.233 (0.034*)	×	×	×
Segmentation Operation	×	×	×	×	×	0.237 (0.031*)
Years of Operation	×	×	×	×	×	×
Annual Turnover	×	×	×	×	×	×
Employees before ERP	×	×	×	×	×	×

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Employees Variation After ERP	×	×	×	×	-0.307 (0.005**)	×
Pilot Duration	×	×	×	-0.218 (0.048*)	×	×
Total ERP Cost	0.223 (0.043*)	0.237 (0.031*)	×	×	×	×

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MODELS OF BUSINESS SUSTAINABILITY ASSESSMENT

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ABSTRACT

Sustainability of business has been for many decades economists. With the outbreak of the latest global economic crisis, economists are increasingly concerned. In the present study, methods of assessing the sustainability of enterprises will be presented in the form of a literature review. First attempts to predict bankruptcy will be reported and then the first comprehensive forecasting models will be presented, analyzing the most important ones. Then reference will be made to modern models that do not predict bankruptcy but to whether an enterprise is viable using qualitative variables. Finally, conclusions will be drawn as to whether a model prevails over others or whether the appropriate model is used as the case may be.

KEYWORDS

Business, Sustainability, Sustainability assessment, Bankruptcy, Economic crisis

1. INTRODUCTION

The financial crisis that originally appeared in the United States of America a decade ago did not take long to appear in the rest of the world, especially in Europe. Depending on the structure of its economy, each country experienced the economic crisis differently, developed industrialized countries such as the US and Germany overtaken the crisis relatively quickly and unmistakably, other countries were affected to a greater extent but eventually overcame it without being irreparably affected their economy and last been countries like Greece, whose economy has been heavily influenced and still experiencing the economic crisis. This crisis has affected and continues to affect the banking system, businesses, households and hence the national economy of each country exposed to the economic crisis. Banks trying to maintain their capital adequacy and liquidity curtailed lending to businesses and households. This action of the banks is also due to the fact that a financial crisis as originally started was transformed as a global financial crisis.

With the outbreak of the economic crisis, households saw their incomes fall, and therefore their purchasing power as well. Households, being the most conscious consumer, restrict the consumer goods market by purchasing only the most necessary. This reduction in demand for goods coupled with virtually non-existent bank lending has led many businesses, which can no longer dispose of the products they produce, at bankruptcy. This is also due to the overwhelming lending that many of the companies have driven in previous years to develop and increase their production, now unable to cover interest and the cost of production closes one after the other. Businesses becoming the pillars of an economy directly affect the economy of each country in which they operate. Therefore, as more businesses are in difficulty or closes in one country, the country's economy is getting worse.

Economists, knowing that the main pillar for word economy recovery is the business, have in recent years increasingly begun to develop models of predictability of their sustainability, which will be a pillar for future research, as the sustainability models developed in recent years with the necessary use of electronic computers. This study will present the existing sustainability studies and whether they are sufficient. How topical is the issue of business sustainability for the last almost 100 years is also the main reason for this research. The second reason is how important it is that it is possible to predict the viability of a business, both by owners or shareholders, and by state-owned banks and future investors.

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The issue of business sustainability is nothing new since it started to concern economists about half a century ago. The first studies included mainly the analysis of the financial statements of the companies that were bankrupt in comparison with companies in the same sector that did not have a financial problem, trying to create a model that would have predicted bankruptcy. These analyzes were mainly based on the calculation of a series of indexes, which, depending on the prices, estimated the probability of bankruptcy. Several of these models achieved high rates of accuracy. The main ones are the z-score model and Altman's zeta model, probability models, onevariate analysis, etc. In recent years, survival models, which, although similar to bankruptcy models, apply to the fact that both have a risk function, actually differ in some important points. Initially, they differ in the sample and the variables they examine, bankruptcy models use only data from the financial statements, while the sustainability models mainly use quality variables. Also, bankruptcy models are based on the results of some indexes, contrary to sustainability models based on the business organization theory, by computing many qualitative parameters that interact and have immediate business results. These differences will be presented in the next chapter more fully.

The aim of this research is to provide an extensive bibliographic review to present the company's most prevalent business sustainability assessment methods that existed and developed before the outbreak of the last economic crisis. This will be done to see if the methods used were reliable and sufficient to predict sustainability and if one is the best. Based on international and domestic literature, the most appropriate ones will be chosen to answer the question, which or which are the most appropriate methods to determine the sustainability of a business?

The offer of this research is very important and always up to date. This is because business sustainability is a major issue for the economies of all developed countries over the last century. Too many economists have dealt with the creation of predictive models of sustainability. This research will present the predominant prediction models used and used worldwide.

The methodology that will be followed to produce the necessary conclusions to answer the question is not based on primary empirical data but will be derived from secondary sources. By secondary sources we mean empirical colleague inquiries on business sustainability models, from which studying the pros and cons will be chosen the most appropriate.

Initially, reference will be made to the concept of sustainability of a business, what is the meaning of the term sustainability. Then there will be a historical retrospection presenting the first sustainability models and how the economists then understood it and will continue with the sustainability models developed in recent years. Finally, reference will be made to the sustainability models used and developed over the last decade and will be the subject of future research.

Once the historical review and the presentation of the main sustainability models have been completed, the conclusions will be drawn and it will be ascertained whether a model can be considered better than another or whether you just depend on the individual researcher and business

As a result, the international financial crisis has led many businesses to bankruptcy, which has created an even greater need to use and develop new methods of sustainability assessment. Both the same businesses for personal gain, as well as financial institutions and the state for their own personal benefit, need to know whether a business is sustainable or not. In the following chapter we will review the methods of business sustainability assessment and how these have evolved over the last few years. Finally, the conclusions will be obtained and the original question of the survey will be answered, if there is a more prevalent method or if a different method is required in each case being considered.

2. LITERATURE REVIEW

Over the last decades, especially the last, due to the economic crisis, the need to develop mechanisms for assessing the sustainability of businesses is becoming more and more intense. The direct stakeholders of whether an enterprise is viable or not, besides the business itself , are financial institutions as well as the state itself, financial institutions to assess whether to repay the loans they have given or to give new and the state to assess whether it will receive taxes and insurance contributions. With the sustainability of a business, described the situation in which an enterprise is able to cover its operating costs over the long term. The chapter will then analyze the main methods of assessing the sustainability of enterprises.

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2.1 THE FIRST SUSTAINABILITY ASSESSMENT MODELS-BREAKING MODELS

The first models estimated the probability of a company's bankruptcy and indirectly its sustainability, that is, a bankruptcy business is not viable, and vice versa, a company with a low probability of bankruptcy is viable. The first studies on the bankruptcy forecast were univariate and their results resulted from the comparison of bankruptcy with healthy businesses.

Fitzpatrick was one of the first to publish a study on the likelihood of bankruptcy in 1932. He compared the ratios between bankrupt and non-bankrupt companies and noted that the bankruptcy rates were too low as opposed to successful firms. He also concluded that the most important ratios are Net Asset Value and Net Profits to Equity (Fitzpatrick, 1932).

In 1935, Smith and Winakor obtained data from 183 companies that had gone bankrupt and took some proportions, led to several conclusions, the most important of which was to find that the ratio Current assets to total assets declined as much closer to bankruptcy was the company (smith & Winakor, 1935). In 1962, another similar survey was made by Jackandoff, who, after a series of comparisons of the ratios between bankrupt and successful business, concluded that the ratios General Liquidity and Net Working Capital to Total Assets were higher for Successful Enterprises. Finally he noticed that the bankrupt companies had a higher dept to worth ratios (Jackendoff, 1962).

The first attempt to analyze using a more complex statistical model was made in 1964 by Tamari, who noted that a large number of non-bankrupt companies showed in their analysis a weakness in one or more indicators. He concluded that an index cannot give credible results about the probability of a company's bankruptcy and proceeded to create models based on exploratory indicators of the risk of corporate bankruptcy. (Altman & Narayanan, 1997) . The first substantial attempt to assess bankruptcy and therefore the sustainability of businesses using indexes was published in 1966 by Beaver (Beaver, 1966). The prediction model followed the univariate analysis. It used 30 indicators that were applied to the analysis of 79 business pairs, each pair consisted of a bankrupt and a successful business between 1954 and 1964. Ratios were selected using a partitioning test. According to Beaver, a failure was defined as a company's inability to meet its overdue liabilities, and the most important indicator for predicting bankruptcy was the cash flow to liabilities ratio (Ko, Blocher, Lin, 2001, Papageorgiou, 2008, Bernhardsen, 2001) . The advantage of this analysis is its ease of application because it looks at a pointer at a time and its value compares it with a reference value, nor does it need to have a person skilled in it to have specialized statistical knowledge . The disadvantage of the univariate method is the linear correlation between indicators and the probability of bankruptcy, which is virtually not nearly the case, and the use of one index at a time is impossible to correctly interpret the situation of a business that depends on many factors at the same time. Subsequent investigations using univariate analysis were few, instead subsequent researchers used multivariate models to achieve more reliable results.

The first who more fully applied the multivariate analysis and became the basis for too many studies on the sustainability of a business was Altman in 1968. Before Altman other researchers were also engaged in the multivariate analysis first with Fisher in 1936 using the method who named Linear Discriminant Analysis (LDA), followed by Smith in 1946 with Quadratic Discriminant Analysis. The method developed by Altman was called Multiple Discriminant Analysis (MDA) in which the calculation of a company's probability of bankruptcy was based on the score obtained by the combination of five indexes. This combination was named Z-score. The ratios that he used were working capital, asset sales, earnings before taxes and interest-on-assets, equity to equity, and non-distributed gains on assets. Altman used these indicators in the analysis of 66 enterprises, which he divided into two equal groups. The results of this model in terms of bankruptcy prediction were excellent when it used the data before the bankruptcy year after correctly predicting the failure in over 90% of businesses. However, the results were not good when it was implemented more than a year before failure, where the erroneous results grew the longer the gap, reaching 4 years before bankruptcy giving 70% false information. This, in combination with the change in the International Financial Reporting Standards (IFRS) and the general accepted accounting principles (GAAP), reduced the model's ability to properly predict that, in conjunction with the fact that it was addressed to large companies alone, was the main disadvantages of model (Ko, Blocher, Lin, 2001) . The questioning of the model came from two economists of the time, Deakin and Moyer, only in terms of predictive capacity and the statistical hypothesis that was not usually the case. The theoretical framework was not disputed by anyone for this, and many later

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researchers were influenced by the Altman model such as Izan 1984 and Takahashi that same year (Spathis, 2002).

Altman himself, in 1977, together with two other researchers, Haldeman and Narayanan, developed a new, more capable and better bankruptcy prediction model, the Zeta model. This model looked at the figures of 53 companies that had gone bankrupt and 58 others who did not have bankruptcy problems between 1969 and 1975, the number of companies was equally divided between two sectors, retail and industry. Initially, the researchers chose 27 important variables, but because the number was too large, they chose through the process the 7 most important variables. In the Zeta and Z-score predictions one year before bankruptcy had almost the same success rate, their difference was seen in the predictability of two to five years before bankruptcy, here Zeta achieved 70% vs. almost 35% achieves the Z-score. In addition, Zeta's advantage was that it could be used by all businesses regardless of their size (Bellovary, Giacomino, 2007).

Another broad method of estimating the probability of bankruptcy is the linear probability model (LPM). The term linear probability model is used to denote a regression model in which the dependent variable is binary. The prices he gets are 1 and 0, 1 if the event is realized if the business continues to survive and 0 if not. This model was first used in 1970 by Meyer and Pifer to predict the bankruptcy of the banks of the time. In Greece, Grammatikos and Gloubos proceeded in 1984 to compare LPM with Altman's multivariate distinct analysis (MDA) using the same sample of enterprises. the conclusion they reached was that LPM was more reliable when it was applied for up to three years before bankruptcy in relation to MDA. (Grammatikos & Gloubos, 1984). The model shows some serious drawbacks, such as the fact that the distribution is not normal and the values should be between 0 and 1 which is not always the case. And so problems of interpretation arise. That's why its use to predict bankruptcy is limited.

Some economists to determine the sustainability of a business use the determination of breakup point. That is, the production that is necessary for the company to cover its costs. And if it is able to cover them, it is concluded that it is also sustainable. This method can be used only in the last year before bankruptcy and not earlier.

There were many methods of research that were based on the pioneers analyzed above. All methods used mathematical models that were calculated using the quantitative data that appeared in the company's financial statements. Therefore the problem of all methods was the reliability of the data of the financial statements of the enterprises.

Because of this, more and more researchers have been supporting the necessity of using and quality data over the last few years to make the prediction of sustainability higher. In 1985, Zavgren in her study concluded that models containing only econometric information did not accurately predict the sustainability of enterprises (Ko, Blocher, Lin, 2001). Zopounidis and Slowinski had the same view in 1995, claiming the need to use quality variables (Zopounidis, slowinski, 1995). Demetrios L. Papadopoulos in his research entitled "Sustainability of heavily indebted businesses" argues that profitability using EBITDA, for example, and liquidity are not sustainability factors, but a combination of many parameters and indicators is needed to assess the sustainability of a business .

2.2 FROM THE BANKRUPTCY STUDIES IN SUSTAINABILITY STUDIES

The first study, which, in contrast to empirical studies using classical financial ratios, contains other qualitative determinants is the research by Ioannis Asimakopoulos, Dionysis Lalounta and Konstantinos Syriopoulos entitled "The determinants of business survival on the Athens Stock Exchange" . This survey first put Greece in the direct assessment of the sustainability of a business rather than through bankruptcy models. The determinant variables incorporated in the econometric models of the empirical studies are selected based on the availability of the data available for them. The factors defining the variable variables are divided into two main categories, those related to the business and those related to the environment where the business operates, such as the industry.

A)   **Factors associated with the business**

The first factor is the debt burden. Researchers' views on the impact of loans on the sustainability of the business differ. Altman believes that borrowing because of tax evasion has a positive effect on the value of a business, but makes it more vulnerable to bankruptcy, as high-borrowing companies have shown a loss of market share (Altman, 1984). Whitaker, who argued that the debt burden is not a negative factor for the

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business (Whitaker, 1999), had the opposite view. Finally, there were those who believed that a company's loans were not a factor affecting its sustainability.

The second factor is the small size of a business on the market. The size is defined either on the basis of turnover or the number of employees. The majority of researchers believe that large companies are more likely to survive because they achieve better economies of scale, have better access to the money markets and more privileged terms, and have better staff (Audretsch, 2000). There are also researchers who believe that large size is a negative factor about sustainability, mainly because of the more complex hierarchy, the more complex the structure of the hierarchy, the more difficult the control of the existing ones on achieving the goals.

The third factor is corporate governance. The main problem of corporate governance is the fact that the shareholders of a company designate a management capable of achieving the goals and maximizing profits. Many times, however, management takes decisions on the basis of their own benefit and that of the shareholders. Control of the management is more difficult as the number of shareholders is greater. An effective solution is the people who make up the management to hold some of the company's shares, thus boosting incentives for profitability (Shivdasani, 1993).

The fourth and last factor is the disadvantage of young age. You connect with the time a business is active in the market. Views differ, researchers like Amburgey believe that a new entrant is disadvantaging against the oldest companies on the market. The reason is that it is very difficult to get a share of the oldest and most successful companies. The opposite view, supported by researchers such as Barron, says a new business uses new technology and makes slow and sure steps, before taking the next step is studying the market well and therefore difficult to survive. Those listed on the stock market have the ability to survive in the early years only from their original funds.

B)   Industry impact

Companies operating in a sector because they use similar production methods and use their own production factors also have the same survival chances according to Hensler. The degree of concentration of enterprises in one sector is positive for the survival of enterprises (Li, 1995), there is the opposite view from many researchers. However, there is also the view that the degree of concentration does not affect positively or negatively the survival probability (Heis, Koke, 2004). Another theory argues that the higher the rate at which new businesses enter the industry, the more difficult their survival is. This is because, in addition to competing with existing firms, a new entrant has to face the competition of the other new entrants. Consequently, the fewer companies enter the industry, the higher the chances of survival of a new business (Audretsch, 2000).

C)   Others factors

Also, a very important factor that affects sustainability is the phases of the economy. Several researchers approach the phases of the economic cycle by looking at some features of the economy, the unemployment rate, interest rates, the rate of GDP change, and so on. Based on these features in times of growth, the chances of survival are rising, but in times of recession they are declining and especially for new businesses.

Modern researchers, combining the indicators with some of the qualitative variables mentioned above, create sustainability assessment models that are quite reliable. Consequently, sustainability models differ with bankruptcy models as regards the use of qualitative variables from the former. The introduction of appropriate qualitative variables gives credibility and greater predictability. Methods combining quantitative and qualitative data are called Non-Parametric Techniques. The main methods of non-parametric techniques are neural networks, decision support systems and recursive partitioning algorithms (Ko, Blocher, and Lin, 2001; Teontor & koublis, 2012) . The application of these methods requires the use of a computer, mainly because of the difficulty of the calculations. An extensive analysis of these methods will be the subject of future research.

It is clear that in the second half of the 20th century many theories on the sustainability of businesses have been developed. the probability of bankruptcy using indexes and the inclusion of economic factors was initially examined, all estimates were based on quantitative variables exclusively. Over the years, new theories have been developed that talk directly about sustainability. These new theories, apart from quantitative variables, also take into account qualitative variables which also affect the sustainability of a business.

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3. CONCLUSION

Sustainability of business is a very important chapter of economic science because businesses are the pillar of the economy of each country. For this, many notable economists have dealt with the possibility of a company's bankruptcy by developing several models to help determine the probability of bankruptcy. The first models to predict the probability of bankruptcy use a number that they considered essential. Depending on the prices they received, the conclusions were drawn as to whether a business would be bankrupt or not. The most common indicators were net equity and net earnings to net worth. The researchers then observed that other indicators are able to predict the possibility of bankruptcy, such indicators being the general liquidity and debt ratio of a business. The reliability of the results obtained from these models was very low, so quickly emerged the need to develop new fuller models whose prediction rates would be higher. The first to find the incompetence of simple models was Tamari, who said that an index is not enough to make a proper prediction. Two years later Beaver was the first to use 30 markers in his prediction model.

The first to present an integrated multivariate model of bankruptcy prediction was Altman in 1968. To predict the possibility of bankruptcy he used the combination of five indices and depending on the score they achieved in combination, the probability of bankruptcy also emerged. The combination of these five markers was named z-score. The model was extremely successful in the possibility of bankruptcy one year before it happened, but as the period before bankruptcy increased, the more incorrect the information was. And so it did not take long to challenge many.

Altman himself, with the help of other researchers, developed a new model with better results called the zeta model. The zeta compared to the z-score a year before bankruptcy achieved the same excellent results. but his advantage was in the implementation for more than a year, where he achieved much better results. Another advantage of the zeta was that it could be applied to any business regardless of its size. There were still many models of the same philosophy that also used numerals to predict bankruptcy.

