BUILDING THE GREEN-SMART WAY: EXPLORING CONDITIONS FOR GREEN AND SMART FURNITURE MANUFACTURING FOR PEOPLE IN THE THIRD AGE

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ABSTRACT

The present paper discusses some of the findings of an ongoing "Green & Smart Furniture" (GSF) research project. It actually focuses on third-age consumers' behavior and interest in purchasing smart and eco-friendly wooden furniture. The research reveals the critical elements for a successful design and production of GSF products that will enhance both needs and expectations of the consumers. Thus, 399 specially constructed questionnaires were gathered during 2013, which were further elaborated and statistically analyzed with SPSS ver 17.0.

Results are quite encouraging for the enterprises that would decide to design and produce smart and eco-friendly wooden products. Consumers show a significant interest in purchasing GSF at a percentage of 70%. They are willing to pay an extra amount of 9% in average than regular prices of conventional furniture. The most important factors in purchasing GSF have been found to be price, quality, functionality, safety and ergonomics, as well as the type of raw materials.

Keywords: *Green Wooden Furniture, Smart Furniture, GSF, Market research, Consumers' Behaviour, Third age, Greece, sustainability*

1. INTRODUCTION

European Union, is one of the biggest manufacturers, traders and consumers of wooden product in the world (European Commission, 2013). Furthermore, the sector of furniture manufacturing in the E.U. has a strong presence internationally, mainly because of the high quality standards in technical and aesthetical level (UEA, 2005). During the period 2000-2007, furniture industry has known significant growth because of a sum of specific conditions. Nevertheless, there is in general a growing concern related to the environmental consequences that occur by the production, use and disposal of goods during the end of their life (Humphrey and Schmitz, 2001).

The knowledge on environmental consequences of the materials that are been frequently used in a particular industrial sector, constitutes enterprises capable to improve their products and their production processes by an environmental point of view and thus to accelerate their entrance to the emerging markets of green products (Nedermark, 1998).

Many furniture manufacturers at a global level, understand the responsibility they have in making environmental friendly furniture, since green products in general that are gradually been introduced in markets, force the designers of products to include environmental criteria in the production processes and in final products (Maxwell and van der Vorst, 2003; Shapiro and White, 1999) and thus the number of such enterprises is growing constantly (Frondel et al., 2007; Epstein and Roy, 2006).

Regarding Greek furniture sector, a related study of Papadopoulos et al., (2010) has shown that the majority of the Greek furniture enterprises are strongly support green entrepreneurship and certification of wood regarding its environmental impacts. Through this process, the firms believe that they will be able to develop new fields of entrepreneurial activity, based to certified ecological furniture products, enhancing their competitiveness and innovative activity (Trigkas et al., 2011).

2. LITERATURE REVIEW

2.1 Green wooden products

Eco-furniture or "green" furniture, is defined as a product of furniture designed to minimize the environmental impact during its whole life-cycle (Albino et al., 2009; Baumann et al., 2002) and thus furniture with characteristics of environmental compatibility, taking into consideration all the stages in furniture life-cycle (Alhola 2008; Progetto Life, 2005).

Several research initiatives have been launched during the last years regarding furniture desgn and production that are environmental friendly. The 'Life Environmental Ecofriendly furniture project' has been launched in Italy during 2001 aiming in developing furniture prototypes with elements compatible to environmental protection, taking under consideration all the stages of a furniture life cycle (Progetto Life, 2005).

A very interesting initiative was also the Finnish Furniture Panel launched in 2004 focusing to environmental impacts of furniture during their life cycle, further aiming in finding solutions regarding the development of the sustainable growth of the furniture industry in the country (Finnish Furniture Panel, 2005; Nissinen and Parikka, 2007). Additionally, several web sites were developed, containing all the related information regarding issues concerning ecological furniture, for manufacturers as long for the consumers (Ecosmes, 2005; Nordic Ecolabelling, 2003; GRIP, 1998).

2.2 Smart furniture

Furniture constitutes part of our everyday living environment especially inside buildings, through which the user comes to a direct interactive contact in executing several activities. Studying daily routine and needs of a person through its interaction with furniture and utilizing technology, it is possible to develop new uses for furniture that will contribute to the improvement of quality of life.

Smart furniture constitutes the future evolution and tendency in furniture industry (Tokuda et al., 2003; Zongdeng and Wenjin, 2010). Thus, a smart furniture product has the capability to alter a conventional space into an intelligent spot that includes computing systems (Ito et al., 2003). Since a smart furniture is equipped with computing networks, sensors (Mavrommati et al., 2003) and several information technology devices, it could offer many different services, either by itself or in cooperation with other devices and items of the everyday human environment under the context of a Ubiquitous Computing (UmpiComp) environment (Wuliji, 2009). UmpiComp environments, regard the method in including and using computing systems in a way that constitutes them available to our everyday living environment, making them simultaneously "invisible" to the user (Weiser, 1993).

In a related study (Karvelas, 2007), some of the research projects in the field are presented, regarding smart furniture in networking to ubiquitous computing systems and environments.

Indicatively we refer the construction of a smart table which can recognize what and how much we are eating and which has been developed by a research team of the National University of Taiwan. The Dietary-Aware Dining Table using sensors for measuring the wage of objects and RFID technology in identifying objects, could know the amount and the type of food that has been consumed by the users during one meal (Chang et al., 2006).

