BUILDING PRODUCTS AND INDOOR AIR QUALITY: THE USER DEMAND AND THE MARKET SUPPLY*

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1. Introduction

In the past two decades, in the decision-making spheres, where the health goals and strategies are established and updated, it appears that the key issue is shifting from the health issues related to the urban environment to the issue of human exposure to indoor air pollution. It is estimated that people spend at least 90% of their time indoors, rising to 100% when the focus is on some of the most vulnerable populations, such as elderly, children, sick people, who need maximum protection. The awareness of the correlation between indoor air quality and health of occupants took place in the Seventies. Thanks to studies of the Anglo-Saxon scientific community, in 1987 the World Health Organization (WHO) coined the term Sick Building Syndrome to briefly outline the symptoms detected in groups of workers employed mainly in large buildings.

Scientific studies have shown the relationship between the occurrence of certain symptoms or illnesses, and the working environment, but also the complexity of the problem due to multiple variables related to people, to the characteristics of the physical environment and to the microclimate conditions. The achievement of this awareness and the recognition of the problem by the WHO have been an important stimulus to continue research and broaden the object up to the home environment that, in the collective, is associated with the idea of safety and health, even though the data contradict that. A study, to date still the most complete and detailed, conducted in 1998 by IEMB (Indoor Environment Management Branch) of the EPA (Environmental Protection Agency), intended to compare Indoor / Outdoor concentrations and exposures in relation to hazard air pollutants. The data analysis has supported the hypothesis that indoor concentrations of most pollutants considerably exceed outdoor ones (and that indoor exposures exceed outdoor ones). The revealed indoor concentrations were generally from 1 to 5 times greater and indoor exposures were 10 to 50 times higher than outdoor exposures (EPA, 1998). Indoor air quality has been, then, finally recognized as an essential goal of an integrated strategy for air pollution as a whole.

A fundamental act of the long process of study and research on the issues of air quality, health and comfort of people in buildings is represented by the document "The Right to Healthy Indoor Air" published by World Health Organization in 2000 (WHO, 2000). It contains nine principles on the human right to health, the first of which states unequivocally the right of every person to breathe clean air inside buildings.

Subsequently, in 2003, the European Commission adopted the document "A European Environment and Health Strategy" (COM (2003) 338), which sets the reduction of the adverse health effects due to environmental factors (including respiratory disorders, asthma and allergies associated to air pollution, both external and internal) among the priority objectives. The updated air quality guidelines (WHO, 2006) make explicit reference to the need for specific indoor air pollution guidelines.

The first significant step in this direction was the publication of the indoor air quality guidelines, in relation to dampness and mould (WHO, 2009). The document contains an analysis of the scientific evidence of health problems associated with the presence of dampness and biological contaminants in the indoor environment and provides recommendations and control measures. The most recent guidelines (WHO, 2010) focus on some pollutants, whose concentrations, particularly high in the living environment, cause serious health effects. Therefore, since the indoor pollution originates from either external or internal, it is understandable as the only measures related to the reduction of external concentrations are not sufficient to ensure good indoor air quality and that, therefore, the action should be synergistic.

It's good that the knowledge gained in the scientific community is also spreading in the society. This makes people more sensitive and aware about the issue of health and, at the same time, incites to adopt solutions to make their living environments healthier.

*Selection and peer-review under responsibility of the ECOMONDO

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The choice of green building products goes in this direction (Oberti, 2014), considering the close relationship between the emission of pollutants from building materials and finishing products and the deterioration of the indoor air quality (the scientific literature about this topic is extended and widespread, since the Eighties) (Levin, 1989; Mølhave, 1982).

2. Materials and methods

The main objective of this study is to analyze the user demand and the market supply about the green building products, in particular focusing on the Indoor Air Quality aspects. The research was developed collecting information and data from sources at different levels: scientific articles, economic reports of the building sector, legislative texts, information from manufacturers, informative articles.