All of the above models had a basic weakness, which was that they only used quantitative variables to predict bankruptcy and no qualitative ones. The use of qualitative variables combined with quantitative increases the credibility and ability to predict sustainability rather than just bankruptcy. The qualitative data that can be added to a sustainability model is divided into two categories. In the first category are factors directly related to the business such as the debt burden, the size of the company, corporate governance and the disadvantage of the young company age . In the second category is the influence of the sector in which the company operates. These factors significantly affect the course of an enterprise and cannot be calculated through numerical figures. Enriching past models with quality data has created new, more credible business sustainability models, which have been called Non-parametric techniques. Without this, however, it means that models using only quantitative variables that have ceased to be widely used.

Which model is suitable for a business to determine its sustainability depends on many factors, the size of the business, how many years the forecast will be, the data that is accessed, and much more. For example, if someone wants to see if a business is going to be viable one year later, it can get great results from the z-score model, which is very simple to implement. But when space is growing, the use of quality data is necessary for better results.

The conclusion is that a predictive model of sustainability cannot be considered as the most appropriate. Many models are appropriate depending on the factors and data available at the time the survey is being conducted. The study of the latest and most modern models such as neurotic networks, for which the use of computer is necessary, will be the subject of a study of future research.

REFERENCES

Altman, E.I. (1984), " A further empirical investigation of the bankruptcy cost question", The journal of finance,39,4,1067-1089

Altman, E.I. (1968), "Financial ratios, discriminant analysis and the prediction of corporate bankruptcy" The journal of finance, 23,4,589-609.

Altman, E.I. Haldeman R.G. & Narayanan R. (1977), "Zeta analysis", Journal of banking and finance, 29-54.

Audretsch D.B. (2000), "Firm survival in the Netherlands", Review of industrial organization, 16, 1-11

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Beaver W. (1966), "Financial ratios as predictors of failure", Empirical research in accounting, Supplement to journal of accounting research 4, 71-111

Bellovary J. , Giacomino D. & Akers M. (2007), " A review of bankruptcy prediction studies, 1930 to present", Journal of financial education, Marquette university, vol.33

Bernhardsen E. (2001), " A model of bankruptcy prediction", Financial analysis and structure department, Working paper from Norges Bank, Oslo.

Fitzpatrick, P.J. (1932), " A comparison of the ratios of successful industrial enterprises with those of failed companies", The accountants publishing company.

Grammaticos T. & Gloubos B. (1984), " Predicting Bankruptcy of industrial firms in Greece"

Heiss F. & Koke J. (2004), "Dynamies in ownership and firm survival, Evidence from corporate Germany", European financial management, 10, 1, 167-195.

Jackendoff N. (1962), "A study of published industry financial and operating ratios", Bureau of Economic and Business Research, Temple University of Philadelphia.

Ko L. , Blocher J.E. and Lin P.P. (2001), "Prediction of corporate financial distress: an application of the composite rule induction system", The international journal of digital accounting research. Vol.1.

Li J. (1995), " Foreign entry and survival. Effects of strategic choices on performance in international markets" . Strategic management journal .

Shivdasani A. (1993), "Board composition ownership structure and takeovers" , Journal of accounting and economics 16, 167-198

Smith R.F. & Winakor A.H. (1935), " Changes in the financial structures of unsuccessful corporations", Bernau of business research, University of Illinois.

Spathis T.C. (2002), "Detecting false financial statement using published data, some evidence from Greece", Managerial Auditing Journal, vol 17, 179-191

Papageorgiou K. (2008), "Predictive models bankruptcy. Construct a regression accounting model at medical devices marketing companies"

Papadopoulos D. (2017), "Sustainability of heavily indebted business", Macedonian University, epixirisiOnline, Digital library

Teodor & Koublis (2012), "bankrupt companies in Europe and analyzing their financial situation", TEI of Crete, Accounting department.

Whitaker R.B. (1999), " Financial distress, reorganization and organizational efficiency", Journal of financial economics, 27, 419-444

Zopounidis C. & Slowinski R. (1995), "Application of the rough set approach to evaluation of bankruptcy risk", international journal of intelligent systems in accounting, Finance and Management 4, 27-41

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SOCIAL COOPERATIVE ENTERPRISES IN GREECE: THE TRANSITION FROM THE LAW 4019/2011 TO THE LAW 4430/2016. A PROCESS WITHOUT A ROAD MAP

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ABSTRACT

This article is the summarized presentation of the role, the practices and the "transformation" of the Social Cooperative Enterprises (SCEs) for Collective and Productive Purposes and the Social Cooperative Enterprises (SCEs) for Social Care, of the Law 4019/2011 of the Ministry of Labour in Greece, which were accomplished by the Social Cooperative Enterprises (SCEs) for Collective and Social Benefit, of the new Law 4430/2016. The Law 4430/2016 with the title "Social and Solidarity Economy and Development of its Entities and Other Provisions" aims firstly at establishing an integrated framework for the Social and Solidarity Economy, as a form of alternative organizing economic activities, secondly, in widespreading it to all the optional sectors of the economy and finally in supporting the productive self-managed ventures. In this paper, we analyse the characteristics of the "new form" of SCEs for Collective and Social Benefit, which also aim at the deployment of sustainable growth and/or to provide social services of general interest. Furthermore, we examine, at a theoretical level the following two factors. If the needs for the production of goods as well as the providing of services for the community, and the needs for social and welfare services for specific vulnerable and disadvantaged people, of the previous forms of SCEs (Law 4019/2016), are also covered by SCEs of the new legislative framework in force (Law 4430/2016). The objective of our work is both to study and describe the above forms of SCEs and to examine the weaknesses of the process of transition from the Law 4019/2011 to the Law 4430/2016, too. This process caused legislative, financial, administrative and other obstacles to "social entrepreneurs" of the earlier Law, while their SCEs, in most of the cases, "survived" in a severe economic environment due to the economic crisis in Greece and due to the lack of funding tools, in the previous years. Those "social entrepreneurs" had actually contributed significantly in the formulation of the new framework, because of the previous governmental experimentation (Law 4019/2011). We, also, approach the impact of those legislative changes, on the existing SCEs, and we finish our study by determining critical elements of a road map, which should have been planned, so as to accompany the transition process of the existing SCEs of the previous Law, during the implementation phase of the new Law for the Organizations of Social and Solidarity Economy (SSE).

KEYWORDS

Social and Solidarity Economy (SSE), Social Cooperative Enterprises (SCEs), Legislative Framework, Greece.

JEL CLASSIFICATION CODES

L31, O35

1. INTRODUCTION

The Law 4019/2011 of the Ministry of Labour In Greece, with title: "Social Economy, Social Entrepreneurship and other provisions», envisage the establishment and operation of Social Cooperative Enterprises (SCEs). Article 1, § 1 of the Law 4019/2011, defines Social Economy as "the sum of economic, entrepreneurial, productive and social activities, undertaken by legal entities or associations whose statutory goal is to pursue actions of collective benefit and the service of wider social interests". Article 2 § 1 of the same Law, introduced and established the new legal form "Social Cooperative Enterprise" as an entity of Social Economy which is a civil cooperative with social objective possessing commercial capacity by law.

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Moreover, Article 2, § 2, elaborates on the types of SCEs. According to their special purposes, SCEs are categorized as: (a) SCEs for Integration; (b) SCEs for Social Care; (c) SCEs for Collective and Productive Purposes (Ministry of Labour and Social Insurance, 2011).

After five (5) years of Law 4019/2011 being in force, the new Law 4430/2016 of the Ministry of Labour in Greece, with title "Social and Solidarity Economy and development of its entities and other provisions" was passed. Law 4430/2016 aims at: a) the establishment of an integrated framework for the Social and Solidarity Economy, as a form of alternative organizing of the economic activities; b) its diffusion to all optional sectors of the economy and c) the support and fostering of the productive self-managed ventures and the collaborative social entrepreneurship . Article 2, § 1 of the Law 4430/2016 defines the Social and Solidarity Economy as "the set of economic activities that are based on an alternative form of organisation of production, distribution, consumption and reinvestment, that follow the principles of democracy, human equality, solidarity, cooperation, and respect, both for man and the environment". Article 3 § 1 of the same Law, introduced the Social and Solidary Economy Entities, which are: a) the Social Cooperative Enterprises (SCEs); b) the Limited Liability Social Cooperatives; c) the Worker's Cooperatives and d) any other non-single membered legal person that covers and applies cumulative features and basic principles of the three (3) earlier mentioned types of Social and Solidary Economy Entities.[1] Furthermore, article 14, § 1, defines that the Social Cooperative Enterprises (SCEs), depending on their specific purpose, are divided into three (3) main categories: a) SCEs for Integration (divided into two subcategories: (i) the SCEs for Integration of Vulnerable Groups; and (ii) the SCEs for Integration of Special Groups of the population); b) the Limited Liability Social Cooperatives of the Law 2716/1999 of the Ministry of Health with the title: "Development and modernisation of the Mental Health Services and other provisions", (considered automatically as SCEs for Integration) and c) the SCEs for Collective and Social Benefit, which are aiming, among others, to the deployment of sustainable growth and/or to provide social services of general interest (Ministry of Labour, Social Insurance and Social Solidarity, 2016).

In this paper, we analyse the characteristics of the "new form" of SCEs for Collective and Social Benefit, which aims to the deployment of sustainable growth so as to provide social services of general interest. Moreover, we examine, first of all at a theoretical level if the needs for production of goods and the providing of services for the community, and if the needs for social and welfare services for specific vulnerable and disadvantaged people, of the previous forms of SCEs (Law 4019/2016), are all also covered by SCEs of the new legislative framework in force (Law 4430/2016). Furthermore, the objective of our work is not only to study, but also to describe the above forms of SCEs and to examine the weaknesses of the process of transition from the Law 4019/2011 to the Law 4430/2016. We finally approach the impact of those legislative changes on the existing social enterprises, and we close our study by determining critical elements of a road map that should have been planned so as to accompany the transition process of the existing social enterprises of the previous Law to the implementation phase of the new Law.

2. SOCIAL AND SOLIDARITY ECONOMY (SSE), SOCIAL COOPERATIVE ENTERPRISES (SCES) AND LEGISLATIVE FRAMEWORK CHANGES IN GREECE

2.1 Literature Review. The approach to the Social and Solidarity Economy (SSE) and the Social Enterprises in Greece

According to Nikolopoulos and Kapogiannis (2012), the Social and Solidarity Economy (SSE) is not only based on the ability of responding to unsatisfied social needs, but it also aims: firstly to local social development; secondly, to the abidance of a system of internally defined values, and thirdly, to the

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[1] They should meet the following factors, such as carrying out common good and social benefit activities in order to meet general needs or needs that are shared by their members, and conducting not only sustainable development and social services but also social inclusion activities. Besides, to be sure to provide information to their members, who are participators on the method of "one person, one vote". Furthermore, to provide the entity's statutes for limitations on profit distribution. Next, a remuneration system should be established in order the maximum net salary not to be greater than three times the minimum net salary of a 2/3 vote by the general meeting. Hence, both to strengthen its economic activities and to maximise its social profit with a producing horizontal cooperation with other SCEs. Lastly, not setting up or directed, directly or indirectly, by public law legal entities (art. 31) (European Economic and Social Committee, 2017).

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combination of using commodity resources with non-monetary ones (volunteering). It is a democratically designed economy and it is applied to the base of the society not only at local level, but also at regional level. It criticizes the economic science in particular to the extent that it separates the wealth and the monetary value. It has characteristics that are incompatible with the priorities of capitalism, while it is determined by autonomy in the construction of alternative relations of production. However, its social and solidarity purpose is linked to the sovereignty of neoliberalism in both modern politics and economic thought as a necessity of integrating the economy into society and its needs. Finally, the SSE is an economy that combines the human and ecological value with local and economic formation that aims at "socializing", "humanizing", "democratising" and "greening" the economy. An essential role is played by the individual against the capital, and it is designed and applied in that way so as to support the base of the society. That's why it is directly linked to the redefinition of the concept of wealth, with different indicators of measuring the quality of life, the well-being in life and the production of goods and services with a new social usefulness and utility.

According to Mitrosylis (2007), in the field of Social Economy in Greece, are included the following: a) Volunteering Organizations, which involve citizens' activities on a personal and social level so as to address social needs based on the principle of solidarity and in the absence of an individual profit; b) Civil Society Organizations, including all social activities developed between the family and the state, and c) mixed Organizations active in the community to support and protect vulnerable social groups and the protection of the rights of socially excluded people. In Greece, the basic legal forms of Social Economy Organizations are mainly Non-Profit Organizations (NGOs), Charity Unions, Foundations, Church Organizations, Associations, Volunteering Organizations, Networks, Citizens' Initiatives and Social Enterprises. The goals and actions of all the above Organizations in Greece (as in most countries) focus primarily on combating poverty, discrimination and social exclusion, caring for vulnerable and sensitive population groups, providing goods and services, strengthening employment and local development policies, etc. They include a wide range of social and welfare services, health care services, mental health services, feeding, clothing, housing, financial support, etc., as well as social, educational, recreational, cultural, tourist, environmental, sports and other activities (Chrysakis and others, 2002; Sakellaropoulos and Economou, 2007; Adam and Papatheodorou, 2010; Kostas 2013).

Subsequently, Mitrosylis (2007) notes that the meaning of Social Enterprise is not the same as that of the Social Economy, but it is formulated as "species to genus" in relation to the meaning of Social Economy. Social Enterprises have plenty of common elements and features but they have a lot of differences from the other Social Economy Organizations, because they are formed as a new alternative and innovative institution with the main purpose of boosting employment and supporting entrepreneurship while providing the necessary social services for citizens (Stravoskoufis and Geormas, 2013), and it is the result of initiatives taken by citizens for the benefit of community members with limited financial interests (Chrysakis et el., 2002), Moreover, they are characterized by their autonomous operation, the development of new flexible forms of employment, their competitiveness, the assumption of economic risk and their continual social and economic activity, they are managed in an "open" manner, which means that all parties participate (members, employees, etc.) and they mainly employ individuals from vulnerable and sensitive social groups in their business activities (Mitrosylis, 2007; Sakellaropoulos and Economou, 2007; European Commission, 2013; Kostas 2014).

The Social and Solidarity Economy (SSE) is an unlike model of economic development that gives special value not only to the social impact, but also to the cultivation of social solidarity and the promotion of democratic governance thesis in both European and national level. Additionally, except from the private and public sectors, there is also a third sector of the economy producing goods and services: the SSE. This sector is different from the public and the private sector because of two main characteristics. On the one hand, the activities it develops give priority in satisfying social needs rather than financial profitability, and on the other hand, these activities are developed through both collective and democratic processes in which people take part by decision-making. Nowadays, the development of SSE is in a great sense of political priority as it is shown by the international experience and it can be a life changing factor in all sectors of the economy. It does not only take in action and exploit social forces in a creative way, but it has also got stability, durability and great endurance to external conditions. Furthermore, it creates economic environments, which offer a great number of advantages to all those who are involved. Finally, it allows and assumes in advance the

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democratic and participatory planning of the overall economy, that it may be called as an economy of social needs (Ministry of Labour, Social Insurance and Social Solidarity, 2017a).

The broader SSE in Greece is a phenomenon both old and new. Its roots can be traced to a number of cases, the most important of which are the cooperative movements that have been developed over the years, even though a lot of the latest developments in this field have been rooted in recent legislation and recent political movements. This means that the sector of SSE in Greece is at a relatively early stage. There are dynamic changes, but at the same time there is a great and an immediate need for support, especially, through the development of skills, networking, financial and other policies in order to be created a condusive environment (Ministry of Labor, Social Insurance and Social Solidarity, 2017b).

2.2 Literature Review. From the Law 4019/2011 to the Law 4430/2016 of the Ministry of Labour in Greece

The first law on Social Economy was introduced in Greece in 2011 (Law 4019/2011), and it made available the first institutional framework for the development of Social Enterprises. Then, in 2016, the Law 4430/2016 was introduced that is the first law that tries to control parallelly the operation of the Social and Solidarity Economy (SSE) in the country, by redefining the field. The law aims, firstly, to the clear institutional rebuilding and the redevelopment of SSE by emphasing on the creation of collective and social benefits by the SSE entities and not on the legal form itself; secondly, to the announcement of the SSE's practices in all possible sectors of economic action; and lastly, the support of both selfmanaged productive projects, and collective Social Enterprises. With the adoption of the new Law, the Special Secretariat for SSE was established as the first discrete dedicated administrative unit in the Greek government for the sector. (Ministry of Labour, Social Insurance and Social Solidarity, 2017a).

Based on the new study of European Economic and Social Committee about recent developments of the Social Economy in the European Union, that was published in 2017, Law 4430/2016 creates firstly, the legal framework for the Social and Solidarity Economy (SSE) as an alternative form of organisation of economic activities (article 1). Secondly, it establishes measures to support the SSE (articles 4-13), and it regulates SCEs (articles 14-23) and Worker's Cooperatives (articles 24-34). The SSE is the collection of economic actions that are based on an alternative organisation of production, distribution, consumption and reinvestment relations that was founded on the principles of democracy, equality, solidarity and collaboration and on respect for the environment and for human beings (article 2 § 1). Moreover, according to the same study, SSE Entities have access to the Social Economy Fund (its aim is funding programmes and actions so as to strengthen SSE Entities, article 10 § 2) and to the National Entrepreneurship and Development Fund. They also meet the requirements for programmes in order to support entrepreneurship and local public bodies give assets not only stable but also otherwise so as to support their public and social interest activities (article 5). Finnaly, they can also sign contracts with the public authorities so as to design and carry out projects of social interest and it is possible to receive fudning from the European Union or National or Regional sources for installations, machinery, etc. (article 6) (European Economic and Social Committee, 2017).

According to the Law 4019/2011, article 2 § 2, SCEs for Social Care focus on production and provision of goods and services of social-care character, towards certain population groups such as the elderly, infants, children, disabled and chronically ill and SCEs for Collective and Productive Purposes focus on the manufacturing of products and the providing of services so as to meet the needs of collectivity (culture, environment, ecology, education, services of general interest, usage of local products, preservation of traditional activities and professions, etc.) that promote local and collective interests, as well as employment strengthening, enhancement of social cohesion, local and regional development. It should be noted that under the Law 4019/2011, article 1 § 5. "Social Care" is not only the production but also the supply of goods, as well as, health and welfare services for specific population groups, such as the elderly, the infants, the children, the disabled, those people with chronic diseases etc. According to the article 1 § 2 of the same Law, "Collective Purpose" is the promotion of collective actions and the protection of the collective goods through development of economic and social initiatives of a local, regional or wider nature. Such actions include cultural, environmental, ecological activities, the utilization and promotion of local products, and the provision of social services (Ministry of Labor and Social Insurance, 2011).

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On the other hand, the new form of SCEs for Collective and Social Benefit, of the new Law 4430/2016 replaced the two (2) above mentioned types of SCEs in Greece.[2] According to the Law 4430/2016, article 14 § 2, SCEs for Collective and Social Benefit aim, among others, to the deployment of sustainable growth and/or to offer social services of general interest. It is noted that according to the Law 4430/2016, article 2 § 2, "Collective Benefit" is defined as the joint service of the needs of the members of the SSE Organization, through the establishment of equal relations of production, the creation of positions of stable and decent work, the reconciliation of personal, family and professional life, and article 2 § 3 "Social Benefit" is defined as serving social needs of local or wider nature by developing social innovation, through "sustainable growth" or "social services of general interest" or social inclusion activities.