Another example has to do with the Drift Table and the Key Table which were developed under the context of the project for residential technologies of Equator IRC, as smart furniture embedding functions such as, slow moving presentations of aerial photos, which their speed, direction and height are defined by the disposal of objects on its surface and their wage, or such as in understanding the mood of the user by the force that he put objects on the surface, using wage sensors (Gaver et al., 2004; Boucher et al., 2006).

The E.U. is also giving special attention in the development of smart furniture for the third age through the funding of the WIDER project (2014), in order to give the opportunity to furniture industries across Europe to innovate and differentiate from the competition and to produce this kind of products.

2.3 Target group for Eco and Smart furniture

The U.S. Congress spends approximately $1.5 trillion for health care services on a yearly basis, while the forthcoming years the population of the third age is expected to become bigger than the younger

one (AAHSA, 2003; Dishman, 2004). The percentage of the U.S. population that is expected to be over 65 years old, shows constantly a growing tendency and it is foreseen to reach the 18,2% of the country's total population in 2025, with this tendency to be global (Dishman, 2004).

Furthermore, the improvement of living and the evolutions in the medicine science have contributed to the increment of the expected living, since during the second half of the 20th century expected living has been increased by 30-40 years (Huth, 1986, Pennathur et al., 2003). According to the forthcoming evolutions in medicine science and biochemist, the expected living is foreseen to be further increased for 20-30 years during the next generation (Pennathur et al., 2003).

Ageing in the third age is manifested usually through the reduction of stamina, ware down of bones and muscles atrophy, slowing down of senses and spiritual capabilities, loss of balance and slowing down of person's activity and mobility (Pheasant, 1986 in Comfurt, 2003a; Burke, 1990).

Many research efforts has been made internationally during the last years regarding the design and development of products that would make easier the way of living of the aged people improving their surrounding space, especially in residencies, aiming to the confrontation or to the tempering of the negative consequences of ageing (Anderson, 1975; Demirbilek, 1999; Haigh, 1993; Naqvi et al., 1994; Pinto et al., 2000; Comfurt, 2003a; Jönsson, 2003; Pennathur et al., 2003; Nikopoulos, 2010).

Thus the target group for "smart and eco furniture" under the context of the present research, has to do with the third age to which the research could offer many solutions in improving their everyday living, through becoming more independent, reduction of health care costs, improvement of their quality of life, securing spare time for persons that are involved to their treatment, improvement of their capabilities and cure until a level through everyday treatment. Regarding furniture enterprises, such an effort could have economic benefits in case of their mass production.

The aim of the present research under the context of the project GSF – Green and Smart (Eco-logical) Furniture, was to register the opinions and the correspondence of furniture consumers of the third age regarding smart and sheer ecological furniture, having as a main scope the introduction of the criteria according to which the first furniture with the above mentioned elements, will be designed at a European level.

3. RESEARCH METHOD

A research instrument was developed to serve as the basis for collecting data pertaining to the study's parameters. All questionnaire items were constructed using self-typing 5-point Likert scales. Furthermore a number of questions would be of multiple-choice type. Both are well-accepted practices in this type of research. It should be noted that most questions reflect perceptions of the interviewed sample in order to outline the trends regarding GSF for the specific target group.

The items pertaining to each scale were pre-tested with 5 face-to-face interviews. The pre-testing process allowed the researchers to assess the content validity of items and ensure that interviewees understood the research instrument as they were intended.

The questionnaire included 4 different groups of interest and a total of 23 questions. The first group of questions regarded the general characteristics of furniture products that are currently used by the consumers. The second group included 9 questions related to the awareness of the consumers regarding the meaning of ecology and the inclusion of technology in furniture products specifically, but also into their everyday living in general. The third group constitutes of questions related to the type, specific characteristics and elements of smart and ecological furniture which could be developed as long the amount that the consumers are willing to pay extra in acquiring such a product. Finally, the fourth group was formed by questions regarding the profile of the consumers that have participated in the research in order to highlight the specific characteristics of the potential consumers of smart and ecological furniture.

The research was addressed to a random sample of 399 consumers from different regions of the country during 2013. Questions were selected in such a way in order to be short and comprehensive for the best possible convenience of the participants.

Before the launch of the study, a content validity test was conducted regarding the questionnaire. This test was based on discussions with furniture enterprises and specialized scientists in the furniture field along with the extended literature reviewing. Following this, a pilot questionnaire was tested to 10 consumers. The pre-sampling results indicated the points that needed to be further clarified improving the quality of the questionnaire (Dillman, 2000).

The construct validity was based on the test of unidimensionality of the elements constituting each factor, as well as the content validity of each factor separately. We used Factor analysis according to the method of Principal Component Analysis. Regarding the content validity of the research variables, the statistical factor of Cronbach's Alpha was used (Siomkos and Vasilikopoulou, 2005; Chantzoudis et al., 2009; Sarigiannidis et al., 2009).

Data were processed and analyzed using the statistic package SPSSWIN ver 17.0 and all the related tests of Frequencies, Descriptives, Crosstabs, Correlation analysis and Cluster analysis were made (Norusis, 2007; Howitt and Cramer, 2003), in order to highlight the specific characteristics of the potential consumers of smart and ecological furniture and the range of integration regarding attributes – functions of the furniture products.