3. Results and discussion

3.1. User demand

The results of surveys carried out periodically in the United States, where attention is substantial to the issue of the green building, containing data with high percentages of consumers who are increasingly sensitive and aware of decisions that can have a significant impact not only on the environment, but also on their living environments, in terms of health and safety. The greatest concern is related to the Indoor Air Quality: that emerges from the market surveys about green building. The continued growth of this market, especially in the US, is already a sign of precise will and sensitivity of the user. The findings in the Smart Market Report (McGraw Hill Construction, 2014) demonstrate that green building is increasingly important in the single family and multifamily sectors:

- 62% of those are building new family homes report that they are doing more than 15% of their projects green. By 2018, that percentage increases to 84%.
- 54% of those are building new multifamily homes report that they are doing more than 15% of their projects green. There is also growth expected, with that percentage rising to 79% by 2018.
- 73% of single family builders (up from 61% since the last report) (McGraw Hill Construction, 2012) and 68% of multifamily builders say consumers will pay more for green homes.

Greater consumer interest has contributed to the ongoing growth, leading the experts to anticipate that by 2016 the green single family housing market alone will represent 26%-33% of the market (McGraw Hill Construction, 2014). In the sixth edition of Green Building Market Barometer (Turner Construction Company, 2014), the data demonstrate that commitment to green construction remains high, with a greater attention on the benefits of improving the health, wellbeing and indoor air quality (Fig. 1). Additional important facts come to light from the U.S. market for green building materials: it reached nearly $40.0 billion and $43.8 billion in 2013 and 2014, respectively. This market is expected to grow at a compound annual growth rate (CAGR) of 9.5% to nearly $69.0 billion over the period 2014-2019 (BCC Research, 2015).

In Europe, according to a widespread survey (EC, 2013), lasted one year and announced in 2013, it is emerged that the most Europeans would be prepared to change their purchasing habits and buy more environmentally-friendly, healthier and safer products, but many feel they lack information and distrust manufacturers' environmental claims. The survey indicates that more than three-quarters of respondents are willing to pay more for green products if they were confident that the products are truly green (77%). However, only slightly more than half of EU citizens feel informed (55%) about the environmental impacts of the products they buy and use.

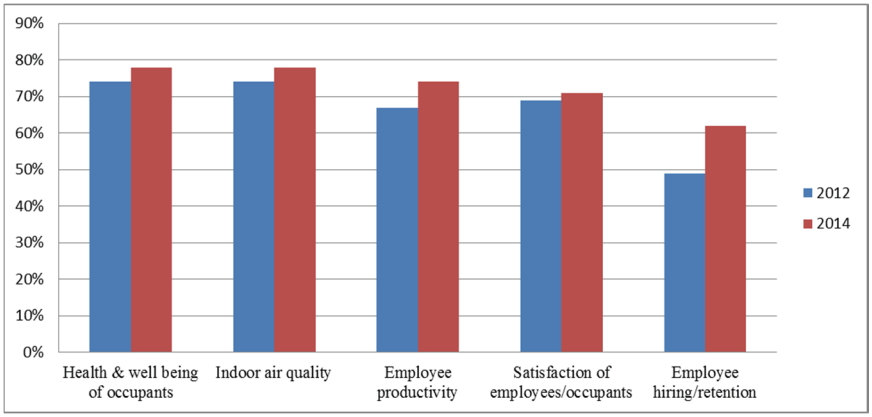

Fig. 1. Importance when evaluating Health and financial benefits of green features. Percentage extremely or very important in 2014 and 2012

From the Italian point of view, an interesting survey about the evolution of the socio-cultural aspects and the consumption of Italians over 14 years, carried out annually by Eurisko, highlighted as the main expectation of the consumers is the possibility to have on the market products not harmful to health and safe (Fig. 2).

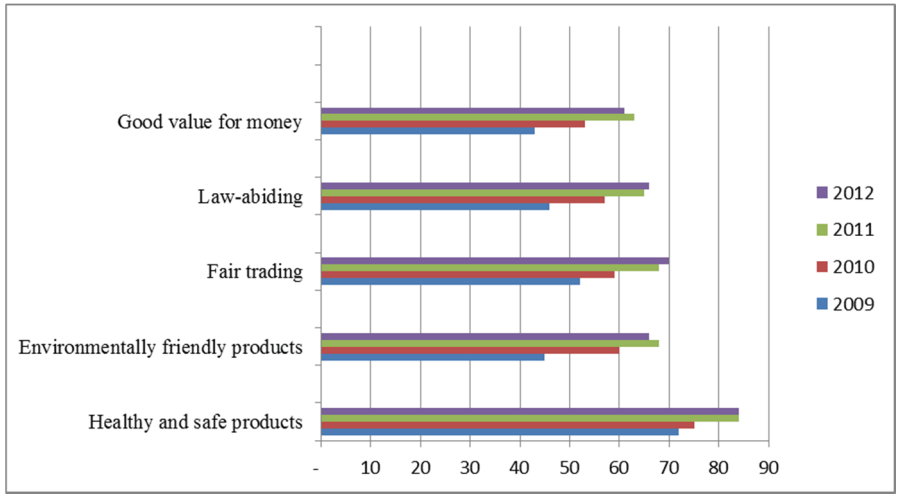

Fig. 2. The increasing expectations of the users about products (Eurisko Sinottica 2009-2012)