In addition, on the basis of Article 2 § 5 of the Law 4430/2016, "Sustainable Development" defines the economic activities, commercial or exchange, which promote environmental sustainability, social and economic equality, as well as gender equality, protect and develop common goods and promote intergenerational and multicultural reconciliation, emphasizing the peculiarities of local communities and according to the article 2 § 6 "Social Services of General Interest" are defined as services accessible to all, which promote the quality of life and provide social protection to groups such as the elderly, infants, children, people with disabilities and chronic diseases, and include education, health, social housing, social nutrition, childcare, long-term care and social assistance services, without, however, replacing the State's general obligations to pursue social policy (Ministry of Labor, Social Insurance and Social Solidarity, 2016).

Accordingly, from the institutional and legal point of view, the elements, the characteristics and the objectives of SCEs for Collective and Productive Purposes and SCEs for Social Care of Law 4019/2011 of the Ministry of Labour and Social Insurance, incorporated, maintained, secured and promoted to the SCEs for Collective and Social Benefit of the new Law 4430/2016 of the Ministry of Labour, Social Insurance and Social Solidarity.

So, theoretically, the needs for both producing goods and providing services for the community, as well as the needs for social and welfare services not only for specific vulnerable people, but also for disadvantaged ones based on the previous forms (Law 4019/2011) are also covered by the new legislative framework in force (Law 4430/2016). As we will see in the next part, there were many weaknesses, barriers and difficulties during the process of transition from the Law 4019/2011 to the Law 4430/2016 that caused legislative, financial, administrative and other obstacles to the "social entrepreneurs" of the SCEs of the earlier Law, which, in most of the cases, "survived" in a severe economic environment due to the economic crisis in Greece and due to lack of funding tools in the previous years.

2.3 The transition from Law 4019/2011 to Law 4430/2016: Approach to the problems

The pass of the Law 4019/2011 was a mature necessity incorporating the first holistic approach to the establishment of the Social Cooperative Enterprises (SCEs).

Following the brief description of Law 4019/2011 above, according to Kostas (2016) and Kostas et. all (2017), the experience of establishing and operating the three (3) types of SCEs of the Law 4019/2011 in Greece and especially of the SCEs for Collective and Productive Purposes has recorded many problems that are obstacles for their viable and effective operation. Those problems are summarized as following: Their financial situation is weak. There is incompetence so as to locate (financial) resources for their development, because of lack of funding, and the limited number of social investors in Greece. Another serious problem is both the absence of direct funding programmes, and the non-absorption of the funds for Social Entrepreneurship, available through the Greek NSRF. There was also a misguided funding use for employment through initiatives co-funded by the Greek NSRF 2007-2013 that did not lead in the expected results. It shouldn't be forgetren that the activation of the Social Economy Fund which had had a specific budget for social cooperatives enterprises since 2012, was never activated, not even to provide incentives to the SCEs for acquiring technical equipment or setting infrastructure for their appropriate and smooth

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[2] With the set in force of the new Law 4430/2016 (article 35 § 2), the SCEs for Social Care and the SCEs for Collective and Productive Purposes was given the possibility to be converted into SCEs for Collective and Social Benefit or to Worker's Cooperatives, following the decision of their General Assemby, and modificating their statutes that it is sent to the Registry Office.

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operations. Also, the bureaucratic burdens and the low rate of specialisation, as well as, the lack of knowledge about the institutions of social cooperatives enterprises at the responsible public servants in certain agencies, such as the tax authorities had negative impact on the development of the SCEs. Moreover, there was a lack of sufficient legislation not only for the institutional and taxation protection, but also for the support of social cooperatives enterprises. It should not be underestimated that there was limited cooperation with other entities, either public or private and the fragmented planning of direct strategic interventions for social cooperatives enterprises that should have corresponded to the current unstable financial conditions. There is a great deal of absence of analysing the factors of the success, and the holistic approach of implementation of their development plan. There is also an absence of not only evaluating their operational tools, but also those of measuring the social impact of the activities of the SCEs. The shortfall of skilled staff for their management and administration, as well as, the limited number of volunteers due to the nature of their operation and the low rate of sensitization of the local societies should be also mentioned, because the existing mentality is not in favour of rising creativity. There is also an absence of a comprehensive approach of Social Economy and Social Entrepreneurship at the secondary and tertiary education, and non-existent actions for informing, training and counselling in Social Economy and Social Entrepreneurship. Moreover, there is a great absence of an appropriate environment or conditions for their network with other Social Economy Organisations, and their competition with other companies of the private sector is too limited. Finally, the delay in establishing an institutional observatory and the appropriate regional support structures for Social Entrepreneurship, the "hesitation" of the state to create actual conditions for their development, the consequent cancellation of the lenient taxation approach, etc. are as some of the major problems that the SCEs faced.

So, to categorize the above, the basic parameters of legislative, financial, administrative and other barriers and problems of the Law 4019/2011 for the SCEs, were the following: Firstly, institutional issues that led to serious gaps in the day-to-day relationship of SCEs with state bodies as their legal status was not clear for those bodies. Secondly, tax issues as there was no favorable tax approach for the creation of a reserve, and its disposal for social purpose and for keeping the relevant accounting books. Thirdly, job issues related to the legal work of members / employees, the possibility of recruiting staff from SCEs, as well as, the obligation of a compensated employment that created several practical and operational problems. Fourthly, financial issues as long as SCEs expect to benefit from the financial support and development tools (by the Social Economy Fund), which was provisioned to be set since 2011. Besides that, issues with the establishment of the Regional Support Mechanisms for supervision, guidance, control, counselling, mentoring, distribution of funding, training of social entrepreneurs (but with certified trainers from the relevant departments of the Ministry of Labor) etc. were also faced. Fifthly, bureaucracy issues such as the outdated, time-consuming and cost-intensive mail exchanging with the Ministry of Labor – Registry of Social Economy versus the use of electronic register. Last but not least, relationships issues with Local Authorities (OTAs) because the relationship of SCEs with OTAs was unfortunately initially tarnished due to some problematic program contracts between some Municipal Administrations and the SCEs that were controlled by them.

Additionally, following the brief presentation of the Law 4430/2016 above, although at an institutional level, both the main features and the main purposes of the SCEs for Collective and Productive Purposes and SCEs for Social Care of Law 4019/2011 are respected by the SCEs for Collective and Social Benefit of the new Law 4430/2016. The key points of the new Law 4430/2016 that are related to our hypothesis, that is the changes of the practices and the operation of the SCEs for Collective and Social Benefit of the new Law 4430/2016, and the modifications in order to resolve the problems, the ambiguities and the gaps of the Law 4019/2011 as indicated above, are the following: First, the term "Social Economy" (articles 1 and 2) is broadened to the term "Social and Solidary Economy" and the legal form of SSE entities is separated from the SCE exclusively (article 3) because an SSE entity may be SCEs or Limited Liability Social Cooperatives of the Law 2716/1999 or Worker's Cooperatives (article 24) or any other non-single membered legal entity (e.g. Agricultural Cooperative, Urban Cooperative, Urban Non-Profit Company, etc.) if the terms of Article 3 (4) are cumulative. Second, the profits of the SCEσ are not distributed to the members unless they are their employees. The profits are annually distributed by percentage: (i) 5% is kept for the formation of a reserve, (ii) 35% is distributed to the employees of the undertaking, unless 2/3 of the members reasonably decides to make available the activities referred to in point iii, (iii) the balance (60%) is allocated to the creation of new jobs and the general expansion of their productive activity. Third, the SSE Entity is obliged, from the second fiscal year of its operation to present an annual salary charge equal to at least 25% of its previous turnover,

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provided that the previous annual use was greater than 300% of the annual cost of wage costs of a full-time employee (article 3 § 4). Forth, they have a Volunteer Registry, in which non-members are registered, who act as volunteers and support the actions of the Entity (article 3 § 3). Fifth, the SSE General Registry is the database that is now kept in an electronic form by the Registry Department, in which the SSE Entities (article 4) are registered. Sixth, the Local and Regional Authorities may be granted, by decision of their governing body, the use of movable and immovable property in SSE Entities for the purpose of enhancing activities of collective and social utility (article 5 § 3). Seventh, the SSE entities may conclude programme contracts with public policy holders or public sector bodies under the conditions set out in Article 6, for the study and execution of projects and programs of social benefit which are related to their statutory purposes. Eighth, a "Social Economy Fund" is proposed, the purpose of which is to finance programs and actions to support the growth of SSE. Ninth, the SCEs were and remain the urban cooperatives of Law 1667/1986, which have as their constitutional purpose the collective and social benefits and have a statutory commercial status (Article 2 § 3 and § 4). Tenth, the number of non-members employees may not exceed 40% of all SCE employees. Eleventh, the rate of gross revenue from the activities of SCEs originating from public law legal entities and local authorities may not exceed 65% of the total enterprise's revenue, calculated on a three-year basis (SCEs for Intergration are excluded from this provision) (article 14). Twelfth, for the corporate liabilities, only the SCE is responsible with its assets. In particular, as regards the liabilities to the State, the administrator or the chairman of its management committee is jointly and severally liable with the SCE for the debts to the State and maintains a right of recourse against the other members of the SCE, who for those debts are liable to the unlimited and joint venture.

The new Law 4430/2016, was of great importance for the ecosystem of Social and Solidarity Economy (SSE) in Greece, as it complemented and upgraded the previous Law 4019/2011, regarding several administrative and financial issues of the SCEs while it also incorporated other legal entities of SSE that were not provisioned earlier, although they were active in the sector of Social Economy and Social Entrepreneurship.

From all the above, it is concluded that although some of the institutional problems, obstacles and the legal "gaps" in the Law 4019/2011 have been corrected, modified and resolved, according to the claims of the "social entrepreneurs", ther are few more. So, in our opinion, the weaknesses of the transition process from the Law 4019/2011 to the Law 4430/2016 caused legislative, financial, administrative and other barriers to the "social entrepreneurs" of the earlier law (4019/2011). Thus, especially for the SCEs of the earlier Legislative Framework, the transition was a process without a road map.

According to the Social Entrepreunership Forum (2016), the problems of the Law 4430/2016 were mainly categorised in the following categories. First of all, it excludes categories of legal entities even though they are internationally regarded as SSE entities. Secondly, by adopting a fearful perception against the ability of ventures to self-regulate, it controls in detail many aspects of SSE operations, and in that way unfortunately, more exclusions are created. Thirdly, either there are many ambiguities at specific points or it concludes problematic ordinances about the operation of the SSE. Finally, the timing and the duration of the consultation did not allow the integration of the European and the international experience in the process (CECOP-CICOPA, ILO, etc.), as well as, the positions of the Social Entrepreunership Forum.

Moreover, based on the announcement of the CICOPA-CECOP (2017)[3], for the Social and Solidarity Economy Law (4430/2016), the law presents significant weaknesses such as: the lack of definition of the workers' cooperative and the social cooperative; the fact that the Cooperative Authorities are not mentioned, as well as the confusion on different levels of legislation (Social Economy in general, cooperatives of workers and Social Cooperatives in particular); the exclusion from the field of application of the Social Economy of a series of cooperatives and SCEs that do not comply with very specific criteria, etc., and at the same time as stated by Papageorgiou (2017), they can not be considered institutions of SSE, the Agricultural Cooperatives, nor the Urban Cooperatives. It should be clarified that those entities that are cooperative, must follow the Global Cooperative Principles and different terms to be used for those who do not.

Furthermore, the provisions of the new Law 4430/2016 create specific problems and ambiguities mainly for SCEs such as the following: The different types that are part of the core of the SSE essentially and formally such as Foundations and traditional Cooperatives that seek the collectiveness of the members, and not the social benefit with the rigorous interpretation given by the law are excluded. Besides, the specific quotas in the distribution of profits remove from the SSE ventures the possibility of enhancing financially other ventures so as to create financing tools that will support their self-organization, the training or any joint

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investments. Furthermore, the payroll provision sets unsustainable problems of viability as it neither takes into account the wide variety of entities and goals, nor it takes into consideration the small profit margins in some ventures in relation to the turnover they achieve. It obliges independent job creation from the activity of production and its goals, because no upper limit is prescribed. It causes a loss-making operation, because the costs of the year before, are not counted, and it excludes the project contracts from operating costs, although it is not only allowed in other types of businesses but it is also counted. Finally, another problem is that the central state sets restrictions on how a social enterprise should be developed (Social Entrepreunership Forum, 2016).

In particular, changes to SCEs for Collective and Social Benefit mainly raise the following five (5) issues: Firstly, it is clearly stated that the administrator or the chairman of the board of directors is fully responsible for the SCE's debts to the state and disincentives are created for taking up the position. Secondly, the law defines that working non-members may not exceed 40% of the total employees, because it violates one of the SSE's basic principles for free and delibarate choice of participation. Of course, there are cases that the employees do not wish to join as members in order not to share obligations and responsibilities. Thirdly, the members' working relationship is defined in absolute terms (compulsory employment relationship) by excluding the award of a contract, but there are also cases that the SCE can not ensure employment to a member. Forthly, there is an upper limit on volunteering job, that can be offered by the members, and that must be done by signing contracts, disclosure of the type of the service, and the Ministry by a Ministerial Decision determines the special terms under which the relevant services are provided and any other relevant issue. Finally, the restriction on the financing of an SCE by Public Bodies and local authorities up to 65% of the company's total revenue calculated on a three-year basis may create problems in SCEs for Collective and Social Benefit that provide services such as social care (occupational therapy, speech therapy, etc.), and receive income from the social security funds (Public Bodies) (Social Entrepreunership Forum, 2016). In the latest case, contracts in real economy, such as social care, are treated as subsidies or state aid, which is completely untrue.

3. CONCLUSION

According to the Report of the British Council on the Social and Solidarity Economy in Greece, there is great potential for developing and expanding the impact of SSE in Greece. The SSE Organisations theoretically, help address some of the most important challenges in the country. In particular poverty and unemployment,while at the same time they seek in promoting and presenting alternative business models which incorporate the social benefit into economic activity. SSE in Greece is currently underdeveloped compared to other European countries with the majority of the SSE operators to be small in size and recently set up, while at the same time they face extremely difficult economic conditions relatively to the beginning of their start up activities. At the same time, the current adverse economic and social situation in Greece is considered by the SSEs as a reason to steghthen, in order to create new opportunities, to tackle unemployment and to introduce new economic and business models in areas where conventional models have failed. Based on the findings, the report finishes with a summary of the challenges and the recommendations for the development of the SSE sector in Greece, with an outline based on an approach for setting an effective, and favorable environment. These focus on four (4) key areas: a) sensitisation and promotion; b) financing and funding; c) training and education, and d) legislation and regulations. The key suggestions include the following: the establishment of a national center for SSE in Greece; the planning and the implementation of a holistic communication strategy, as well as, sensitization in order to promote the SSE movement; providing start-up capital in the form of grants or loans, in order to emerge the SSE enterprises; the establishment of a Social Action Group for finding alternative forms of financing; introducing and adapting tested models of specialised training programs; and lastly, providing specialised training for measuring the social impact (Ministry of Labour, Social Insurance and Social Solidarity, 2017b).

We close our study with remarks and we determine critical elements of a road map (Fig. 1) that should have been planned and accompany the transition process of the existing SCEs of the previous Law to the implementation part of the new Law for the Social and Solidarity Economy Entities and especially for the SCEs for Collective and Social Benefit.

Therefore, a Diagnostic Mechanism / Market Research for Products and Social Services should be created, for analyzing the market gaps and needs that could be filled in and the opportunities that could be

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exploited by existing and new SCEs or by SSE Entities. Secondly, the need for Educational and Training programmes for basic business and development issues through a certified SSE trained team appointed by the Ministry of Labour for: 1) existing SCEs, 2) new SCEs, and 3) employees of public and private bodies who will be able to manage funding or will be able to support social economy ventures should be realised as a prerequisite. Thirdly, a funding scheme, namely the Social Economy Fund linked to Regional Operational Programmes (NSRF 2014-2020) should be deployed with SCEs being eligible entities in that and other relevant European funding programs. Fourth, Establishment and set in operation of the pending Regional Support Centres to act as incubators or support incubators, in which training services for development, mentoring for their establishment and operation, as well as, services for start ups and their operation would be provided. Fifth, information and awareness activities for the citizens and stakeholders, by using the appropriate communication channels to stimulate and promote the concept of SSE. Sixth, networking activities for SCEs to enhance the public dialogue and cooperation of SCEs with the public and private sector to achieve the general objective for local development and Seventh, Cooperation, network and echange of good practices, know-how and tools for social added value.

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Figure 1: Indicative Road Map for Transition from Law 4019/2011 to Law 4430/2016 for SCEs.

INDICATIVE DIAGRAMME
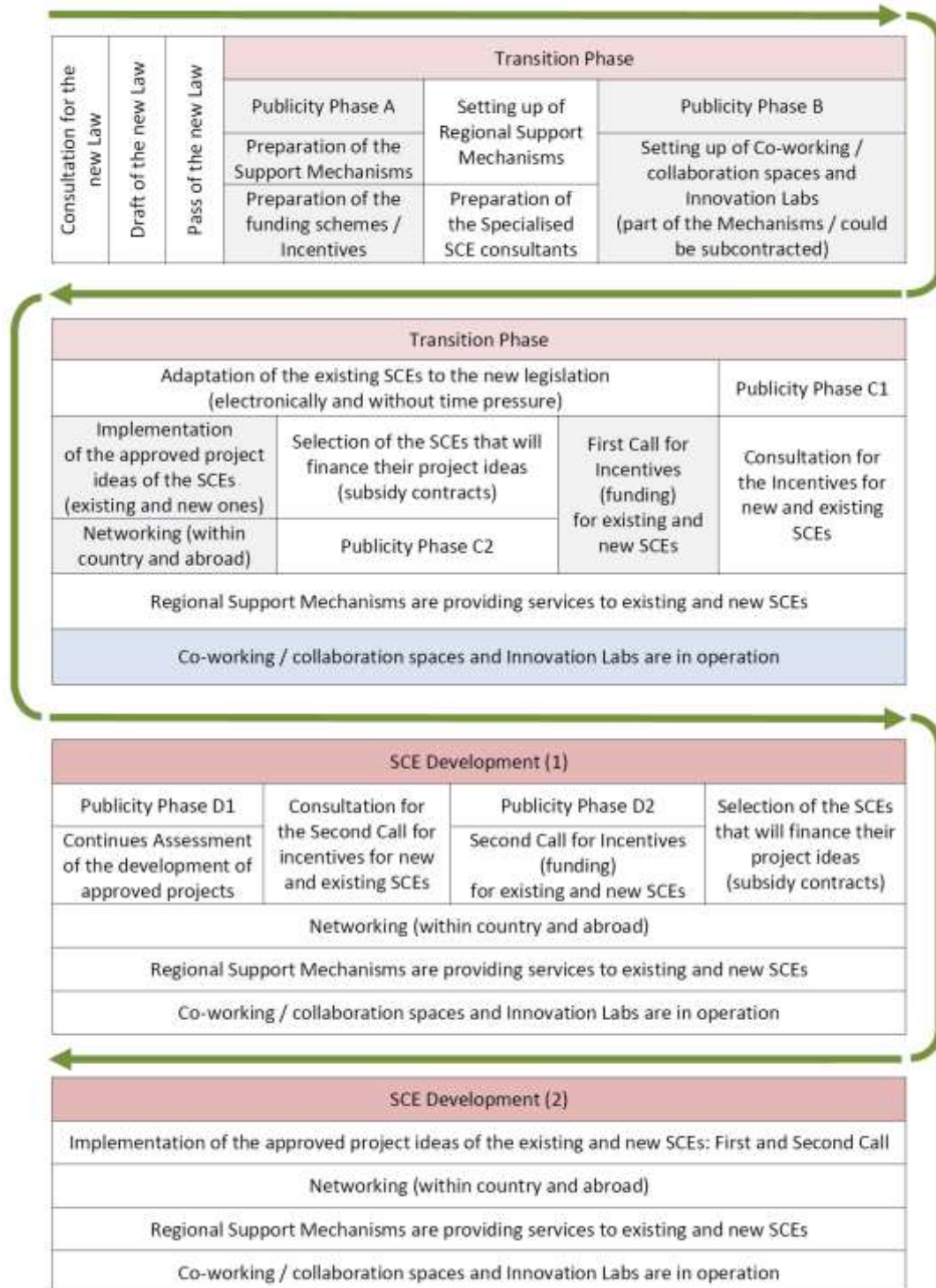OF A ROAD MAP FOR TRANSITION FROM LAW 4019/2011 TO LAW 4430/2016 FOR SCEs

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REFERENCES

Adam S. and Papatheodorou C., 2010. *Social economy and social exclusion: A critical approach*, Studies/8, Observatory on Economic and Social Developments, Labour Institute, Greek General Confederation of Labour, INE-GSEE, Athens.