4. RESULTS

The sample consists mainly of people between 61 - 75 years old, of low and average annual family income ranging from 5.000€ to 20.000€. Furthermore, the majority states that they live in towns in detached residences with a surface from 50 to 100 square meters, while the 24,0% of them owns bigger spaces (101 - 120 square meters). The majority live with husbands/wives or the rest of the family.

The analysis of the first group of the research's questions delineated the contemporary use of furniture in residences and their specific characteristics regarding people of the third age. Spending most time, in their living room (at a percentage of 40,4%) and kitchen (at a percentage of 32,6%) the target group places great importance on chairs (27,9%) and tables. Wooden furniture comes also first to the participating consumers' favor regarding everyday use.

A 54,4% of the target-group consumers admit that they are not willing to replace conventional furniture with green and smart ones unless it is cheaper (Figure 1). This finding is quite normal considering the squeezed income in the current difficult economic climate in Greece during the last 4 years. However, there are also three more criteria that seem to have a significant role in purchasing GSF: a) health condition (50,4%), b) assistance of GSF to everyday living (49,4%) and c) environmental protection along with the improvement of their everyday living conditions (49,1%). The last criterion confirms further previous relative researches (Papadopoulos et al., 2010; Trigkas et al., 2011) regarding the role of environmental protection in developing new target groups and markets for the furniture and wood sectors in Greece and in general, as well as for the development of new entrepreneurial opportunities under the context of green entrepreneurship. The awareness of contemporary consumers of environmental issues indicates that the area of green furniture should be an alternative aspect under consideration by furniture enterprises when forming their competitive strategies.

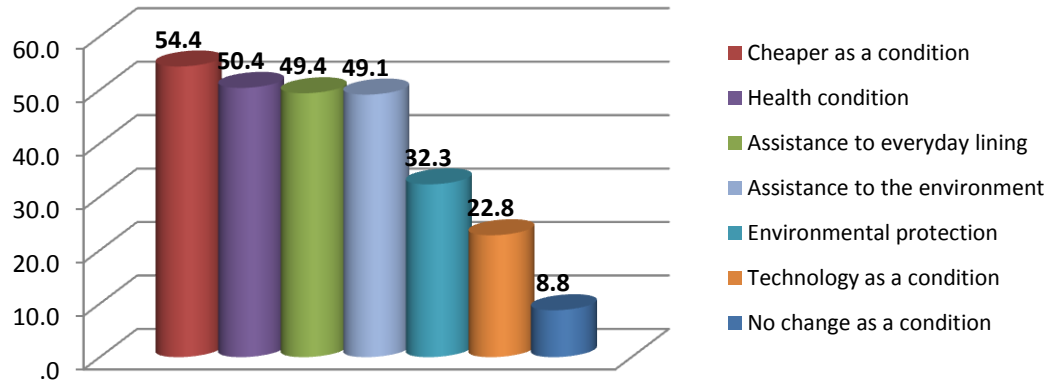

Figure 1. *Criteria for changing conventional furniture with smart and ecological ones*

The analysis of the answers to the third-group questions indicated characteristics and properties desired by GSF in regard to:

- environmental and natural resources protection,
- technology and its applications

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- the specific needs and demands of end users and their surrounding space.

Therefore, the most important criteria using a 5-Linkert scale (with 1 as very much) appear to be:

a) sustainability regarding natural resources' use (ranking 1.72),

b) production processes that respects the environment (1.74),

c) energy saving during production and use (1.79) and

d) to be manufactured by recyclable materials (1.82).

Attributes such as ergonomics, safety, use of ecological finishing materials, the ability of reusing the components in the end of life-cycle and the use of innovative materials, follow at a lower significance ranking.

It should mentioned that these findings coincide with EU policies on furniture's value chain, which set among major priorities the production and use of products that minimize their environmental footprint, in the context of efficient use of resources and sustainability. Forest products should follow the Cascade principle according to the European Commission (2013), and thus present a life cycle of: a) production, b) reuse, c) recycle, d) bioenergy production and e) eco-disposal of wooden products

CHARACTERISTICS AND PROPERTIES **OF ECOLOGICAL FURNITURE**	**Rank**	**Std. Dev.**
Preservation of natural resources	1.72	.963
Environmental friendly production process	1.74	1.042
Energy saving	1.79	.971
Use of recycable materials	1.82	.938
Safety and Ergonomics	1.86	.937
Use of ecological varnishes	1.91	1.148
Material reusability	2.02	1.113
Use of innovative materials	2.37	1.193

Table 1. *Criteria that ecological furniture should meet (ranking 1 till 5, with 1=very much and 5=not at all)*

The familiarity of third-age consumers with technology was further explored as well as the range of inclusion of computing systems into several technological applications and functions. 36.3% of the respondents consider the use of technology as a good idea while the 31.6% consider it as quite necessary and a 25% stated that technology helps a lot their everyday living. These consumers seem to have bigger familiarity with technology mainly regarding applications such as the use of mobile phones (2,54), home automations like automatic wind screens and lightning (3,39), use of audiovisual

means such as TV, DVD, projectors. (3.43), and IT and internet at a ranking of 3.79 and 4.00 respectively.