The emerging trend from these investigations is the growing consumer awareness of having to direct their purchase choices towards products that are environmentally friendly, healthy and safe. This tendency clashes, however, with an offer of the market not yet completely mature.

3.2. Market supply

Referring to the European survey previously mentioned (EC, 2013), it is interesting to relate the comments on the results of the investigation expressed by EU Environment

Commissioner Janez Potočnik: “Of course we all want to see more green products on shelves, but this survey shows that most of us are confused by green claims and don’t trust them. That is not good for consumers, and it is not rewarding those companies that are really making an effort. We are working with companies and other stakeholders to develop the credible information consumers are looking for when they buy products. This will help develop markets and open up opportunities for innovation and investment in the green economy.”

These words reveal the serious problem related to the market for green products: the poor transparency and clarity of the information provided to the consumers. Inadequate communication can be misleading or liable to create confusion to the addressees of the message, it can obstruct the decision-making process and could undermine confidence in the self-declared environmental claims.

These are the reasons why it becomes necessary to refer to a set of principles to be applied when communicating information about the products performances, as indeed also emphasized by the European Commission in the Communication “Building the single market for green products. Facilitating better information on the environmental performance of products and organisations” (COM (2013) 196). The EU action aims to reduce the current uncertainty on what constitutes a green product and a green organisation. It is a step towards a more integrated internal market, where products and organisations that are genuinely green are recognised by consumers.

Of note, in this direction, also the work in ISO (International Standard Organization) area: within the technical committee ISO/TC 207 “Environmental management”, whose task is the development of legislation on the management of environmental issues, there is a subcommittee SC3 “Environmental labelling”, which deals with the issue of labeling and environmental product declarations and processed the series of standards 14020:2002 Environmental labels and declarations - General principles. In them, guidelines are traced for proper environmental communication on products, offering different types of schemes, joined by the term “environmental claims”.

Such statements, expressed in terms of labels or logos, symbols, declaration, etc., regardless of the form they take, they must respect the basic principles:

- be verifiable, accurate, not misleading and communicated in a non-misleading way;
- to ensure transparency, both to make available, on request of the stakeholders, information about the labelling environmental, and in promoting an open consultation process among stakeholders exactly in the development phase of labeling programs;
- be based on scientific methodologies that allow the accuracy, reproducibility and comparability of results;
- be related to the aspects of the life cycle of the product.

Another critical aspect is related to the cost of green products not yet competitive compared to the traditional (this is especially true in Europe), although over time the gap has been gradually reduced. Among the causes of a higher cost, there are a limited production, the cost of development manufacturing and, in some cases, a specialized distribution (Malin, 2000).

Despite the difficulties, we note the efforts of several manufacturers to provide an adequate response to consumer demands. Wiser and competitive manufacturers are working to change the production process, in order to offer products whose pollutants emission levels are negligible. Some categories of manufacturers are particularly active, such as those of the finishing products. As an example, considering that the main pollutants from building products are VOC (Volatile Organic Compounds) and that the greatest responsibility of air concentrations is due to solvents, the most important producers of paints and adhesives, products in which these substances were present in large measure, proposed in recent years alternative products, with reduced amount of solvents. This was possible thanks to significant investment in research by the manufacturers: the result is the transition from the old

formulations containing polymers in solution to formulations aqueous-based polymeric dispersions or based reactive resin (epoxy, polyurethane) solvents-free.

4. Conclusions

The picture resulting from this work highlights that demand and supply are still far. If on the one hand the consumer appears to have reached a good awareness on the issues of health and safety within the living spaces and consequently requests building products with specific features, on the other hand the market responses are not be able to completely satisfy the needs of the consumer. More research and investments by the manufacturers together with regulatory measures can be the drives so that it is possible matching supply with demand as soon as possible.

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