European Commission, 2013. *Social economy and social entrepreneurship*, Social Europe guide, Volume 4, Luxembourg, Directorate-General for Employment, Social Affairs and Inclusion.

European Commission, 2014. *A map of social enterprises and their eco-systems in Europe. Country Report: Greece*. EC, Brussels.

European Economic and Social Committee, 2017. *Recent evolutions of the Social Economy in the European Union,* CIRIEC, https://www.eesc.europa.eu/en/our-work/publications-other-work/publications/recent-evolutions-social economy-study. Accessed 30 March 2018.

Chrisakis M., Ziomas D., Karamitropoulou D., Chatzantonis D., 2002. *Employment prospects in the field of Social Economy*, National Labour Institute, Sakkoulas publications, Athens.

CICOPA and CECOP, 2017. Announcement of CICOPA-CECOP for the Law for the Social and Solidarity Economy, *Social Economy*, Vol. 11, January-March 2017, Institute for Research and Studies on the Cooperatives, pp. 287.

Geormas, K., 2013. Social Economy in Europe. Definitions, Experience and Perspectives, in: K. Geormas (Ed.), *Social Economy. Theory, Experience and Perspectives*, Enallaktikes Ekdoseis, Athens, pp. 13-44.

Karavaggeli and Lepidas, 2015. "Proposals for reforming the institutional framework for the Social Economy to the Ministry of Labour- Department of Registry of Social Economy", Thra.Ki. SCE, Komotini.

Kostas, A., 2013, Social Economy Organizations and Social Enterprises in Greece, in: K. Geormas (Ed.), *Social Economy. Theory, Experience and Perspectives*, Enallaktikes Ekdoseis, Athens, pp. 83-100.

Kostas, A., 2014. Social Economy and Social Entrepreneurship in Greece. Their contribution in enhancement of employment, local development and the role of European Institutions: The case of Municipality of Kavala. PhD Thessis. Panteion University, Athens.

Kostas. A., 2016. Research: The Importance and the Role of Social Economy Organizations and Social Cooperative Enterprises in Greece. A case study in the district of Kavala, *Scientific Journal "Social Cohesion and Development"*, Vol. 11, Issue 2, pp. 171-174.

Kostas, A., Tsoukalidis, I., Karasavvoglou, G. A., Polychronidou, P., Tsourgiannis, L., 2017. "The barriers for the development of the Social Cooperative Enterprises in Greece", in: Karasavvoglou, A., Goić, S., Polychronidou, P., Delias, P. (Eds.), *Economy, Finance and Business in Southeastern and Central Europe, Proceedings of the 8th International Conference on the Economies of the Balkan and Eastern European Countries in the Changing World (EBEEC), Split, Croatia, 2016*, Springer Proceedings in Business and Economics, pp. 513-522.

Ministry of Labour and Social Insurance, 2011. Law 4019/2011 "Social Economy and Social Entrepreneurship and Other Provisions". http://www.ypakp.gr. Accessed 1 March 2016.

Ministry of Labour, Social Insurance and Social Solidarity, 2016. Law 4430/2016 "Social and Solidarity Economy and Development of its Entities and Other Provisions", http://www.ypakp.gr. Accessed 19 January 2018.

Ministry of Labour, Social Insurance and Social Solidarity, 2017a. *Annual report 2017 & Action Plan for the Development of the Ecosystem of Social and Solidarity Economy 2017-2023*, Special Secretariat for Social and Solidarity Economy, Ministry of Labour, Social Insurance and Social Solidarity. http://www.ypakp.gr. Accessed 25 January 2018.

Ministry of Labour, Social Insurance and Social Solidarity, 2017b. *Greece Social and Solidarity Economy Report*, British Council, Athens.

Mitrosili M., 2007. *Study of the institutional and legal framework in the field of Social - Solidarity Economy*, Institute of Social Policy, National Center for Social Research, Athens.

Nikolopoulos T. and Kapogiannis D., 2012. *Introduction to Social and Solidarity Economy.The step-by-step of an opportunity*, The co-editors' publications, Athens.

Papageorgiou, K., 2017. Results due to rush of confusion?, *Social Economy*, Vol. 11, January-March 2017, Institute for Research and Studies on the Cooperatives, pp. 290-291.

Sakellaropoulos, Th. and Economou, Ch., 2007. *Aimed Studies for development of Social Entrepreneurship. Developmental Consortium "Social Entrepreneurship"*, EU Initiative EQUAL, Research Centre of Economic and Social Researches, Panteion University, Athens.

Social Entrepreunership Forum, 2016. "Contribution to the configuration of the common positions regarding to the Law 4430/2016" http://seforum.gr/wp-content/uploads/2017/06/BEL_145x210.pdf. Accessed 30 March 2018.

Stravoskoufis, Th and Geormas, K., 2013. Social Economy and Social Entrepreunership, in: K. Geormas (Ed.), *Social Economy. Theory, Experience and Perspectives*, Enallaktikes Ekdoseis, Athens, pp. 137-160.

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TOTAL QUALITY MANAGEMENT IN GREEK TERTIARY EDUCATIONAL SYSTEM

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ABSTRACT

This work explores the assurance of the principles of Total quality management in Tertiary Education. In addition, the possibility of changing the culture of quality, working culture and readiness acceptance is explored. The instrument EFQM scale was used. 230 Greek students/ pre-service teachers from 4 Faculties of Primary Education were participated in the study.

KEYWORDS

Total, quality management, Greek, Tertiary, Educational System

1. THEORETICAL FRAMEWORK

The adoption and implementation of the Principles of Total Quality Management (TQM) is affirmed by the Quality Awards. Amongst the most prestigious Quality Awards are the Malcolm Baldrige National Quality Award (MBNQA), the Deming Award, and the European Quality Award, the EFQM Excellence Model.

Seeing the positive impact of Quality Models in Japan with the Deming Award and in the USA with the Malcolm Baldrige National Quality Award (MBNQA), the European Union established the European Foundation for Quality Management, EFQM. The key objective of the Foundation is to promote the Principles of Total Quality Management (Calvo-Mora et al., 2006). The European Foundation for Quality Management in collaboration with the European Commission established, in 1990, the European Foundation for Quality Management (EFQM) Award, which is a distinguished Quality Award. The Model and the Award share the same name (EFQM). The purpose of the EFQM Excellence Model (EFQM) is to increase the competitiveness of businesses and organizations in the global market (Porter & Tanner, 2004). Parallel to this it may also function as a self-assessment and comparison tool for businesses (Campatelli, et al., 2011, Davies, 2008).

EFQM rests on nine criteria for evaluating an enterprise. The first five of these, Leadership, People, Strategy, Partnerships & Resources and Processes constitute the Enablers. The next four criteria, the People Results, Customer Results, Society Results and Business Results constitute the Results. The EFQM Excellence Model (EFQM) is presented in Figure 1 (Figure 1**:** EFQM).

Figure 1**:** EFQM
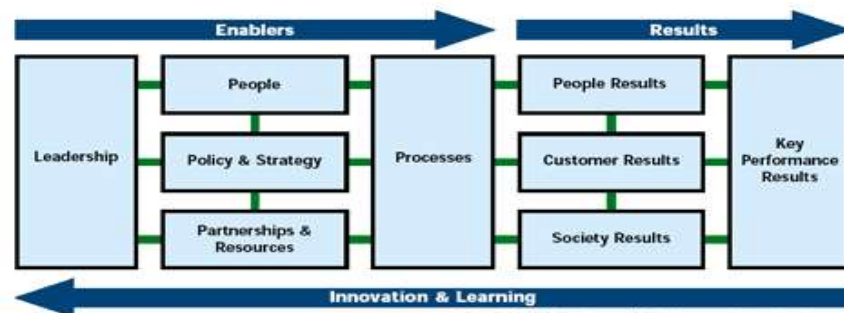
Source: https://blogs.warwick.ac.uk/yixiang/entry/efqm_vs_iso/

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Kim et al. (2010) claimed that the EFQM Excellence Model essentially emphasizes the balance between the five criteria which constitute the Enablers and the four that comprise the Results.

Tari (2006) suggested that the EFQM Excellence Model is a self-assessment tool, while Castka el al. (2003) view it as a comparative assessment one. Conti (2007) stresses that innovation is a sufficient and necessary parameter of the EFQM Excellence Model (EFQM), in order to attain Quality Management and Continuous Improvement. In what follows the five Enabler criteria that relate to this survey will be presented.

Criterion 1- Leadership: Leadership is a key factor that shapes and determines the procedures and practices applied in the educational organization. Leadership poses the objectives, provides the vision and shapes the course and the future of the organization, attend to and promotes Continuous Improvement, the establishment of a Quality culture and the attainment of Operational Excellence.

Criterion 2 - People: The needs for education and training of the staff and the Continuous Improvement of its skills and dexterities are acknowledged by this criterion, its ultimate objective being the maximization of the staff's loyalty to the organization. It requires and encourages the involvement of all employees in improvement actions, encourages communication with Leadership and rewards the efforts made while also attending to possible social benefits for the educators and trainers.

Criterion 3- Policy and Strategy of the Organization: This criterion assesses the degree by which the organization's Policy and Strategy conforms with its vision, values and mission and are clearly articulated by means of a strategic plan which is closely tied to the Quality Principles and takes account of both the needs as well as the expectations of Human Resources.

Criterion 4 – Partnerships & Resources: The healthy and constructive collaboration with suppliers, inventory and energy management, the use and evaluation of the effects of technology on the organization are some of the issues examined in the fourth criterion.

Criterion 5 - Processes: This criterion distinguishes Processes to Educational, Research and Administrative. Educational Processes refer to the teaching activity / teaching and to the degree such reflects the needs and expectations of students, the organizations themselves and society as a whole. Research Processes regard the research activity realized in the context of the organization and the degree it reciprocates the needs and expectations of students, the organizations themselves and society. Finally, Administrative Processes refer to the existence of the documents where such are recorded and analysed.

2. THE RESEARCH INSTRUMENT

The instrument EFQM scale, which intended to measure quality in tertiary education, includes 72 items. The first named category "enablers" entails the sub categories named Leadership with 7 items (eg. The school leader informs the mission, vision and values of the school to all levels of the staff.), Policy & Strategy with 10 items (eg. The organization's policies and strategies are clearly formulated in writing), People with 8 items (eg. HRM develops training plans for the improvement of the staff's knowledge, competencies and skills), Partnerships and Resources with 8 items (eg. Successful partnerships are founded with suppliers to generate value and mutual benefits), Educational Processes with 3 items (eg. The teaching process corresponds to students' needs and expectations), Research processes with 3 items (eg. The research process corresponds to students' needs and expectations), and finally Administrative processes with7 items (Responsibilities are allocated for the periodic monitoring and review of the processes).

The second category named «results» entails the sub categories called Students results with 5 items (eg. The satisfaction of students has improved), Educators results with 3items (eg. The dedication of teachers has increased). Educators' Achievements with 3 items (eg Educators recognize the problems and suggest useful solutions). Educators' satisfaction with 7 items (e.g. The satisfaction of educators have increased). Society results with 4 (eg. The school contributes to environmental protection). General results with 2 items (eg. The success of students has increased). Teaching results (performance) with 2 items (eg. The effectiveness of teaching process has improved). For each item of the instrument a 5-point Likert scale was used that ranged from 1- Strongly Disagree to 5- Strongly Agree. In the present paper only the second category is going to be analysed.

3. RESEARCH SAMPLE

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The research sample consisted of 230 Greek students/ pre-service teachers from 4 Faculties of Primary Education. 156 were females and 74 females. From the 230 students, 57 were first, 68 second, 64 third and 41 fourth year students.

4. DATA ANALYSIS METHODOLOGY

Implicative Statistical Analysis: It is a data analysis devoted to the extraction and the structuration of quasi-implications and was originally developed by Gras (Gras & Kuntz, 2008). According to Coutourier (2008) Implicative Statistical Analysis establishes the following properties between the variables it handles: 1. the relationship between variables that are dys-symmetrical, 2.the association (wording) of measures that are not linear and are based on probabilities, and 3. the user's possibility to use graphical representations that follows the semantic of the relationship. For the analysis of the collected data of this research, the Hierarchical Clustering of Variables and Gras' Implicative Statistical Analysis method was conducted using a computer software called C.H.I.C. (Classification Hiérarchique, Implicative et Cohésitive) (Bodin et al., 2000). For the needs of the present study, Similarity, Hierarchical and Implicative diagram have been released by the application of C.H.I.C. software on the research data (Bodin et al., 2000). C.H.I.C. given a set of data enables the extraction of association rules. Based on the implication intensity and the similarity intensity, C.H.I.C. allows the building of two trees and one graph (Coutourier & Gras, 2005; Coutourier, 2008). The most classical tree is a similarity tree that is based on the similarity index defined by Lerman (1981) and it does not provide a non-oriented classification.

5. RESEARCH GOALS

For this reason and more specifically, for the examination of the importance of each possible and feasible/latent relationship that can be investigated in this model, the following 10 hypotheses are examined:

Ho1: All the factors are related with each other affecting in the same way that Greek primary and secondary' responses in the EFQM scale and constitute a sole and unique factor.

Ho2. Leadership, has a direct effect on the Policy & Strategy factor.

Ho3. Leadership has a direct effect on the People factor.

Ho4. Leadership has a direct effect on Partnerships and Resources factor,

Ho5. Policy & Strategy has a direct effect on the People factor.

Ho6. Policy & Strategy has a direct effect on the Partnerships and Resources factor.

Ho7. Policy & Strategy has a direct effect on the Processes.

Ho8. People factor has a direct effect on the Partnerships and Resources factor.

H9. People factor has a direct effect on the Processes factor.

Ho10. Partnerships and Resources have a direct effect on the Processes factor.

6. RESULTS-IMPLICATIVE STATISTICAL ANALYSIS OF THE EFQM SCALE

Observations in the Similarity diagram: In the similarity (Diagram 1: Similarity Diagram) the items groupings are presented based on the teachers' answers, concerning the instrument EFQM scale. The similarities are significant in a level of 99%. Based on the specific diagram we can make the following observations: In the similarity diagram (Diagram 1: Similarity diagram) two distinct similarity subgroups are distinguished (Subgroup a, Subgroup B).

The first subgroup A refers relations among the factors LEADERSHIP and POLICY_STRATEGY (Subgroup A). In particular, the stronger similarity in this subgroup is between the factors LEADERSHIP and POLICY_STRATEGY (Classification au niveau : 2 : (LEADERSHIP POLICY_STRATEGY) similarite : 0.922104).

Diagram 1: Similarity Diagram

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Arbre des similarites : C:\Users\Drasi5_PC7\Desktop\DRASI B IMPLICATIVE ggg.csv

The second similarity subgroup refers to similarity relations among the factors ((PEOPLE PARTHERSHIPRES) PROCESSES).

This similarity of the second group factors shows that teachers deal with factors PEOPLE, PARTHERSHIPRES and PROCESSES in the same way. More specifically, the stronger similarity in this subgroup is between factors PEOPLE and PARTHERSHIPRES (Classification au niveau : 1 : (PEOPLE PARTHERSHIPRES) similarite : 0.947639). the similarity of the second group factors is also significant (Classification au niveau : 3 : ((PEOPLE PARTHERSHIPRES) PROCESSES) similarite : 0.88211).

Significant is the similarity of all factors of the two groups A and B, LEADERSHIP POLICY_STRATEGY) ((PEOPLE PARTHERSHIPRES) PROCESSES (Classification au niveau: 4 : ((LEADERSHIP POLICY_STRATEGY) ((PEOPLE PARTHERSHIPRES) PROCESSES)) similarite : 0.622498).

From the similarity diagram (Diagram 1) it becomes obvious that all the factors, LEADERSHIP, POLICY_STRATEGY, PEOPLE, PARTHERSHIPRES AND PROCESSES of the EFQM scale are related with each other.

Consequently, the null hypothesis Ho_1, which claims that all factors are correlated affecting similarly the response of the teachers examined in the EFQM scale and form one unique factor is verified.

The null hypothesis Ho2, which supports that, Leadership has a direct effect on the Policy & Strategy factor, is verified.

The null hypothesis Ho3, which supports that, Leadership has a direct effect on the People factor, is verified.

The null hypothesis Ho4, which supports that, Leadership has a direct effect on Partnerships and Resources factor, is verified.

The null hypothesis Ho5, Policy & Strategy has a direct effect on the People factor, is verified.

The null hypothesis Ho6, Policy & Strategy has a direct effect on the Partnerships and Resources factor, is verified.

The null hypothesis Ho7, Policy & Strategy has a direct effect on the Processes, factor, is verified.

The null hypothesis Ho8, People factor has a direct effect on the Partnerships and Resources factor, is verified.

The null hypothesis Ho9, People factor has a direct effect on the Processes factor, is verified.

The null hypothesis Ho10, Partnerships and Resources has a direct effect on the Processes factor, is verified.

Remarks on the Hierarchical Diagram: In the hierarchical diagram (Diagram 2: Hierarchical diagram) the hierarchical relations among factors in order of importance are displayed. In addition, in the hierarchical diagram we can see the direction of these relations. The implications are significant in a level of importance of 99%. The first hierarchical group refers to PARTHERSHIPRES and PEOPLE (cohesion: 0.693).