Focusing more on the specific characteristics and properties of smart furniture, the analysis of the results has revealed that the anthropocentric design constitutes the basic property of the furniture product with technological characteristics to follow. Such attributes could be the capability of warning for health problems of the person at home or the capability to communicate with the user and interact with its environment.

These findings could be further correlated with the results of Table 2, regarding the aims that smart furniture should achieve. Thus, at a declining significance ranking, the participants consider that smart furniture should facilitate user's everyday living > execute some routine activities > secure an independent everyday living of the person > generate a pleasant environment inside the house.

Aims regarding the health of the user, such as the function of becoming a warning device in health and safety issues and the monitoring of the person's health in general follow with a ranking of 2.03. Chi square test has shown that a statistical significant correlation exists between groups of ages and a) the property of facilitating the communication with other people outside the house (Pearson X2 = 33.53, for a significance level >99.9% Approx. Sig= 0.001) and b) monitoring of person's health (Pearson X2 = 32.51, for a significance level >99.5% Approx. Sig= 0.005). Hence, the older the person, the bigger becomes the need of communication with other people and the monitoring of their health.

PROPERTIES AND CHARACTERISTICS OF SMART FURNITURE	**Rank**	**Std. Dev.**
Facilitation of user's everyday living	1.40	.760
Facilitation of user's routine works	1.73	1.137
The independent everyday living of users	1.87	1.062
Pleasant environment inside the houses	1.88	1.064
Its function as a warning device regarding user's health and safety issues	1.89	1.130
Monitoring of user's health	2.03	1.510
Securing the user's privacy	2.07	1.189
Interraction with other furniture	2.26	1.286
Communication with person outside the house	2.49	1.383

Table 2. *Properties and characteristics of smart furniture (ranking 1 till 5, with 1=very much and 5=not at all)*

Thus, anthropocentric design is significant for smart furniture with the potential to facilitate user's everyday routines in a pleasant environment inside the house with parallel simple and easy-to-use technological support in health issues such as monitoring and warning.

Finally, the three most important factors that influence the participants' decision in purchasing GSF appear to be price, quality and functionality of the furniture as presented in Table 3. The rest of the factors follow, such as safety and ergonomics, environmental protection, technology and the design.

FACTORS	Rank	Std. Dev.
Price	1.40	.821
Quality	1.43	.750
Functionality	1.53	.820
Safety and ergonomics	1.60	.862
Raw materials	1.70	.926
Environmental protection	1.81	1.009
Technology	2.29	1.295
Design	2.40	1.326

Table 3. Factors and range of influence in purchasing smart and ecological furniture (ranking 1 till 5, with 1=very much and 5=not at all)

The above mentioned factors of Table 3 are correlating each other and the correlation analysis using the Pearson correlation coefficient (Pcc) indicates that at a significance level of 0.01 the factors that affect positively each other in order for a consumer to buy GSF are the following:

- Quality in relation to a) raw materials used for manufacturing (Pcc = 0.606), b) functionality (Pcc = 0.469), c) ergonomics and safety (Pcc=0.412).
- Price in relation to a) quality (Pcc = 0.365) and b) functionality (Pcc = 0.229).
- Functionality in relation to a) safety and ergonomics (Pcc = 0.626) and b) raw materials used in manufacturing (Pcc = 0.560).
- Design in relation to a) technology (Pcc = 0.624) and b) ergonomics and safety (Pcc = 0.455).

Based on these findings, it is speculated that the added value for the GSF consumer is significantly related to economic factors, which is quite expected within the context of the severe Greek economic crisis. Qualitative characteristics and facilitation of everyday routine of users follow indicating that the main criteria regarding the decision of purchasing GSF are not substantially different of those for the conventional furniture. Nevertheless, firms will have to detect these specific elements that will allow them to achieve differentiation during production, including the incorporation of sophisticated technology and environmental protection in their products.

Following the above mentioned findings and according to Table 4, it is observed that the consumers' preferences, regarding the functions that a smart furniture could have, are mainly oriented towards: a) the convenience in maintenance and cleaning (1.64), b) convenience in movement (1.67), c) safety (1.71) and d) support of persons for changing spots of the furniture or adjustment of its dimensions according to their anthropometric characteristics.

FACTORS INFLUENCING PURCHASING DECISION	Rank	Std. Dev.

Convenient maintenance and cleaning	1.64	.974
Supporting of furniture to persons with the capability of easy movement	1.67	1.109
Safety of furniture	1.71	.938
Supporting of furniture to persons to change from sitting in vertical position and vice versa (chair/bed)	1.72	1.079
Supporting of furniture to persons with movement and adjustment to the anthropometric characteristic (height of table)	1.83	1.217
Informing of relatives for health problems	1.92	1.290
Other characteristic	2.33	2.309
Informing of relatives for routine activities	2.76	1.566

Table 4. *Functions of a GSF (ranking 1 till 5, with 1=very much and 5=not at all)*

The functions of smart furniture should secure convenience and adjustments to individual anthropometrics and kinesiology according to age and safety. The average consumer of the third age, according to the research, thinks of multifunctional furniture, which will furthermore contribute towards the reduction of everyday living cost through the satisfaction of a wider range of needs.