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Particularly, in hierarchy PARTHERSHIPRES-PEOPLE (cohesion: 0.694) the importance of the ARTHERSHIPRES factor implies the importance in PEOPLE. At this point it is worth mentioning that the hierarchy of PARTHERSHIPRES and PEOPLE (cohesion: 0.694) is important.

The second hierarchical group refers to items PROCESSES-PARTHERSHIPRES-PEOPLE (cohesion: 0.6401) and shows that the importance to PROCESSES factor leads to the importance of PARTHERSHIPRES and PEOPLE factors. The partial hierarchy of PARTHERSHIPRES-PEOPLE factors (cohesion: 0.650) is very strong.
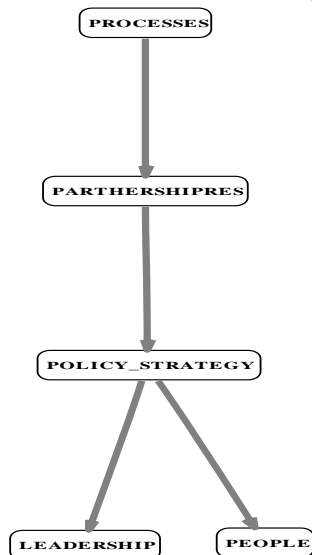
Diagram 2: Hierarchical diagram
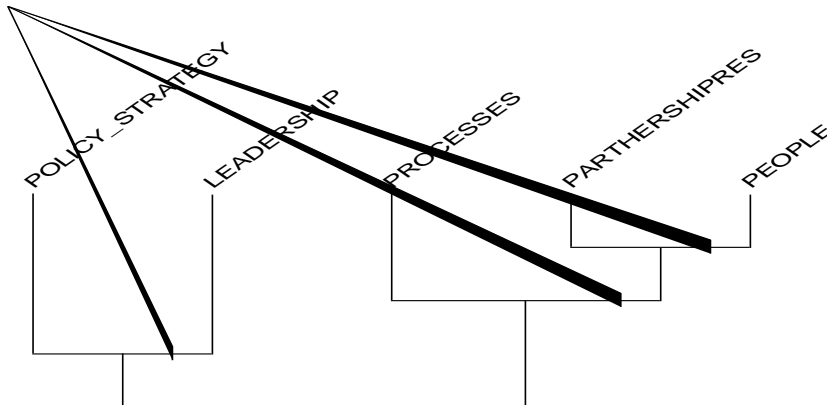
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Remarks on the Implicative Diagram: The implicative diagram shows the implicative relations between the variables (Diagram 3: Implicative Diagram). According to this diagram, all the tasks of the test are connected by implicative relations. The implications represent relations significant at levels of 99% respectively**.**

Diagram 3: Implicative Diagram

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According to the implicative graph (Diagram 3: Implicative Diagram), factors which referred to the PROCESSES can lead and shape PARTHERSHIPRES-PEOPLE and POLICY_STRATEGY. In addition POLICY_STRATEGY factor is responsible for the dimensions that LEADERSHIP and PEOPLE take.

7. CONCLUSIONS

The analysis of the results showed that all factors (Leadership, Policy & Strategy, People, Partnerships and Resources and Processes) are correlated affecting similarly the response of the students examined in the EFQM scale and form one unique factor named enables.

Leadership connected with the ability of development vision, values and ethics, creates opportunities for leaders themselves to defend the values transfer their vision to human resources and puts achievable goals and covers all the needs of the institution, creates an effective strategy and policy, updating all parameters that constitute the strategic plan, gives the possibility of association of all parties, staff and students, has a deep understanding of expectations, takes improvement actions that lead to high performance of the institution, gets and gives recognition of all actions of the parties and encourages future efforts.

In addition human resource management which is a key factor for the success of the institution because it encourages educational programs, activities of lifelong learning supports, attempts for improvement, prospects of professional development and career ensure job satisfaction, healthy cooperation among all parties and promotion of abler people.

This fact could led the institution of tertiary education to enhances high efficiency and maximize the culture of excellence.

REFERENCES

Bodin, A., Coutourier, R., & Gras, R. (2000). CHIC!: Classification Hierarchique Implicative et Cohesitive-Version sous Windows – CHIC 1.2. Rennes: Association pour le Recherche en Didactique des Mathematiques.

Calvo-Mora, A., Leal, A., & Roldan, J. (2006). Using enables for the EFQM model to manage institutions of higher education. *Quality Assurance in Education, 14*(2), 99-122.

Campatelli, G., Cittib, P., & Meneghin, A. (2011). Development a simplified approach based on the EFQM model and Six Sigma for the implementation of TQM principles in a university administration. *Total Quality Management*, *22*(7), 691-704.

Castka, P., Sharo, J. M., & Baamber, C. J (2003). Assessing teamwork development to improve organizational performance. *Measuring Business Excellence*, *7*(4), 29-36.

Conti, T. A. (2007). A history and review of the European Quality Award Model. *The TQM Magazine, 19*(2), 112-128.

Couturier, R. (2008). CHIC: Cohesive Hierarchical Implicative Classification. In R. Gras, E. Suzuki, F. Guillet & F. Spagnolo (Eds), *Statistical Implicative Analysis : Theory and applications*(41-53). Berlin: Springer.

Coutourier, R., & Gras, R. (2005). CHIC: traitement de données avec l'analyse implicative. *Extraction et Gestion des Connaissances (II)*, 679-684. Paris: RMTI.

Davies, J., Hides, M. T., & Casey, S. (2001). Leadership in higher education. *The TQM Magazine*, *17*(7-8), 1025-1030.

Gras, R., & Kuntz, P. (2008). An overview of the Statistical Implicative Analysis (SIA) development. In R. Gras, E. Suzuki, F. Guillet & F. Spagnolo (Eds), *Statistical Implicative Analysis : Theory and applications*(11-40). Berlin: Springer.

Kim, D. Y., Kumar, V. & Murphy, S. A. (2010). European Foundation for Quality Management Business Excellence Model. *International Journal of Quality & Reliability Management*, *27*(6), 684-701.

Lerman, I. C. (1981). *Classification et analyse ordinale des données*. Dunod: Paris.

Porter, L., & Tanner, S. (2004). *Assessing Business Excellence*. (2nd ed.). Oxford: Butterworth-Heinemann.

Tari, J. J. (2006). An EFQM model self-assessment exercise at a Spanish University. *Journal of Educational Administration*, *44*(2), 170-188.

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ICT FOR ACCOUNTANTS: BLESSING OR CURSE?

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ABSTRACT

Information and Communication Technology (ICT) is one of the key drivers for almost all professions and the professional accountants could not be the exception; prerequisite to be competent is the use of ICT. Either they act as financial managers or as independent evaluators or as consultants advising organisations, they have to interact with and be knowledgeable about ICT to enable them to perform their jobs competently. On the other hand, newer forms of automation, driven by machine learning technologies, are now beginning to encroach on more highly skilled 'cognitive' and 'non-routine' occupations such as accounting. Digitalization will lead to the substitution of jobs in cognitive routines, including basic accounting tasks. The experts claim that while a versatile educational background reduces the consequences of the ongoing turmoil induced by technological advancement, the accounting profession experiences more substantial changes. The traditional and highly valued role of the accounting is being disrupted in an intensely networked and interdisciplinary world. This digital disruption is the catalyst for the significant change in the role of accountants, reflected in the automation of many tasks previously undertaken by them. Modern accountancy packages are also easy to use and cloud based; this new software is inroaded into the older established, hard to use packages which are more specialist dependent. The purpose of this study is to analyze the results of the use of ICT by the accountants. In particular, how technology has greatly improved the work of the accountant, since technology nowadays is evolving rapidly in relation to the past. It also identifies which ICT skills are critical for professional accountants who wish to be competent in the current and future working environment. Finally, it highlights disruption to traditional accounting practice and research. The authors, hopefully, provide a foundation from which researchers should contemplate their motivation, informing theories and values regarding the domain of accounting expertise. In order to ascertain the views of professional accountants on the ICT usage, a research conducted in November 2017, in the areas of Drama and Kavala. A 40-item self administrative questionnaire was chosen to collect the data for the research. One hundred accountants of the aforementioned areas replied to the questionnaire. The findings present their current ICT infrastructure and their use of ICT services. Greek accountants have made improvements in adopting new technology in their everyday work. In addition to mandatory transactions in accordance to Taxisnet and other eGovernment systems, they are aware of databases that include updates to accounting and tax regulations, as well as the use of sophisticated software applications to process their work. A description of the ICT skills required by professional accountants in order to be competent in today's work environment is also included. Finally, it draws useful insights regarding the forthcoming digital disruption in the profession of accountant.

1. INTRODUCTION

ICT has been a major factor of efficient accounting information system and has been used to increase the reliability of accounting information (Lim, 2013). Accounting information systems include the computer hardware and software fundamentals in recording accounting information. The practices show that there is a significant relationship between ICT and accounting information system (Taiwo, 2016).

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ICT is seen as one of the key drivers in changing the business environment, because it is integrated into almost all aspects of business. Whether professional accountants function as financial managers within a specific organisation, act as independent evaluators of the financial information and systems of organisations or act as consultants advising organisations, they will have to interact with and be knowledge able about information technology to enable them to perform their jobs competently (Wessels, 2005).

The use of ICT has been a challenge to some users and companies and has changed for still many aspects of accounting practices (Nwanyanwu, 2016).

The accounting profession is made up of three parts – policy, practice and research (Laughlin, 2011). These do not – and should not act in isolation from each other. Within the broad profession of accounting, there needs to be more communication and coordination between practitioners, policy makers and academic researchers about the future of accounting work and the type of accounting that will be practised and researched in the future (Picard et al., 2014).

The global expansion of the accounting profession, thus, is explained by the growing cultural legitimacy that accountancy represents in an increasingly rationalized society. By extending accounting professionalism to assert new knowledge claims, the accounting professionalism is extended within the organization by generating new ways in which claims to accounting expertise can legitimately be made (Meyer, 1986).

One that is concerned about what they see as a significant and widening "gap" between academic research and accounting practice, and another that is content with that gap, seeing researchers' role as one of observing the world, theorising and publishing about it. The accounting discipline is thereby at risk of developing two parallel streams of literature, one revisiting well ploughed fields with potentially retrogressive results. Today's industrial and public accountants perform fewer clerical tasks – e.g. recalculating client depreciation computations, manually preparing confirmation requests for client accounts receivable balances, observing and manually indicating the location, quantity and condition of the client's inventory – than did their counterparts a few years ago, largely due to computer technology (Guthrie & Parker, 2016). Clients now expect professional accountants, relieved of mechanical tasks, to "add value" to what they observe, read and write – evaluate complex systems and information, detect, predict, advise and recommend appropriate courses of action. Critical thinking is the process enveloping these activities to help provide this added value and to communicate the results effectively to others (Reinstein & Bayou, 1997).

Modern or contemporary professional accountants are required to provide leadership and management support in addition to their routine jobs (Greenwood et al., 2002). It is therefore, essential that professional accountants must have requisite organisational, management, behavioural, and people skills. These skills provide necessary support to IT skills so that professional accountants can perform their jobs effectively. It is, however also important to note that experience of accountants, the culture of organisations, and the formal training of accountants will always have significant influence on the level of competence in accountant possesses in operating, designing and using IT (Pollard & Steczkowicz, 2003; Havelka & Merhout, 2013).

Furthermore, accounting professionals, whether in public accounting, management accounting or not-for-profit accounting, provide value-added services to others in a dynamic, complex, expanding, and constantly changing profession. These professionals need to develop a paradigm of skills, one of which is "how to think", requiring them to develop lifelong learning skills to think critically (to grasp the meaning of complex concepts and principles), and to judge and apply these concepts and principles to specific issues (Guthrie & Parker, 2016).

A study focused on elite accounting firms (i.e., the ''Big Four''– Deloitte Touche, KPMG, Pricewaterhouse Coopers and Ernst & Young, now known as EY) has demonstrated that these firms assume a leading role in processes of change in the accounting profession and that modifications in practice adopted by the elite accounting firms diffuse rapidly amongst other firms in the profession (Suddaby et al., 2015). Both themes reflect the process of reconstructing the individual accountant as an agentic actor. This is not to suggest that accountants have not been agentic actors. Clearly they have but their agency has been largely constructed around both the profession (Suddaby & Muzio, 2015) and, more recently, the firm (Cooper & Robson, 2006).

The advances in computer technology and the maturation of the worldwide, competitive business environment mandate that virtually all types of businesses and educational institutions make drastic changes. These changes are at the frontiers of what is variously known as 'the second machine age' (Brynjolfsson and McAfee, 2014) or 'the fourth industrial revolution' (Schwab, 2016). They represent a potentially transformative convergence of new and improved technological capabilities in a range of areas, including

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digitisation, data capture and storage, robotics and artificial intelligence (AI). Accountants also maintained a distinct boundary between technology professionals and accounting practice. The role of accountants in modern business organisations is no exception, which has been transformed from manual to computerised accounting (Ismail & Abidin, 2009). In fact, IT has changed the way data is collected, processed, stored, and aggregated for preparation of accounting and finance related information required by the management to control and manage business activities (Winograd et al., 2000). Progress in each of these areas has lately started to combine and 'cross-over' in ways that enable larger, and frequently unexpected, leaps in capability. Most notably, there has been striking recent progress in 'machine learning' – a form of AI in which machines are 'trained' to perform specific tasks using vast data troves. This disruption of technological advances, mass migration and social entrepreneurship outlined how professional accountants operate in the workplace and the nature of the services they provide. These changes have the potential to affect the knowledge, behaviors and skills professional accountants require in order to be able to perform their roles successfully (Cooper, 2015).

In general, transformation in the professions today is being driven by a massive shift in the way in which value is created (ACCA, 2012; AICPA, 2014; IMA and ACCA, 2015). Given that a key role of business leaders, accountants and financial managers is to protect the interests of their clients, how well does the profession score in understanding, tracking, monitoring, nurturing and reporting these new value creating services that will underpin education and employment in the near future? Big data and digital technologies impact significantly on the accounting, financial services and auditing workforce of the near future (Fawcett, 2015). These digital disruptions are the catalyst for tremendous change in the role of accountants (Freeman and Wells, 2015), reflected in the automation of many tasks previously undertaken by them. This environment of change is also reflected in the globalization of business and the contracting of tasks offshore from first world countries to qualified accountants in countries with lower labour costs (ACCA, 2008). These developments are having such a significant impact that they should rightly be in the spotlight – a spotlight that also shines strongly on the accounting profession, accountants and academic scholars. Susskind and Susskind (2015) argue that there will be a decline in today's professions and describe the people and systems that will replace them. "In an Internet society, we will neither need nor want doctors, teachers, accountants, architects, the clergy, consultants, lawyers, and many others, to work as they did in the 20th century". The same authors challenge the "grand bargain" – the arrangement that grants various monopolies to today's professionals – arguing that our current professions are antiquated, opaque and no longer affordable, and that the expertise of the best is enjoyed only by a few. There is no question that the journey for the accounting profession, accountants and academic scholars in the next years will encounter turbulence. The traditional and highly valued role of the accounting is being disrupted in an intensely networked and interdisciplinary world (Guthrie & Parker, 2016). Growing utilisation and value profile of ICT have already forced professional accountants to upgrade their skills set so as perform their job better (Wessels, 2005).

The purpose of this study is to analyze the results of the use of ICT by the accountants. In particular, how technology has greatly improved the work of the accountant, since technology nowadays is evolving rapidly in relation to the past. It also identifies which ICT skills are critical for professional accountants who wish to be competent in the current and future working environment. Finally, it highlights disruption to traditional accounting practice and research.

The study focused small to medium sized accounting practices in Greece, which emphasize the importance of understanding and being competent in the use of ICT. The study also provides a novel view, by encompassing view of what ICT skills and competencies are necessary for contemporary accounts and how do they complement each other to enable professional accountants throughout their professional lifecycle. Through this research, therefore, the authors approach the ICT competencies for the entire life cycle of the work process of professional accountants. The outcomes of this research will be useful for accounting profession, particularly. At the same time, these outcomes could be used by academic institutions or business schools for curriculum design so as to incorporate competences for courses aimed at different levels of professional accountants' professional lifecycle. It is also expected that the findings of this study will formalise professional accountants' ICT competencies framework and will provide support for job training and career planning for professional accountants.

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This approach evaluates the role of the ICT for the accountants, not only in the present but also in the near future. The remainder of the paper is structured as follows. Section 2 describes the method, section 3 presents the results and section 4 presents discussion and draws conclusions together with directions in the future.

2. APPROACH

Our approach describes a method by which the role of accounting profession has become engaged in domain changes as a result of adopting new practices and new forms of expertises. We identify three distinct entities, each of which incorporates a distinct type of institutional work, *ICT used*, *Skills needed* and *Accountant profession practices*. We describe the situation in figure 1.

Figure 1: Digital Disruption in Accountant world
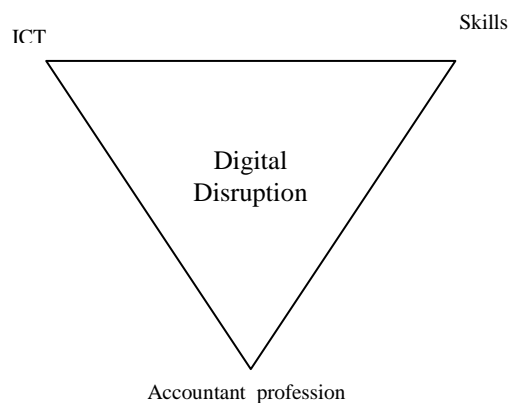
There are some studies regarding digital disruption in the accountant profession. The accountant profession is at the forefront of technological disruption, with accountants facing a serious threat of extinction in the next 10 years if they fail to innovate (McGuigan, & Kern, 2016). Technological advancement is reshaping the way accountants engage through an automation of technical bookkeeping and compliance services, real-time financial reporting, freely available software for basic accounting practice and a renegotiating of innovative fee structures (Stokes, 2016). These factors require the accounting profession to rethink not only what professional services it offers, but how it offers them. In addition to the above, other studies have also been developed to showcase the interconnection between these concepts and how they ultimately affect the digital disruption in accountant world (IBM, 2014).