Of significant importance are also the findings presented in Figure 2 which concern the extra amount of money that the consumers are willing to pay in order to buy GSF. A rather satisfactory 27.4% states that are willing to pay a 5-10% extra for GSF compared to conventional furniture. Adding the percentage of those who are willing to pay an extra 1-5% (22.4%) and an extra 11-15% (18.6%), a cumulative percentage of 68% of the research sample seems willing to pay till 15% more for GSF in relation to a conventional furniture.

These findings are quite significant, since besides the economic downturn and its dramatic consequences to the family income and the furniture sector in Greece, consumers are willing to pay extra for the added value of a furniture product with technological and ecological innovations to satisfy specific needs. This information is quite valuable for the furniture manufacturing sector; it actually can constitute an important recommendation regarding competitive strategies based on differentiation. Reconsideration of low-cost business strategies towards innovation and differentiation are quite sufficient to secure a significant part of the internal market and furthermore, to boost extroversion within the crisis context (Papadopoulos et al., 2012; Trigkas et al., 2012; Papadopoulos et al., 2010).

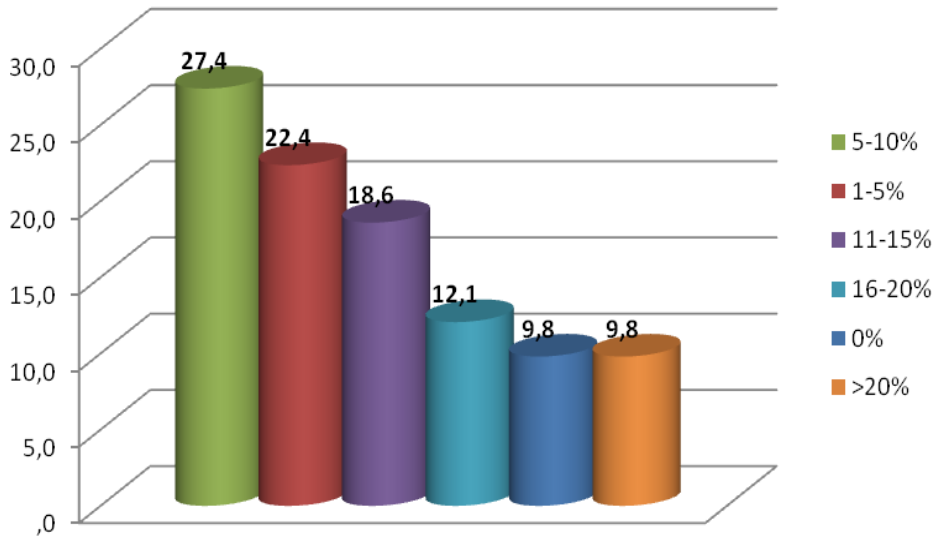

Figure 2. *Extra amount of money that consumers are willing to pay for a smart and ecological furniture*

Thus, according to the above mentioned results, it seems that there exists a "critical mass" of consumers of GSF in Greece, which can constitute a significant market for innovative Greek furniture enterprises during the period of the economic recession. Furthermore, the specific type of furniture can also support export activities which are rather rare for the Greek furniture sector.

Using cluster analysis we tried to focus more on the preferences of the target group of potential GSF consumers in relation to their specific characteristics and profile, such as their age and income. Table 5 presents the basic GSF properties and characteristics in relation to the consumers' age. Thus, it seems that for almost the sum of the age groups, these properties are convenience in maintenance and cleaning and the convenience in moving the furniture, especially for ages over 66 years old, as well as supporting in changing positions when sitting. The capability of warning for health problems seems to play a significant role for ages over 75 years old.

Age Groups	Furniture Attributes	Rank
<50 years	Safety	1.50
	Convenience in maintenance and cleaning	1.56
50-55	Moving the furniture	1.56
	Convenience in maintenance and cleaning	1.73
56-60	Convenience in maintenance and cleaning	1.70
	Safety	1.75
61-65	Adjustment to anthropometrics	1.61
	Supporting in changing position from sitting into vertical and vise versa	1.74
66-70	Safety	1.75
	Moving the furniture	1.77
71-75	Convenience in maintenance and cleaning	1.47
	Moving the furniture	1.50
76-80	Convenience in maintenance and cleaning	1.39
	Warning relatives for health problems	1.61
>80 years	Convenience in maintenance and cleaning	1.00
	Moving the furniture	1.00

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	Supporting in changing position from sitting into vertical and vise versa	1.00
	Adjustment to anthropometrics	1.00

Table 5. *Groups of consumers according to age and furniture attributes (ranking 1 till 5, with 1=very much and 5=not at all)*

What are the main reasons that our target group would decide to pay an extra amount of money? The research indicated (Table 6) that there are actually different criteria for different ranges of percentages of extra amounts. More precisely, the actual purchase price and the level of quality are the main criteria for people who are willing to pay 1-15% more for GSF. The actual price seems to be the only criterion for paying more than 20% since there is a common perception that GSF will be rather expensive. However, the people who seem willing to pay an extra amount of 1-5% expect also better ergonomics, safety, functionality and assurance that environmental protection has been taken into account during production. On the contrary, the results show the willing to pay of the consumers an extra amount from 16-20% has to do mainly with the design of a GSF.

Extra amount	**Criteria in purchasing**	**Rank**
1-5%	Quality	1.12
	Safety - ergonomics	1.12
	Environmental protection	1.16
	Price	1.16
	Functionality	1.16
6-10%	Price	1.20
	Quality	1.20
11-15%	Quality	1.65
	Functionality	1.71
16 – 20%	Design	4,00
>20%	Price	1.19

Table 6. *Groups of consumers according to the extra amount they are willing to pay in purchasing a GSF and purchasing criteria (ranking 1 till 5, with 1=very much and 5=not at all)*

5. CONCLUSIONS - PROPOSALS

Wooden furniture is still the firs preference of the participants of the research, regarding everyday use. Thus, wood could constitute the basis for the construction of a GSF, since it is by its nature an ecological material having the minor environmental footprint in relation to other materials. This property can be even of greater value when wood comes from certified sustainable managed forests and if the wood products bear the relevant labeling at European and international level according to UNECE and FAO (2012).

The criterion of price in relation to the quality plays the most fundamental role in the purchasing decision of GSF and the willingness to change conventional furniture. Modern consumers that belong to the third age seem to have a great awareness regarding environmental issues, a fact that enterprises should take into consideration and include to their planning and strategy.

GSF properties and characteristics of special interest seem to be the promotion of sustainability in natural resources use, the environmentally friendly production process, energy saving during its production and recyclable materials (when other than wood).

Regarding the "smart" - technological characteristics of the GSF, the significant ones are these of the ability to warn for health problems of the person, the ability to communicate with the end users and the ability to interact with its environment, with ergonomic design as a core element. Thus, the participants in the present research consider that "smart" furniture should facilitate their everyday routine and secure independence of the person. Regarding the specific technological applications that could be included to smart furniture, the technology of mobile phones seems to be more familiar to the users with the use of audiovisual means and use of computers and internet to follow.

The main criteria regarding the purchasing decision of GSF do not substantially differentiate in relation to conventional furniture products, a fact that can direct furniture enterprises towards the development of their competitive advantages. Nevertheless, regarding their manufacturing strategy they should detect these elements that differentiate them from competition and allow them to achieve their targets, including sophisticated technology and environmental protection in their products.

The majority of the sample state that are willing to pay an extra amount of 9% in average of the price of a conventional product, while the 2/3 of the consumers could afford a 15% extra amount. This percentage is of great importance if we take under consideration the reduced available income of the consumers because of the economic crisis in Greece during the last 4 years. This percentage is higher than the one found in a relevant study regarding the market of furniture with only ecological characteristics (Papadopoulos et al., 2013). A 10% states that they are not willing to pay extra, a fact that can be explained because of the reasons mentioned above.

These findings are quite encouraging regarding the existence of potential GSF consumers in Greece and indicate that third-age consumers are willing in purchasing GSF that includes sophisticated characteristics and properties focused on their needs which also comply with ecological standards. The capability in warning a familiar person to the GSF user for health problems seems to play a significant role for ages over 75 years old, which are these group of ages that usually need medical care.

The present research is the first in Greece and at European level, according to our knowledge. We could argue that it promotes the development of innovation for furniture manufacturing industries, in

order to approach an extended range of consumers, through the production of GSF. Thus, a new pathway is opening in confronting the difficulties and strong competition that furniture sector faces at national and European level, and recover the crisis (Papadopoulos et al., 2013). Furthermore, findings constitute an optimistic message towards furniture manufacturing sector; firms should redesign their strategy (Papadopoulos et al., 2009), focusing in differentiation by including GSF products in their portfolio, innovating through the production and promotion of furniture products with high added value. This fact could secure a share of the domestic market and boost extroversion, which is of great importance. This optimistic thesis is further certified by the findings of a previous study regarding only ecological furniture (Papadopoulos et al., 2013), where Greek and Cypriot enterprises consider the development of ecological furniture very positively, without mentioning the inclusion of "smart" elements.

Findings also certify the research of Tokuda et al., (2003) and Zongdeng and Wenjin, (2010), that "smart" furniture constitutes the future trend and evolution in the furniture industry.

The present research has certain limitations. Further research could be extended to a bigger sample of consumers in Greece and other countries e.g. Cyprus, Italy, Germany, Spain, France, Russia, Portugal, Israel etc. In this way, we could have a holistic picture of trends and tendencies in these countries too and develop a more concrete portfolio of characteristics and properties of innovative green and smart furniture.

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REFERENCES

Albino, V., Balice, A., Dangelico, R.M. (2009), "Environmental Strategies and Green Product Development: an Overview on Sustainability-Driven Companies", *Business Strategy and the Environment*, Vol. 18, pp. 83–96.

Alhola, Katriina – Parikka, (2008), "Promoting environmentally sound furniture by green public procurement", *Ecological Economics,* Vol. 68, No. 1-2, pp. 472-485.

American Association of Homes and Services for the Aging (AAHSA), (2003), "Progress and Possibilities State of Technology and Aging Services", Program report.

Anderson, J. C. (1995), "Relationship in business markets: Exchange episodes, value creation, and their empirical assessment", *Journal of the Academy of Marketing Science,* Vol. 23, pp. 346–350.