2.1 Research model

Our approach is based on the aforementioned studies. The approach that this research will address is depicted as follows:

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Figure 2: Link of digital disruption of accountants with customer behaviour, threats from competition and lack of interest for the customers.
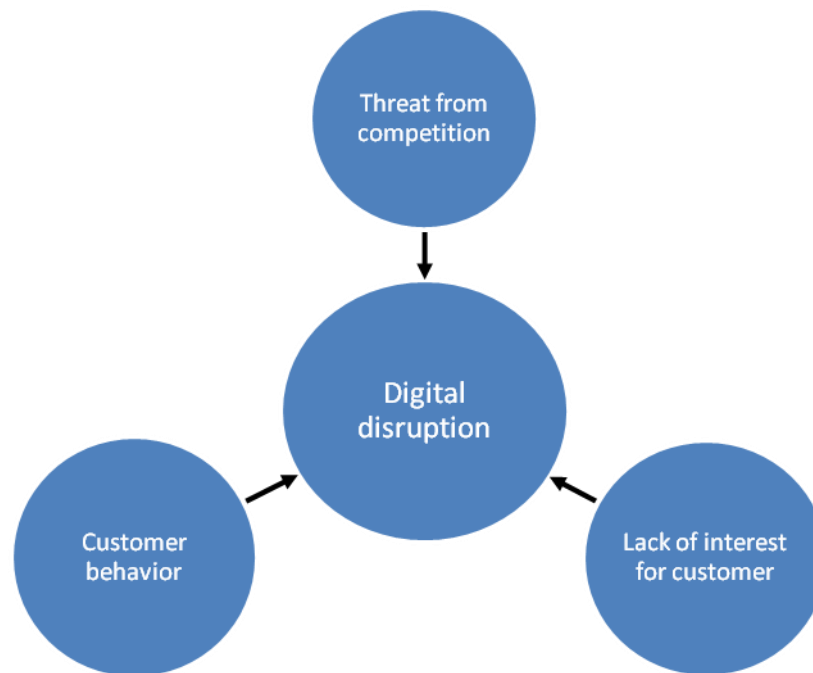
The aim is to answer the research problem posed in the introduction as well as to verify the possible links that have been formulated earlier. In order to achieve this goal, we compose a questionnaire for the purpose of collecting empirical data from accounting offices in the region selected for the research.

This questionnaire consists of five (5) sections of questions; it is structured since it has a strict of questions. It is an updated version of a similar survey by Emmanouilidis & Economides (2010). The sections of the questionnaire are:

Section A - General information for the accounting office
Section B - Infrastructure for information & communications technologies
Section C - Use of internet technology & internet presence
Section D - Accounting applications & services
Section E - Digital disruption

In order to ascertain the views of experts on the digital disruption of the accounting office, the views of 50 experts in the regions of Drama and Kavala were recorded and processed. The research was conducted with the process of completing and collecting the questionnaire by the participants. It was conducted in November and December 2017. In the questionnaire we chose closed questions for quick completing and data processing. Moreover, the questions were multiple choice, where it is possible to choose among several predefined answers and most of them were questions of scale or preference, where the degree of preference of the respondent stated. They are the most important questions in a questionnaire, because they allow classification of the views or attitudes of respondents. The chosen scales in this research are the Likert and the Gutman. In Likert scale, the attitudes have five response categories "Totally agree" = 5, "Agree" = 4, "Neither agree nor disagree" = 3, "Disagree" = 2, "Totally disagree" = 1. In the Gutman scale the attitudes have two response categories "Yes" and "No".

Furthermore we attended the questionnaire marked by clearness and clarity. The questions were short and clear. The negative questions were avoided because they are often misunderstood, since the negative keyword is ignored and the respondent gives an answer that is contrary to his/her real opinion. Also we did not include questions with double meaning, because they require the respondent to answer two separate ideas with a single answer. For this survey, the approximate estimate of the number of questionnaires to be allocated to participants was 50.

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2.2 Research hypotheses

In order to derive to a conclusion on the combination of the above concepts, this study is based on three (3) research hypotheses. These hypotheses will be analyzed on the basis of the method which will be presented below.

The research hypotheses on which we will be based are the following:

H_1: Threat from competition related with lack of interest for customer

H_2: Threat from competition and related with customer behavior

H_3: Lack of interest for customer related with customer behavior

2.3 Data collection

To ensure the appropriateness of our questionnaire, a reliability test, which measures the internal consistency, was performed using Cronbach's alpha coefficient. Nunnally & Bernstein (1978) suggests that Cronbach's alpha should be more than 0.7 so as to be characterized a construct reliable. In this study all the indices were greater than 0.7. In the table below are presented the results of reliability analysis. The value of all three factors is above of the limit 0.7. Colums "Mean value" and "Standard deviation" presents mean value for the items consists each factor and the corresponding standard deviation.

Table 1. Reliability Analysis

Factors	Items	Cronbach's Alpha	Mean value	Standard Deviation
Factor1: Threat from competition	Large accounting businesses are increasingly interested and active in your area and field	0.785	1.69	0.73
	Customer satisfaction is low in your sector			
	Technology is mainly used to reduce costs and not to improve or innovate customer experiences			
Factor2: Lack of Interest for Customer	Emphasizing and suggesting new digital channels to your customers	0.772	2.74	0.42
	You are interested in your customers by taking care of collecting their data and making full use of it			
	You are interested in your customers by taking care of listening to them			
Factor3: Customer behavior	Your business has an aging customer base with few new customers	0.721	2.08	0.87
	Customer behavior has changed as a result of the emergence of digital products and services			

3. RESULTS

3.1 Sample

Table 2. The experts. Who are they and where do they come from.

Area	Number of respondents
Drama	20
Kavala	30

Sample consists of 50 accountants, from the area of Drama and Kavala. Half of them work in offices with up to 3 employees.

Table 3. Number of employees in the office

Number of employees	Frequency	Percent
Up to 3	25	50
Between 4 and 9	23	46
More than 9 people	2	4

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Total	50	100

90% of the respondents work in independent accounting offices.

Table 4. Type of accounting office - Frequencies

Type of accounting office	Frequency	Percent
Independent accounting office	45	90.0
It is part of the company	5	10.0
Total	50	100

34% of the respondents have high and very high level of skills in accounting packages.

Table 5. Level of skills in accounting packages

Level of skills	Frequency	Percent
Very low	7	14%
Low	9	18%
Average	17	34%
High	11	22%
Very high	6	12%

50% of the respondents have low and very low level of skills in telecommunications software, intranets and client/server management.

Table 6. Level of skills in telecommunications software, intranets and client/server management

Level of skills	Frequency	Percent
Very low	11	22%
Low	14	28%
Average	16	32%
High	5	10%
Very high	4	8%

3.2 Result

After that, we construct three new variables, one for each one of the factors in table 1, as the mean value of the corresponding items.

To respond to the three initial research hypotheses, we applied the Pearson Correlation coefficient method for the three factors that created in the previous step. The Pearson Correlation coefficient for threat from competition and lack of interest for customer is 0.080 with corresponding p-value 0.580. That means that Hypothesis H_1 is not verified, that is threat from competition is not related with lack of interest for customer. The Pearson Correlation coefficient for threat from competition and customer behavior is 0.350 with corresponding p-value 0.013. That means that Hypothesis H_2 is verified and more specific, threat from competition is positive correlated with customer behavior. Finally the Pearson Correlation coefficient for lack of interest for customer and customer behavior is -0.213 with corresponding p-value 0.138. That means that Hypothesis H_3 is not verified, that is lack of interest for customer and customer behavior are not correlated.

4. DISCUSSION AND CONCLUSIONS

The purpose of this study was to analyze the results of the use of ICT by the accountants. In particular, how technology has greatly improved the work of the accountant, since technology nowadays is evolving rapidly in relation to the past. It also identified which ICT skills are critical for professional accountants who wish to be competent in the current and future working environment. Finally, it highlighted disruption to traditional accounting practice and research.

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Growing utilisation and value profile of ICT have also forced professional accountants to upgrade their skills set so as perform their job better. As a result, there is an increasing concern about the level of competencies that accountants possess in the use of ICT, and whether they are prepared to meet the challenges of contemporary business environment. However, the skills acquired by professional accountants are still below the minimum level drawn by the accounting professional bodies such as the International Federation of Accountants and the American Institute of Certified Public Accountants (Oulasvirta, 2014; Tan & Laswad, 2018). This study focused on ICT based competencies framework for professional accountants, specifically those operating in small to medium sized accounting practices. This study makes a significant contribution to knowledge and practice by providing theoretical base for developing information technology related competencies for knowledge workers in general and professional accountants in particular.

Just as accounting practice has begun changing to provide this new environment, accounting education must change as well. Accounting education should provide students with the requisite set of skills that future employers seek, including strong communication, quantitative analysis, interpersonal and intellectual skills.

There is no question that the journey for the accounting profession, accountants and academic scholars in the next years will encounter turbulence. The traditional and highly valued role of the accounting is being disrupted in an intensely networked and interdisciplinary world. The research conducted to investigate the skills and abilities that professional accountants will need in future emphasise the importance of understanding and being competent in the use of ICT. ICT is seen as one of the key drivers in changing the business environment, because it is integrated into almost all aspects of business. Whether professional accountants function as financial managers within a specific organisation, act as independent evaluators of the financial information and systems of organisations or act as consultants advising organisations, they will have to interact with and be knowledgeable about information technology to enable them to perform their jobs competently.

The study examined the skills and competencies for professional accountants, particularly in small to medium sized accounting practices in Greece, which emphasise the importance of understanding and being competent in the use of ICT. The study provided a novel view with an all encompassing view of what ICT skills and competencies are necessary for contemporary accounts and how do they complement each other to enable professional accountants throughout their professional lifecycle. However, it concentrated on professional accountants of a particular region of Greece. There is a significant number of professional accountants from other regions but were not included in this survey. It is unlikely that their views would be significantly different but this may not be the case. Another limitation is the skills list presented. The skills were drawn from a range of sources (Emmanouilidis & Economides, 2010; Awayiga et al., 2010; Jones, 2011) but there is a possibility that other essential aspects were omitted.

Since this study investigated the ICT skills employer's need and their level of satisfaction with accounting profession. The findings of this survey are likely to be broadly reflective of employers in other locations. The conclusions from this survey provide empirical and relevant input for content review of the accounting programs in order to improve the essential skills and knowledge for accountants. The way to address the ICT skills deficiencies would require accountant professionals to look beyond the basic ICT skills. They need to incorporate advanced skills with the widely used accounting packages. Professional accountants need to learn about telecommunications software, intranets and client/server management.

We also find no major difference between the ICT skills needed and the ICT skills possessed by professional accountants. The graduating accountants are not significantly different from what employers expect of an accounting graduate. There has been disapproval over the years, of how accounting students are being taught. This finding suggests positive results from curriculum modifications over the years. The IT skills gap across the technological areas still needs to be addressed. The results of this survey also imply that academics have to put considerable attention to the development of skills in order to continue reducing the gap between the skills needed and skills possessed. However, whether the accounting graduate's skills needed by employers can be developed comprehensively by academics alone is a question for further study.

Furthermore, accounting professionals, whether in public accounting, management accounting or not-for-profit accounting, pro- vide value-added services to others in a dynamic, complex, expanding, and constantly changing profession. These professionals need to develop a paradigm of skills, one of which is "how to think", requiring them to develop lifelong learning skills to think critically (to grasp the meaning of complex concepts and principles), and to judge and apply these concepts and principles to specific issues.

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Accountants of the future will need to be adaptable and agile, and to achieve this, their education needs to be holistic in design, integrated, creative and diverse.

This means that future accounting is likely to take on non-formal characteristics, where discovery and exploration become key, curiosity and reflection a mainstay and inquiry-based contextual appreciation common practice. By providing learners with a creative space, such as a portfolio of wor, in which they own and explore their learning, they gain valuable insights into their study. This is perhaps best illustrated in an Accountant professional's comment: "The research conducted to investigate the skills and abilities that professional accountants will need in future emphasize the importance of understanding and being competent in the use of ICT.

REFERENCES

ACCA (2008). Future scenarios to 2020, *ACCA*, London.

ACCA (2012). The future of accountants, *Accounting and Business*, October.

AICPA (2014). CPA horizons 2025 report, available at: www.aicpa.org/Research/ CPAHorizons2025 (accessed 26 March 2018).

Awayiga, J.Y., Onumah, J.M., & M. Tsamenyi. (2010). Knowledge and skills development of accounting graduates: The perceptions of graduates and employers in Ghana. *Accounting Education: An International Journal*, 19 (1-2), 139-158.

Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. WW Norton & Company.

Cooper, B. (2015). Class of 2025: the future finance professional. *Future proofing the profession: preparing business leaders and finance professionals for 2025*, 81-87.

Cooper, D. J., & Robson, K. (2006). Accounting, professions and regulation: Locating the sites of professionalization. *Accounting, organizations and society*, *31*(4-5), 415-444.

Emmanouilidis, E. C. & Economides, A. A. (2010). ICT usage by Greek accountants. International Journal of Information Systems in the Service Sector, Vol. 2, No. 1, pp. 49-70. *IGI-Global*. ISSN: 1935-5688; EISSN: 1935-5696

Fawcett, T. (2015). The digital disruption, *Academic Leadership Series*, Vol. 6, pp. 34-40.

Freeman, M., & Wells, P. (2015). Reducing the expectation gap: using successful early career graduates to identify the capabilities that count. *Academic Leadership Series*, *6*, 67-78.

Greenwood, R., Suddaby, R., & Hinings, C. R. (2002). Theorizing change: The role of professional associations in the transformation of institutionalized fields. *Academy of management journal*, *45*(1), 58-80.

Guthrie, J., & Parker, L. D. (2016). Whither the accounting profession, accountants and accounting researchers? Commentary and projections. *Accounting, Auditing & Accountability Journal*, *29*(1), 2-10.

Havelka, D., & Merhout, J. W. (2013). Internal information technology audit process quality: Theory development using structured group processes. *International Journal of Accounting Information Systems*, *14*(3), 165-192.

IBM, (2014). Designing and modeling. Available at: http://www.ibm.com/support/knowledgecenter/es/SS6RBX_11.4.3/com.ibm.sa.bpr.doc/top ics/t_ovwmdlidef0.html [Accessed April 2018].

IMA and ACCA (2015). Tomorrow's finance enterprise, *ACCA*, London.

Ismail, N. A., & Abidin, A. Z. (2009). Perception towards the importance and knowledge of information technology among auditors in Malaysia. *Journal of Accounting and Taxation*, *1*(4), 61.

Jones, C. G. (2011). Written and computer-mediated accounting communication skills: Employer perspective. *Business Communication Quarterly*, 74, 247-271.

Laughlin, R. (2011). Accounting research, policy and practice: worlds together or worlds apart?. *Academic Leadership Series*, 2, 21-32.

Lim, F. P. C. (2013). Impact of information technology on accounting systems. *Asia-Pasific Jornal of Multimedia Services Convergent with Art, Humanities and Socialgy*, *3*(2), 93-106.

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McGuigan, N., & Kern, T. (2016). CreActive Accounting Education: Visioning Future-Oriented Accounting Programs through a Reflective Unlearning of Current Practice. *Journal of University Teaching & Learning Practice*, *13*(2), 8.

Meyer, J. W. (1986). Social environments and organizational accounting. *Accounting, organizations and society*, *11*(4-5), 345-356.

Nunnally, J. C., & Bernstein, I. H. (1978). *Psychometric theory*.

Nwanyanwu, L. A. (2016). Accountant's Perspective of Advances in Technology of Capital Assets and Financial Performance in Nigeria: A focus on the Construction Industry. *Applied Economics and Finance*, *3*(1), 138-144.

Oulasvirta, L. (2014). The reluctance of a developed country to choose International Public Sector Accounting Standards of the IFAC. A critical case study. *Critical Perspectives on Accounting*, *25*(3), 272-285.

Picard, C. F., Durocher, S., & Gendron, Y. (2014). From meticulous professionals to superheroes of the business world: A historical portrait of a cultural change in the field of accountancy. *Accounting, Auditing & Accountability Journal*, *27*(1), 73-118.

Pollard, C., & Steczkowicz, A. (2003). Assessing business managers' it competence in smes in regional australia: preliminary evidence from a new it competence instrument. *PACIS 2003 Proceedings*, 69.

Reinstein, A., & Bayou, M. E. (1997). Critical thinking in accounting education: processes, skills and applications. *Managerial Auditing Journal*, *12*(7), 336-342.

Schwab, K. (2016). The Fourth Industrial Revolution. Crown Business. *New York*.

Stokes, G. (2016). Relevance and professional associations in 2026: Towards a new role for thought leadership. *Relevance and ProfessionaL Associations in 2026*.

Suddaby, R., & Muzio, D. (2015). Theoretical perspectives on the professions. *The Oxford handbook of professional service firms*, 25-47.

Suddaby, R., Saxton, G. D., & Gunz, S. (2015). Twittering change: The institutional work of domain change in accounting expertise. *Accounting, Organizations and Society*, *45*, 52-68.

Susskind, R. E., & Susskind, D. (2015). *The future of the professions: How technology will transform the work of human experts*. Oxford University Press, USA.

Taiwo, J. N. (2016). Effect of ICT on Accounting Information System and Organisational Performance: The Application of Information and Communication Technology on Accounting Information System. *European Journal of Business and Social Sciences*, *5*(2), 1-15.

Tan, L. M., & Laswad, F. (2018). Professional skills required of accountants: what do job advertisements tell us?. *Accounting Education*, 1-30.

Wessels, P. L. (2005). Critical information and communication technology (ICT) skills for professional accountants. *Meditari Accountancy Research*, 13(1), 87-103.

Winograd, B. N., Gerson, J. S., & Berlin, B. L. (2000). Audit practices of Pricewaterhouse Coopers. *Auditing: A Journal of Practice & Theory*, 19(2), 176-182.

ROAD ACCIDENTS 2010-2015. A COMPARATIVE STUDY ON INJURED PEOPLE AND PREVENTION TECHNIQUES. CASES OF GREECE, POLAND AND LITHOUANIA

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ABSTRACT

In this essay we would like to examine the road accidents that occur in Greece, and compare it to other European countries that seem to have similar road accidents history during the years 2010 -2015, such as Poland and Lithuania. The motivation for writing this essay is that road accidents appear as a major social plague all around the world. In recent years, the raise in car accidents is due to the number of vehicles which continue to increase. Road accidents occur in the road network, with afflictive results such as death, injuries and various damages. Car accidents as a major social phenomenon, has a qualitative aspect. However, a quantitive research is necessary initially. The study refers to the period between 2010-2015. Our data are the number of road accidents in Greek prefectures, the number of injured/killed in Greece per sex, the time of the accidents in Greece per sex/per age, the number of road accidents in Poland and Lithuania. Most of the data come from sources, such as published researches of the Greek Statistic Service (EL. STAT.), Reports published by the European Union, and by the traffic police. All data that refers to road accidents prevention comes mainly from Reports of the National Road Safety Council and also from Reports about the Road Safety Vademecum of the European Commission. The extracted results, would allow us to compare common variables among the three under study countries, of Greece, Poland and Lithuania, and describe the trends of the problem among them. The goal of the essay is to show once more how great this social problem is, focusing on the three European countries: Greece, Poland, Lithuania. We will try to figure out whether the road accidents are increased or decreased in relation to the total population of each country.

KEYWORDS

Road traffic, accidents, Greece

JEL CLASSIFICATION CODES

 I31, H51, R42

1. INTRODUCTION

The first victim of road accident in human's history, is dated on 17th August 1896, while the 44 year old Bridget Driscol was hit by a car. The car was running with 12,8 km/h, while the speed limit was 6,4 km/h. The coroner said that this kind of accident should not be repeated. Unfortunately, road accidents became a usual phenomenon that keeps repeating in modern times.[1]

Accidents on the road network make up an important social phenomenon for all the countries around the world. This serious issue does not seem to attract adequate consideration and therefore daily traffic accidents occur. The purpose of this paper is to analyze the road accidents in Greece by analyzing the victims of the road accidents in the country. In addition, this paper will lead to a specific conclusion. Both people and the

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[1] World's first road death. London, Roadpeace www.roadpeace.org/org/articles/WorldRirstDeath.html

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government should take responsibility regarding this massive issue and work together to reduce the high percentages of the road accidents, which we will analyze below through various measures.