Baumann, H., Boons, F. and Bragd, A. (2002), "Mapping the green product development field: engineering, policy and business perspectives", *Journal of Cleaner Production,* Vol. 10, pp. 409–425.

Boucher, A., Pennington, S., Beaver, J. and Gaver, B. (2006), "Designing Electronic Furniture for the Curious Home", *Convivio Webzine*, Issue 1, http://webzine.convivionetwork.net/

Burke, K. (1990), *The second half of life - A Home To Live In*, Kansas State University, Agricultural Experiment Station and Cooperative Extension Service.

Chang, S., Liu, H., Chu, J., Hsu, C., Chen, T., Lin, C., Chen, Y. and Huang, P. (2006), "The diet-aware dining table: Observing dietary behaviors over a tabletop surface", *PERVASIVE 2006*, pp. 366--382

Chantzoudis, D., Velissariou, A. and Sarigiannidis, L. (2009), "The impact of knowledge management on new product performance: the case of the Greek industry", *PRIME Journal (Practical Issues in Management & Economics)*, Vol. 2, pp. 25-47.

Comfurt, (2003), *A novel design and production approach for comfort furniture for healthy senior citizens*, Biomechanics Institute of Valencia.

Demirbilek, O. (1999), *Involving the elderly in the design process: A particularly design model for useability, safety and attractiveness*, Ph.D. Thesis, Institute of Economics and Social Sciences, Bilkent University.

Dillman, D.A. (2000), *Mail and Internet Surveys: The Tailored Design Method*, John Wiley & Sons, New York, NY.

Dishman, E. (2004), "Inventing Wellness Systems for Aging-in-Place", *Computer Magazine*, Published by IEEE Computer Society.

Ecosmes, (2005), Available at:

http://www.ecosmes.net/cm/navContents?l=EN&navID=info&subNavID=1&pagID=6

Epstein, M.J. and Roy, M.J. (2006), "Implementing a corporate environmental strategy: establishing coordination and control within multinational companies", *Business Strategy and the Environment,* Vol. 16, pp. 389–403.

European Commission, (2013), "A new EU Forest Strategy: for forests and the forest-based sector", Commission Staff Working Document, Brussels 20/9.

Finnish Furniture Panel, (2005),

http://www.ymparisto.fi/default.asp?contentid=185610&lan=FI&clan=en

Frondel, M., Horbach, J. and Rennings, K. (2007), "End-of-pipe or cleaner production? An empirical comparison of environmental innovation decisions across OECD countries", *Business Strategy and the Environment,* Vol. 16, pp. 571–584.

Gaver, W. W., Bowers, J., Boucher, A., Gellerson, H., Pennington, S., Schmidt, A., Steed, A., Villars, N., and Walker, B. (2004), "The drift table: designing for ludic engagement", *Conference on Human Factors in Computing Systems archive*, CHI '04 extended abstracts on Human factors in computing systems, pp. 885 – 900.

GRIP, (1998), "Advice to purchasers — office furniture", The GRIP Centre, Oslo.

Haigh, R. (1993), "The Ageing Process: A Challenge for Design", *Applied Ergonomics*, Vol.24, pp. 9-14.

Howitt, D. and Cramer, D. (2003), *Statistics with SPSS 11 for WINDOWS*, Kleidarithmos Eds, Athens.

Humphrey, J. and Schmitz, H. (2001), "Governance in global value chains", *IDS Bull*, Vol. 32, pp.1-17.

Huth, Jo M. (1986), "Technology's impact on the residential environment of the elderly" *Neht. Journal of Housing and environmental Res.*, Vol.1, pp. 305-322.

Ito M., Iwaya A., Saito M., Nakanishi K., Matsumiya K., Nakazawa J., Nishio N., Takashio K. and Tokuda H. (2003), "Smart furniture: improvising ubiquitous hot-spot environment," *Int. Conf. on Distributed Computing Systems*, pp. 248-253.

Jönsson, B. (2003). *Elderly People and Design*, Lund, Sweden, Department of Design Sciences, LTH, Lund, University.

Karvelas, A. (2007), "Furniture as an interactive device in Ubiquitous Computing Environments", Master Thesis, University of Aegean, Department of Products and Systems Engineering Designers, Syros, Greece.

Mavrommati, I., Markopoulos, P., Calemis, J. and Kameas, A. (2003), "Experiencing Extrovert Gadgets*", Proc. HCI 2003*, Vol. 2, Research Press International, pp. 179-182.

Maxwell, D. and Van derVorst, R. (2003), "Developing sustainable products and services", *Journal of Cleaner Production*, Vol. 11, pp. 883–895.

Naqvi, S.A., Stobbe, T.J. and Jaraiedi, M. (1994), "Prediction of elderly seating comfort from physical condition, chair type and gender", *The International Journal of Industrial Ergonomics*, Vol.13, pp. 289-296.

Nedermark R. (1998), *Ecodesign at Bang & Olufsen in product innovation and eco-efficiency*, In: Klostermann J, Tukker A, editors. Twenty-three industry efforts to reach the factor 4, Kluwer Academic Publishers.

Nikopoulos, F. (2010), "Design of furniture for elder people: Users needs – furniture characteristics", Master Thesis, Aristotle University of Thessaloniki, Faculty of Forestry and Natural Environment, Sector of forest products technology.

Nordic Ecolabelling, (2003), "Swan Labeling of Furniture and Fitments", Version 3.2 March 19, 2003–March 31, 2009.

Norusis, M. (2007), *A guide of data analysis with SPSS 12.0*, Kleidarithmos Eds, Athens.

Papadopoulos, I., Karagouni, G. and Trigkas, M. (2009), "Design of marketing strategies of the Greek wood and furniture enterprises", *Practical Issues in Management and Economics (PRIME) International Journal*, Vol.2, pp. 136-149.

Papadopoulos, I., Karagouni, Glykeria, Trigkas, M. and Platogianni, E. (2010), "Green Marketing. The case of Greece in certified and sustainable managed timber products" *EuroMed Journal of Business*, Vol. 5, No.2. pp. 166-190.

Papadopoulos, I., Trigkas, M. and Karagouni, G. (2010), "The Effects of Economic Crisis on Greek Wood and Furniture Sector and Ways to Confront it", Book Proceedings of *the 3rd Annual International EuroMed Conference of Business Developments Across Countries And Cultures*, Nicosia Cyprus, November 4-5, 2010, pp. 745-767.

Papadopoulos, J., Efthimiou, I., Trigkas, M. and Papadopoulou A. (2012), "Marketing strategies of furniture enterprises during economic crisis", *PRIME Journal (Practical Issues in Management & Economics)*, Vol. 5, pp. 86-102.

Papadopoulos, I., Karagkouni, G., Trigkas, M. and Beltsiou, Z. (2013), "Green Wooden Furniture. Determination of market trends and tendencies in Greece and Cyprus during economic crisis", 6th Annual Internation6al EuroMed Conference, "*Confronting Contemporary Business Challenges through Management Innovation*", Estoril, Cascais, Portugal, 23rd-24th, September 2013, pp 1653-1670.

Pennathur, A., Sivasubramaniam, S., Conteras, L.R. (2003), "Functional limitations in Mexican American elderly", *International Journal of Industrial Ergonomics*, Vol. 31,pp. 41-50.

Pheasant, S.T. (1986), *Bodyspace: Anthropometry, Ergonomics and Design*, Taylor and Francis Ltd., London.

Pinto, R.M., De Medici, S., Van Sant, C., Bianchi, A., Zlotnicki, A. and Napoli, C. (2000), "Ergonomics, gerontechnology, and design for the home-environment", *Applied Ergonomics*, Vol. 31, pp. 317-322.

Progetto Life Ambiente Ecofriendly Furniture, (2005), *LIFE00 ENV/IT/ 000034,* http://life-ambiente-ecofriendly-furniture.consorziocasatoscana.it/html/index.php?newlang=eng

Sarigiannidis, L., Basouri, Z., Chantzoglou, P. and Chantzoudis, D. (2009), "The effects of outsourcing on the organizational output and on the entrepreneurial goals of Greek hotel units", Minutes of the "*2nd Hellenic Congress ESDO*", pp 304-326.

Shapiro, K. and White, A. (1999), "Right from the start: product stewardship through life-cycle design", *Corporate Environmental Strategy*, Vol. 6, pp. 14–23.

Siomkos, G.I. and Mavros, D. (2008), *Market Research*, Stamoulis Publications, Athens.

Siomkos, G.I. and Vasilikopoulou, A.I. (2005), *Implementation of Analysis Methods in the Market Research*, Stamoulis Publications, Athens, Chapter 7, pp 285-312.

Tokuda, Y., Iwasaki, S., Sato, Y., Nakanishi, Y. and Koike, H. (2003), "Ubiquitous Display for Dynamically Changing Environments", Conference on *Human Factors in Computing Systems archive*, CHI '03 extended abstracts on Human factors in computing systems, pp. 976 – 977.

Trigkas, M., Papadopoulos, I., Karagouni Glykeria, (2012), "Implementation characteristics of green entrepreneurship in Greek furniture sector", 7th European Conference on *Innovation and Entrepreneurship (ECIE)*, 20 – 21 September, Santarem, Portugal.

Trigkas, M., Papadopoulos, I., Tassiopoulou K. and Porikos, N. (2011), "Green entrepreneurship in Greek furniture enterprises", Proceedings *Management of International Business and Economics System*, 2011 (MIBES) International Conference, 16 – 18 September, Serres, Greece, pp. 232 – 249.

UEA, (2005). The European Federation of furniture manufacturers, The furniture waste site; 2005, Available at: www.ueanet.com/furniturewaste/frame4.htm.

Weiser, M. (1993), *Some Computer Science Problems in Ubiquitous Computing*, Communications of the ACM.

Wider project, (2014), "Green Growing of SMEs: Innovation and Development in the Energy Sector in the Mediterranean Area", European project http://www.wider-project.eu

Wuliji D. (2009), "Creative design of intelligent children furniture," IEEE 10th Int. Conf. on *Computer- Aided Industrial Design & Conceptual Design*, pp. 1345-1348.

Zongdeng Zh. and Wenjin L. (2010), "The Innovative Design Method of Intelligent Furniture Intelligent System Design and Engineering Application", International Conference on *ISDEA*, Vol. 2, pp. 673-677.

UNECE and FAO, (2012), "Forest Products Annual Market Review 2011-2012", United Nations, New York and Geneva, pp 107-116.