To begin with, the Greek road network faces numerous problems since several roads are not being preserved as they should. So, roads become full of puddles or other obstacles, which undoubtedly contribute to road accidents. Furthermore, many drivers do not have appropriate road consciousness and sufficient driving experience. Thus, several road accidents frequently have many catastrophic results (for example road accidents with multiple death victims).

Our motivation to make this research lies to the fact that in the town where we live, which is Kavala and in general in our country, Greece, traffic accidents occur on a daily basis engaging both cars and motorcycles. However, the main idea that has intrigued us the most (as it will be also demonstrated in the analysis to follow below) is the fact that in Greece the greatest number of road accidents that result to people being injured concern mainly the young people. Our purpose is to further analyze the above mentioned fact using statistical data and generate conclusions to prove whether it is true.

The purpose of this paper is the presentation and processing of statistical data, which we have received from ELSTAT (Elstat, 2018)[2] regarding the road accidents per area in the country of Greece as well as the statistical data, which demonstrate at which ages, which countries and regarding which sex, the largest number of road accidents is observed. With proper processing of this data, by using excel spreadsheets as well as employing the SPSS statistical packet, we will draw several conclusions.

The reason for choosing Poland, Lithuania and Greece in this research, is due to the fact that all three countries have the highest road fatalities rates, in the period 2010-2015, compared with other EU countries according to the EU statistics. More specifically, the European Commission Vademecum for road safety mentions that, Poland and Lithuania, together with Romania and Latvia have the highest rates in road fatalities in 2013, whereas, United Kingdom, Sweden and Denmark have the lowest rates.

The diagram below shows rate of people killed in road accidents during the period of year 2010- 2015, for the three under study countries. We notice that for serial years, all countries appear quite similar rates. The date is retrieved by the official site of the European Commission Services.

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[2] http://www.statistics.gr/el/statistics/-/publication/SDT04/-

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Image 1: People killed in road accidents for countries Greece, Lithuania, Poland

People killed in road accidents (source: EC services)
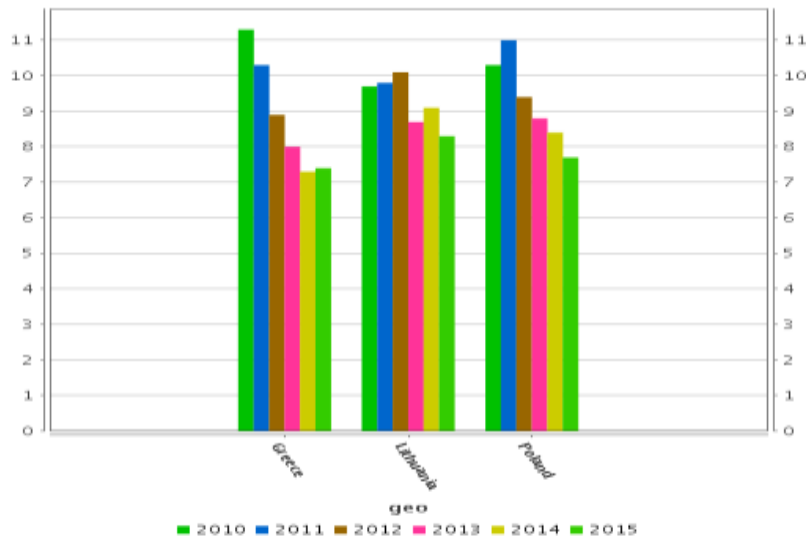
Source of Data European Commission (EC) – DG Mobility and Transport
Last update: 03.05.2018
Date of extraction: 07 May 2018 22:06:39 CEST
Hyperlink to the graph: http://ec.europa.eu/eurostat/eurostat/tgm./drawGraph.do&init=1&plugin=1&language=en&pcode=sdg_11_40&toolbox=legend
Disclaimer: This graph has been created automatically by Eurostat software according to external user specifications for which Eurostat is not responsible. Graphic included
General Disclaimer of the EC website: http://ec.europa.eu/geninfo/legal_notices_en.htm
Short Description: The indicator measures the number of fatalities caused by road accidents, including drivers and passengers of motorised vehicles and pedal cycles as well as pedestrians. Persons dying on road accidents up to 30 days after the occurrence of the accident are counted as road accident fatalities. After these 30 days, the reason for dying might be declared differently.

For Member States not using this definition, corrective factors were applied.
Code: sdg_11_40

2. ROAD ACCIDENTS IN GREECE

The motorway network in Greece has been modernized throughout the 2000s and part of it is still under construction. With a total length of about 2.500 km as of 2017, Greece's motorway network is the biggest one in Southeastern Europe and one of the most advanced in Europe.[3]

2.1 Greek accidents per province

According to the International Road Traffic and Accidents Database (IRTAD) a survey in 2011 revealed that Greece had the worst road safety record in the EU and among the countries that present the most road fatalities per 100,000 population. Greece was one of the worst performing countries in the EU regarding road safety and the examination of road safety situation and trends in Greece had been the subject of several studies[4]. In the present study, we examine the trend of the total victims (casualties both killed and injured) per Greek province for the period 2010-2015.

We have extracted data from the Greek Statistical Services (ELSTAT) regarding road accidents in Greece per prefecture during the period 2010-2015. The data depicts all fatal and non-fatal road accidents, although in our paper, we are focusing in injured people. The people that experience road accident (victim) are categorized as the driver, the pedestrian and the passenger.
The Greek provinces are:

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[3] https://en.wikipedia.org/wiki/Highways_in_Greece
[4] Trends of road traffic accidents in Greece, I.Gkegkes, et al. Surg Chron 2013; 18(4): 190-193

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- Sterea Ellada (Central Greece) which consists of the prefectures of Athens, East Attica, West Attica, Piraeus, Aetolia & Akarnania, Viotia, Fthiotida, Fokida, Evvoia and Evritania.
- Epirus which consists of the prefectures of Arta, Thesprotia, Ioannina, Preveza
- Peloponnesus which consists of the prefectures of Achaia, Argolida, Arkadia, Ilia, Korinthos, Lakonia and Messinia.
- Macedonia which consists of the prefectures of Grevena, Drama, Imathia, Chalkidiki, Thessaloniki, Kavala, Kastoria, Kilkis, Kozani, Florina, Pella, Pieria, Serres (& Agio Oros).
- Thrace which consists of the prefectures of Evros, Xanthi, Rodopi.
- Thessaly, which consists of Karditsa, Larissa, Magnisia, Trikala.
- Islands of Aegean Sea which consists of Kyklades, Dodekanisa, Lesvos, Samos, Chios.
- Islands of Ionion Sea which consists of Leykada, Zakynthos, Corfu, Kefallinia.
- Crete which consists of Heracleon, Chania, Lasithi, Rethymno.

Beginning with Sterea Ellada (Central Greece), one notices that of all road accident, the drivers (injured and killed) are about 89%, the passengers (injured and killed) are about 36% and the pedestrians (injured and killed) are about 15%. Almost in each traffic accident, usually the driver gets killed/ injured. The pedestrians are the least involved, that makes them usually the most unfair victims. The passengers in year 2012 seem to have the highest rate in Central Greece.

Table 1: Road accidents and the total of victims (injured and killed) in Central Greece (Sterea Ellada)

Central Greece (Sterea Ellada) – Years (Population 2.900.024)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	Pedestrians (injured and killed)	Passengers (injured and killed)	Road Accidents
2010	0,88	0,15	0,36	834,00
2011	0,90	0,14	0,38	762,00
2012	0,89	0,15	0,40	715,90
2013	0,87	0,15	0,34	689,80
2014	0,88	0,15	0,39	677,40
2015	0,90	0,14	0,29	630,70

Image 2: Road accidents and the total of victims (injured and killed) in Central Greece (Sterea Ellada)
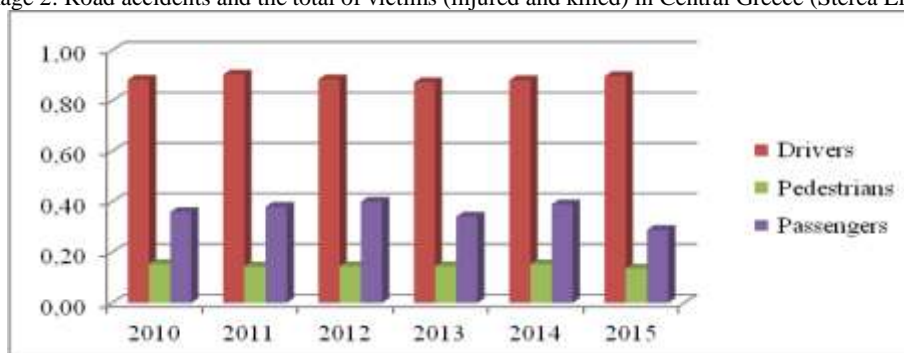
In Epirus, during 2010-2015 there were driver victims in almost every accident (98%). Around 52% of the road accidents caused passenger victims, and about 15% of the road accidents in Epirus caused pedestrian victims. The drivers in years 2010, 2011, 2012 were killed/ injured in all road accidents that happened during these 3 years. It is surprisingly high (comparing with Central Greece) the passenger victims, which means that passengers got killed/injured in more than the half accidents.

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Table 2: Road accidents and the total of victims (injured and killed) in Epirus

Epirus – Years (Population 336.856)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	Pedestrians (injured and killed)	Passengers (injured and killed)	Road Accidents
2010	1,02	0,18	0,37	40,50
2011	1,10	0,10	0,57	41,75
2012	1,00	0,14	0,62	36,75
2013	0,95	0,20	0,62	37,00
2014	0,93	0,20	0,57	39,25
2015	0,90	0,11	0,38	34,00

Image 3: Road accidents and the total of victims (injured and killed) in Epirus

In Peloponnesus, about 92% of the road accidents have caused to driver victims, about 38% caused passenger victims and about 15% caused pedestrian victims. The rates are quite similar to the rates noticed in Central Greece.

Table 3: Road accidents and the total of victims (injured and killed) in Peloponnesus

Peloponnesus – Years (population 1.046.897)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	Pedestrians (injured and killed)	Passengers (injured and killed)	Road Accidents
2010	0,93	0,15	0,40	179,86
2011	0,90	0,17	0,38	150,57
2012	0,89	0,17	0,38	128,29
2013	0,95	0,12	0,43	130,14
2014	0,95	0,11	0,36	135,71
2015	0,93	0,14	0,34	148,57

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Image 4: Road accidents and the total of victims (injured and killed) in Peloponnesus
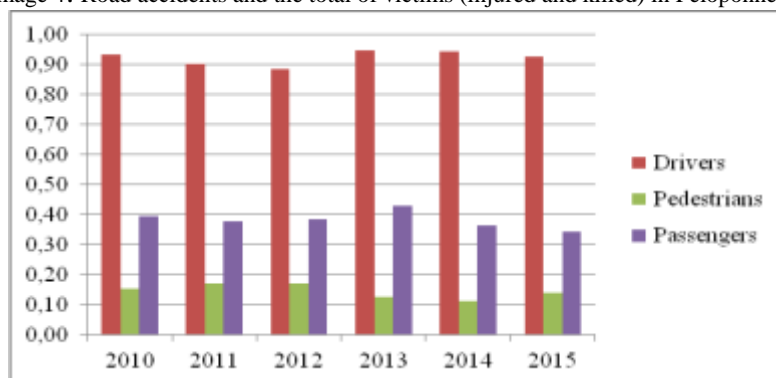
In Macedonia province during 2010-2015, the road accidents caused about 92% driver victims, about 45% passenger victims and about 14% pedestrian victims. In year 2015, 88% of total road accidents caused drivers to be casualties. Passengers are certainly fewer victims than drivers, but more victims than pedestrians.

Table 4: Road accidents and the total of victims (injured and killed) in Macedonia

	Average Rate Number of Victims per Number of Road Accident			
Macedonia –Years	**Drivers** (injured and killed)	**Pedestrians** (injured and killed)	**Passengers** (injured and killed)	**Road Accidents**
2010	0,96	0,13	0,46	234,46
2011	0,93	0,14	0,43	233,69
2012	0,90	0,12	0,45	197,92
2013	0,91	0,16	0,41	206,77
2014	0,93	0,16	0,54	176,00
2015	0,88	0,17	0,43	201,77

Image 5: Road accidents and the total of victims (injured and killed) in Macedonia
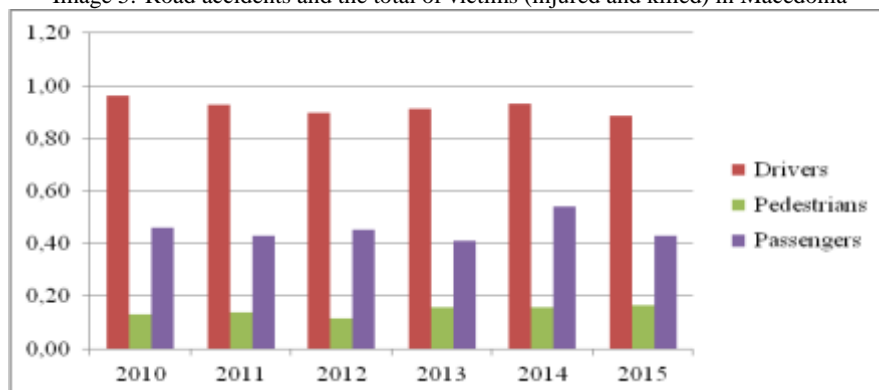
The table below shows in Thrace, which is similar to other provinces. The same period, the average drivers that experience road accidents are 89%, passengers are 40% and pedestrians are 14%. The trend of the rates are not stable. Some years goes up, and some other years go down.

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Table 5: Road accidents and the total of victims (injured and killed) in Thrace

Thrace – Years (population 371.208)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	Pedestrians (injured and killed)	Passengers (injured and killed)	Road Accidents
2010	0,91	0,12	0,43	118,67
2011	0,94	0,16	0,40	119,33
2012	0,84	0,17	0,36	94,33
2013	0,87	0,12	0,45	95,67
2014	0,90	0,14	0,35	90,67
2015	0,86	0,14	0,40	86,67

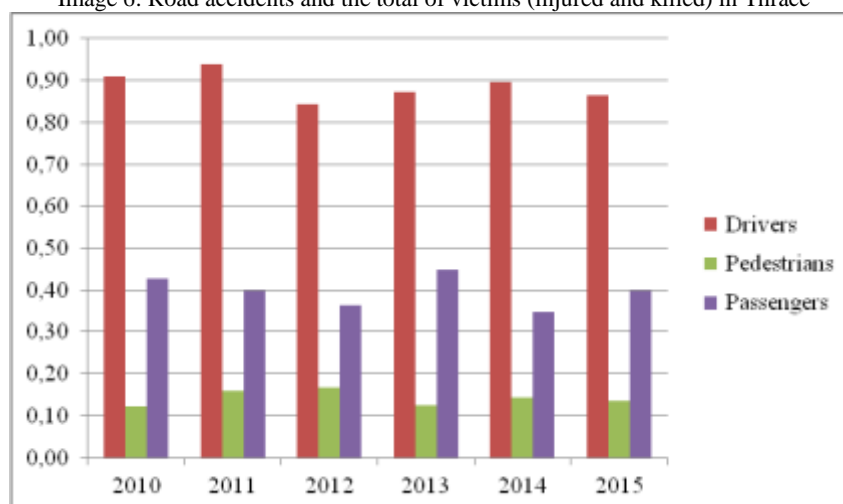Image 6: Road accidents and the total of victims (injured and killed) in Thrace

In Thessaly, about 92% of road accidents caused driver victims, about 32% caused passenger victims and about 15% caused pedestrian victims.

Table 6: Road accidents and the total of victims (injured and killed) in Thessaly

Thessaly – Years (population 718.964)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	Pedestrians (injured and killed)	Passengers (injured and killed)	Road Accidents
2010	0,94	0,18	0,40	122,00
2011	0,92	0,15	0,31	114,00
2012	0,93	0,15	0,30	93,75
2013	0,93	0,17	0,31	79,50
2014	0,88	0,14	0,30	68,75
2015	0,92	0,13	0,30	58,75

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Image 7: Road accidents and the total of victims (injured and killed) in Thessaly
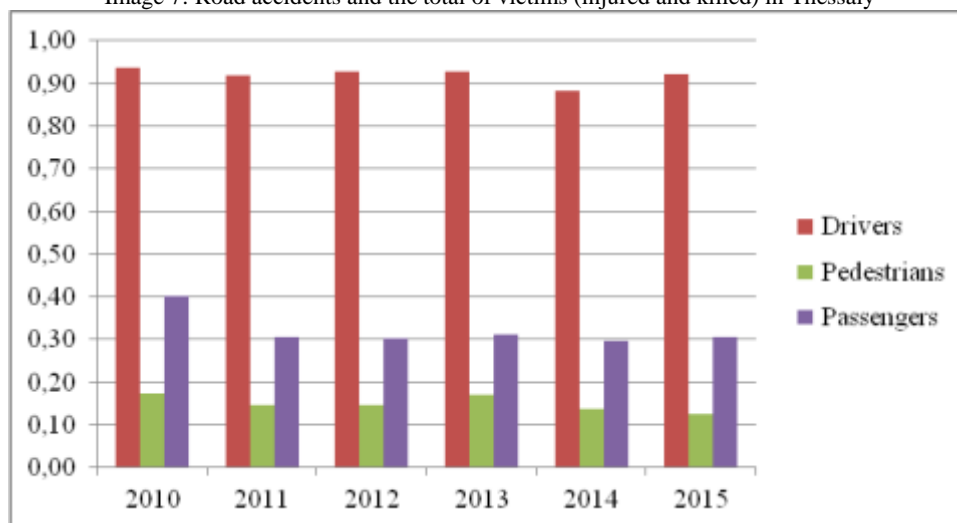
The period 2010-2015, at the province of Aegean Islands, the average rate of driver victims was around 92%, while the passenger victims average rate was 29% and the pedestrians average rate was around 14%. It is worth mentioning that in year 2010 the drivers had the lowest rate, compared with all drivers' rate in all years, in all provinces. Also, in year 2015, the rate shows more passenger victims than previous years in same province.

Table 7: Road accidents and the total of victims (injured and killed) in Aegean Islands

Aegean Islands – Years (population 480.772)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	**Pedestrians** (injured and killed)	**Passengers** (injured and killed)	**Road Accidents**
2010	0,82	0,15	0,28	132,80
2011	0,92	0,16	0,24	111,20
2012	0,96	0,12	0,31	94,20
2013	0,94	0,11	0,30	74,40
2014	0,97	0,11	0,25	85,00
2015	0,90	0,17	0,38	89,20

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Image 8: Road accidents and the total of victims (injured and killed) in Aegean Islands
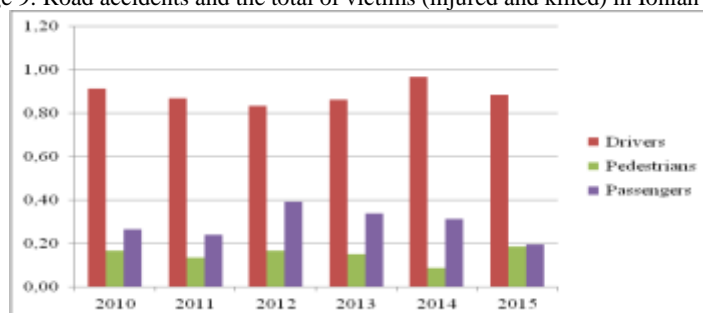

In the Ionian Islands, the road accidents have caused about 89% victims that were drivers, about 29% victims that were passengers and about 15% that were pedestrians. In year 2014 alone, pedestrian's rate as victims is the lowest (0.09) compared to all victim rates, in all provinces, for the years 2010-2015. However, the next year this rate was doubled.

Table 8: Road accidents and the total of victims (injured and killed) in Ionian Islands

Ionian Islands (population 204.624)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	Pedestrians (injured and killed)	Passengers (injured and killed)	Road Accidents
2010	0,91	0,17	0,27	76,25
2011	0,87	0,14	0,24	59,25
2012	0,83	0,17	0,39	47,50
2013	0,86	0,15	0,34	49,50
2014	0,97	0,09	0,31	42,00
2015	0,89	0,18	0,19	46,00

Image 9: Road accidents and the total of victims (injured and killed) in Ionian Islands

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Crete has similar rates with other islands. The average rate of victims that experienced a road accident as a driver was 89%, as a pedestrian was 34% and as a passenger 17%.

Table 9: Road accidents and the total of victims (injured and killed) in Crete

Crete – Years (population 623.065)	Average Rate Number of Victims per Number of Road Accident			
	Drivers (injured and killed)	Pedestrians (injured and killed)	Passengers (injured and killed)	Road Accidents
2010	0,93	0,15	0,37	102,50
2011	0,85	0,18	0,38	91,00
2012	0,87	0,20	0,39	75,50
2013	0,90	0,15	0,32	72,25
2014	0,84	0,19	0,29	51,25
2015	0,94	0,16	0,30	52,25

Image 10: Road accidents and the total of victims (injured and killed) in Crete
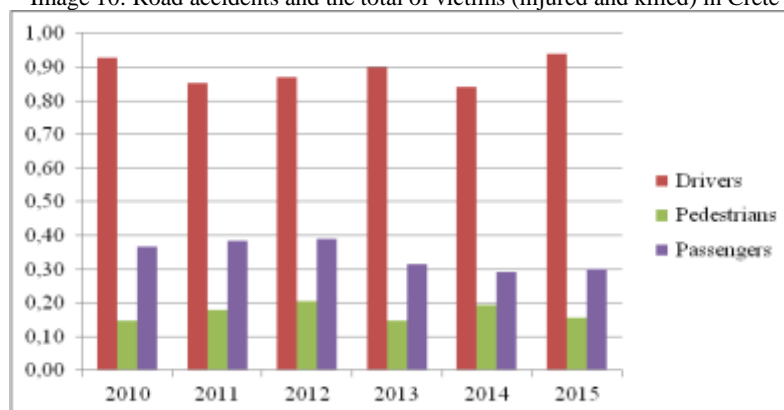
In conclusion, drivers are the ones that become a road accident victim, more often than the passengers or the pedestrians. From the above analysis it is shown that Greece has almost the same rates during years 2010-2015, as per average people killed or injured, in every province. More analytical conclusions are not easy to extract at this point, because the provinces, consist of some prefectures that are over populated and some others that are less dense. Usually, in places that are crowed, it is more likely an accident to occur. Also, the road network condition plays an important role to the number of accidents per geographic area.

In the next section, we are going to analyze the injured casualties (both male and female) in Greece, per age group and per time of the accident.

2.2 Road victims per age/sex/time of accident

In our paper, we have obtained information from the website of ELSTAT and we have also collected several tables, which show the number of injured people in Greece for the period from 2010 to 2015. More specifically, we have organized the data in relation to the injured people and we have separated them by the time of the accident, by gender and by age so that we simplify our analysis and subsequently do our research in the easiest possible way.

In the excel sheet which refers to 2010-2015, in the second column we have completed with the time of the accident (0-4, 5-8, 9-12, 13-16, 17-20 and 21-23.) In addition, in the following columns we have completed with the gender and we have also created subcategories for the age. In other words, the ages are formed at <20, 20-29,30-39,40-49,50-59,> 60. Based on the centralized table that we have received as reference from ELSTAT, we found some results.

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Table 10: Injured people by hour/ sex and age (2010-2015)

Year	Time of th	<20 Male	<20 Female	20-29 Male	20-29 Female	30-39 Male	30-39 Female	40-49 Male	40-49 Female	50-59 Male	50-59 Female	≥60 Male	≥60 Female
2010	0_4	195	78	651	203	324	95	176	61	111	37	67	24
2010	5_8	108	52	441	162	363	94	221	67	135	58	161	81
2010	9_12	158	120	498	176	517	202	401	188	308	159	596	391
2010	13_16	353	186	830	274	709	252	510	198	304	200	408	293
2010	17_20	374	169	745	267	652	202	437	175	273	167	397	239
2010	21_23	241	113	546	172	376	125	237	99	124	64	137	100
2011	0_4	148	65	551	166	310	93	172	53	92	26	55	21
2011	5_8	77	52	482	125	348	100	214	94	137	53	138	80
2011	9_12	187	96	463	156	466	184	414	172	279	155	580	391
2011	13_16	284	177	749	216	653	223	431	197	325	154	422	251
2011	17_20	361	174	688	210	554	175	367	162	248	121	330	201
2011	21_23	195	81	498	123	292	97	227	78	124	41	132	71
2012	0_4	140	57	450	160	278	55	154	40	81	41	56	20
2012	5_8	105	55	419	123	263	84	193	86	111	62	110	83
2012	9_12	137	76	416	137	478	181	365	160	284	147	546	343
2012	13_16	255	171	629	218	556	183	445	191	306	152	388	249
2012	17_20	259	161	567	197	480	168	379	171	224	126	314	233
2012	21_23	173	69	440	142	266	82	191	73	130	69	119	94
2013	0_4	124	34	364	126	217	49	152	42	78	25	38	17
2013	5_8	78	45	380	126	255	95	202	75	115	52	130	40
2013	9_12	182	98	407	125	428	178	380	159	276	133	555	347
2013	13_16	255	141	589	208	510	190	436	187	358	158	349	247
2013	17_20	297	147	582	193	466	167	365	159	251	119	283	208
2013	21_23	185	80	464	132	298	104	201	71	132	53	111	62
2014	0_4	87	56	405	129	214	71	133	43	60	20	51	21
2014	5_8	60	42	354	99	266	69	182	67	110	45	118	62
2014	9_12	128	74	388	122	427	140	385	153	260	127	530	312
2014	13_16	229	139	588	175	522	206	423	208	280	154	382	259
2014	17_20	244	175	567	192	463	192	382	135	263	121	280	199
2014	21_23	128	86	405	107	285	81	175	70	123	67	114	56
2015	0_4	96	50	382	115	197	43	123	44	73	24	41	18
2015	5_8	68	47	334	91	270	75	189	69	114	59	120	59
2015	9_12	102	74	347	121	378	124	304	117	296	152	518	317
2015	13_16	216	107	562	183	530	189	448	184	306	149	401	264
2015	17_20	223	117	476	175	404	155	356	159	226	108	279	184
2015	21_23	152	90	418	115	263	76	205	79	142	62	116	82

2010

In the Excel analysis for **2010** in regards to the injured people due to road accidents in Greece, we have noticed that between men and women, men are the most injured in an accident than women of all ages. In our table, the category of the age of 20-29 for both men and women lists the highest number of wounded people at all hours. We have also noticed that the most injured people as regards both sexes appear at the hours between 1pm-4pm (13-16) with the highest number being men between the age of 20-29 (830 injured). As shown in this survey, men are more frivolous than women and are more often injured in road accidents than women.

Women are perhaps more conscientious while driving and they do not try to compete with each other, (for example men drivers who try to complete with others, showing that they have a nicer car, that they drive faster and better). One could say that male drivers are of a larger number in comparison with the female drivers and therefore this is why men probably get injured more often in road accidents. Also, the age of 20-29 is a young age in which most of the people are ignorant of danger, have little experience of driving, and one might say that they may not have the proper education and culture. What drives the interest is that the largest numbers of injured are of the hours between 13- 16 pm. One would think that the majority of road accidents occur during the early morning hours (for example, because of fatigue or drunkenness following a night out), however we have noticed that they occur at noon. This is because the traffic on the streets at that time is higher (peak hours) and during these hours many people are returning home from their jobs-school-university.

2011

In the **spreadsheet for 2011** we have created exactly the same table according to the subcategories that we have analyzed above. We have noticed that for 2011 the largest numbers of injured people in Greece

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appear to be males. In addition, this year the most injured people appear to be men between the age of 20 and 29 and specifically during the hours 13 - 16 pm (749 injured), the same case is for the previous year as well.

2012

For the year 2012, once again, men aged 20-29 show the most injuries. The largest number of injured people is once again at 13-16 (629 injured). However, this number it has been reduced both in comparison to 2010 and 2011. This may be due to the fact that some measures have been implemented by the Greek government so that the road accidents are reduced.

However, we cannot say that these measures were sufficient since the number of road accident remains large.

2013

In the year 2013, the numbers of injured have been reduced for all ages compared to the previous years that we have analyzed. Once again, men aged 20-29 hold the lead, and in particular at the hours between 13 and 16 pm (589 injured) and 17-20 (582 injured). We have noticed that the injured men in the age group of 20-29, which represent the highest rates, has fallen sharply. In other words, in the initial year of our study the number of injured people was 830while now this number has fallen to 582 (248 injured fewer). This is a positive result. If proper prevention measures are being taken these numbers will be further reduced.

2014

Concerning 2014, there are no major differences compared to 2013. Once again, men 20-29 are the most injured at exactly the same hour (588 injured).This means 6 additional injured men in comparison to the previous year.

2015

The last year of our analysis is 2015. The category with the most injured remains exactly the same with the number of wounded being 562. This is a smaller number in comparison with the previous five years that we have analyzed above. There are no major variations in the rest of the categories in comparison with the previous year.

To conclude, the category of men aged between 20 and 29 is the ones with the highest number of injured people proportionally in all six years that we have analyzed and especially during the hours between 13 and 16 pm. Over the years there has been a relative decrease in this number however this decrease cannot be characterized as slight in any way. Due to these facts, we would need to concentrate on finding specific ways of dealing with this social problem. Ways that will be efficient and will lead to better results. We would need to concentrate on educating the young people in a more efficient way so that they gain all knowledge and experience needed to drive appropriately in their whole life. The young people are the ones that need to be aware of the dangers while driving and they should learn how to always follow correctly the road traffic codes/rules.

3. COMPARISON OF THE THREE UNDER STUDY COUNTRIES

The road victims[5] (casualties) in the three under study countries, appear in the below table. From 2010 until 2015, the total road accident victims in all three countries were 418603 people. Each year the number of the victims decline for Greece, Lithuania and Poland.

Table 11: A comparative table of road casualties in the three countries (Greece, Lithuania, Poland) **Source:** OECD

Variable	Road casualties (injured + killed)						
Unit	Persons						
Year	2010	2011	2012	2013	2014	2015	**Total number**
Country							
Greece	20366	18400	16628	16054	15359	14889	**101696**
Lithuania	4529	4215	4253	4263	4014	3836	**25110**
Poland	52859	53690	49369	47416	45747	42716	**291797**
TOTALS per year	**77754**	**76305**	**70250**	**67733**	**65120**	**61441**	**418603**

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[5]**http://stats.oecd.org/OECDStat_Metadata/ShowMetadata.ashx?Dataset=ITF_ROAD_ACCIDENTS&ShowOnWeb=true&Lang=en**

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Similarly, the number of injury accidents are more in Poland, less in Greece and even less in Lithuania, because of the different demographic status among those countries. The injury accidents are declining year by year, yet the number is still very high.

Table 12: A comparative table of road injury accidents in the three countries (Greece, Lithuania, Poland) Source: OECD

Variable	Road injury accidents						
Unit	Number						
Year	2010	2011	2012	2013	2014	2015	Total accidents
Country							
Greece	15032	13849	12398	12109	11690	11440	**76518**
Lithuania	3530	3266	3391	3391	3225	3033	**19836**
Poland	38832	40065	37062	35847	34970	32967	**219743**
TOTAL ACCIDENTS per year	57394	57180	52851	51347	49885	47440	**316097**

4. ANTICIPATION MEASURES

The thorough research in Greek Provinces show the extend problem of road accidents and the tough cost of life lose. Numbers can give us all the evolution of this tragic reality and shall aware each single human being. Accidents don't just happen by chance. On the contrary, most of them could have been avoided.

The ETSC (European Transport Safety Council) identifies a slight decrease of the fatal accidents on road at the European Union by 2 % the years 2017 and 2016. The target is to minimize this number by 50% until 2020. However, this seems very difficult since within the years 2010 – 2017 there was only a 20% decrease at the E.U., which means that there is still a large percentage remaining (ETSC,2018).

For the achievement of the goal three basic principals have been set: i) Pursuit of highest prototype of road safety, ii) Active engagement of all sectors at all levels of Public and Private sector, which have taken measures for the decrease of the accidents on road, iii) Informing the citizens to take over their own percentage of the responsibility for the safety on roads of the E.U.

To minimize road accidents some anticipation measures are necessary, such as the use of *seatbelt* not only in front seats, but in the rear seats as well. The non use of a seatbelt is one out of four causes of death in traffic accidents. Moreover, according to an E.U. report 5000 deaths in annual basis are caused due to driving under the influence of *alcohol*. For this reason road patrols must be intensified and more strict penalties for the offenders of the law should be adopted. A third cause of accidents is the *attention distraction* while driving, which has serious consequences and the use of mobile phone is the main reason. Even though 90% of drivers admits that use of mobile phone while driving is unacceptable, 80% of them admit that they use it. In Greece there was a recent change of the Traffic Code which prohibits the use of mobile phones while driving. Furthermore, *motorbike* is a favorite mean of transport for people. However, the possibilities to be engaged in an accident are 16 times more than when compared to car. The use of helmet should accompany every movement with motorbike, so as to protect from serious injuries. Compliance with the rules of road behavior is a requirement for avoidance of traffic accidents.

Over speeding is the cause of 30% of traffic accidents. *For the short-term solution* of the problem the combination of the following factors is needed: i)Better road network infrastructure (More noticeable speed limit traffic labels, placing of bumpers to areas with large movement of pedestrians or children like schools, parks and children playgrounds), ii) Settlement of speed limits, iii) Education of drivers, iv) Implication of increased patrolling levels and stricter compliance with the rule of road behavior.

The effective utilization of new technologies and placement of smart speed adjusting systems (ISA) to the vehicles would be a satisfactory *long-term* measure.

Regarding the *Road Network*, the state is responsible for making it safe for its citizens. The continuous maintenance of the road network, the proper signing and the functionality of the traffic lights in the cities as well as the necessary zebra's crossings are the obligatory necessities for the safety of drivers.

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According to researches 8100 *children* have been killed on the roads of European Union over the last decade. From the fatal accidents concerning the children in 50% of them they are car passengers, 1/3 are pedestrians and around 13% are on bicycles. Based on the above researches one of the thirteen children deaths is due to a traffic accident. Parents and civilians from their point of view, should comply strictly with the Traffic Code not only for the speed but also for the proper positioning of children in the vehicle.

At the developed countries, the main cause of death for *young people* aged between 15-24 years of age are the road accidents, as present research shows specifically. The percentage of the accidents of young drivers is double when compared to the experienced ones. Cause of accidents is loss of control, mainly due to over speeding and driving during the night after alcohol consumption. There are several steps we could follow for the protection of young drivers such as: i) More strict audits should be applied to young drivers , ii) The highest allowed limit of alcohol consumption should be diminished, iii) Driving at night without the company of an experienced driver should be limited, iv) The education for getting driving license should be improved, like for example it should be focused to the way of recognizing and avoiding of the road dangers, beyond the knowledge for traffic rules and vehicle control. HERMES program of the E.U. contains guidelines for the improvement of drivers' education.

Finally, there are five actions that should be taken into account by everyone, in order to prevent accidents, and those are: Awareness, Sensitivity, Activation, Education and New Technologies. May all help in stop painting red – by human's blood, the blurry roads.

5. CONCLUSION

In the present paper, we have initially written down all road accidents that happened in Greek provinces, regarding the number of casualties (drivers, pedestrians, passengers) during 2010-2015. From the extracted data it is shown, that in almost each road accident at least one driver is killed and about half of the casualties are passengers, whereas pedestrians are the least to be killed or injured. From another data process, concerning the sex, the age and the time of the accident, came up that Greek young males of 20-29 years are the major road victims. In general, from year 2010, the road accidents and the number of victims tend to decrease, and not only in Greece but in Poland and Lithuania, too.

The purpose of this paper was to demonstrate the size of road accidents, to process data and statistics and conduct to any possible conclusion. The proper data collection and processing, has indeed led to the pre mentioned expected results. A future study could focus on children's road accidents, so as to raise awareness in an effort to minimize the loss of young lives.

REFERENCES

European Transport Safety Council, *About us,* 2018, available at https://etsc.eu/about-us/

European Commission, *Annual Accident Report 2016,* available at https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/statistics/dacota/asr2016.pdf

Jakubauskas Gazvydas, *Road safety strategy: Lithuania*, Ministry of Transport and Communications of the Republic of Lithuania, available at https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/2015_round_tables/grazvydas_jakubauskas.pdf

Ministry of Transport and Communications of the Republic of Lithuania**,** *Annual average daily traffic,* available at https://lakd.lrv.lt/en/sector-activities/traffic-volumes/annual-average-daily-traffic-aadt-in-2016

Ministry of Transport and Communications of the Republic of Lithuania, *National safety strategies and action plans*, available at https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/20151210_1_lithuania.pdf

Sadauskas Vigilijus, *Investigation of road accidents on Lithuanian state roads,* available at https://www.draudimas.com/allfiles/Eismo_ivykiu_keliuose_tyrimai_Lietuvoje.pdf

Statista, *Number of road fatalities in Lithuania from 2006-2015,* available at https://www.statista.com/statistics/437932/number-of-road-deaths-in-lithuania/

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Wikipedia, *About Lithuania*, available at https://en.wikipedia.org/wiki/Lithuania

World Health Rankings. *Lithuania road traffic accidents,* available at http://www.worldlifeexpectancy.com/lithuania-road-traffic-accidents

Hellenic Statistical Authority, *Population and Social Conditions: Road Traffic Accidents yearly,* available at http://www.statistics.gr/

https://osp.stat.gov.lt/documents/10180/3329771/Transport.pdf

https://www.baltictimes.com/news/articles/20905/

http://www.ioas.gr/symvoules_gia_tin_odiki_asfaleia/