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RESEARCH CONCERNING DESIGNING SPECIFICATIONS AND COMPONENTS FOR AN ECO-INNOVATIVE TECHNOLOGIES IMPLEMENTATION MODEL

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Abstract: *The development of Romanian clean technologies market is due to legislation, which obliges polluting companies and intensive resources consumers to retrofit. It is the key-role of research institutes to aid and built various consortia, in order to develop solutions and clean process technologies. State and private companies have developed own solutions and green technologies in their research - development - innovation departments. Creating a model for the implementation of eco – innovative technologies is a part of an extensive research, being a component of a virtual hub for eco-innovation, in order to increase the organizational competitiveness in recycling of waste electrical and electronic equipment and the involvement of public and private entities in promoting eco-innovation for the development of green economy. The eco - innovative technologies implementation model represents a tool to achieve this goal, its interactive approach leading to obtain a friendly eco - profile for the user organization, that can be visualized by potential partners and also, to the eco - innovative technology improvement by selecting the best solution, considering the ecological and technological points of view.*

Keywords*: eco-innovation, technology, implementation model*

1. Introduction

National and international economies are focused on sustainable directions concerning goods and services production and consumption, in order to keep a clean environment without harming it, no natural resources depletion or damage of ecosystems.
There are developed and improved many friendly environmentally practices as reducing or eliminating waste levels and pollutants emissions, improving waste treatment, reducing raw materials demand and natural resources usage [1].
European Union highlights ideas for sustainable consumption and production, as overall objective in the EU Sustainable Development Strategy (EU SDS), “by addressing social and economic development within the carrying capacity of ecosystems and decoupling economic growth from environmental degradation and Improving the environmental and social performance of products and processes and encouraging their uptake by business and consumers”.
Between all directions to follow by European Union countries one refers to “increase global market share in the field of environmental technologies and eco – innovations” [2].
Eco-innovation is more and more present in organizations activities for a sustainable consumption and production, “that will contribute to improving the environmental performance of products and increase the demand for more sustainable goods and production technologies”. Its definition emphasizes the society commitment on environment protection, being “any innovation that makes progress towards the goal of sustainable development by reducing impacts on the environment, increasing resilience to environmental pressures or using natural resources more efficiently and responsibly”[1].
The 10-year strategy proposed by the European Commission on 3 March 2010: *Europe 2020* – represents an advancement of the EU economy, aiming "smart, sustainable, inclusive growth" for all European countries, focused also on greater coordination of national and European policy.
The most important instrument is represented by the Eco-innovation Action Plan (EcoAP), which development is oriented on “specific bottlenecks, challenges and opportunities for achieving

environmental objectives through innovation", by complementing other Europe 2020 Flagship Initiatives. The development of EU capacities for a sustainable growth represents an Europe 2020 Strategy priority, also their transition towards a green economy represents a target for the Eco-innovation Action Plan [3].
Main ideas developed for promoting resources efficiency intend to connect economic growth to a rational use of resources; that is the purpose of the Roadmap to a resource efficient Europe, that supports "the shift towards a low-carbon economy, an increased use of renewable energy sources, the modernization our transport sector and promotes energy efficiency".
Analyzing the relationship between the Eco-innovation Action Plan and technologies, the first one is defined like a "tool to identify and implement measures for the deployment of key environmental technologies". It is important to strengthen the cooperation between European Union and Member States, by involving the disseminations of new innovative technologies and promoting appropriate skills development; these are done by using business environment, especially the small and medium enterprises (SMEs), to obtain "the development of a strong and sustainable industrial base able to compete globally"[3].
According to European Council environment targets and to the Kyoto Protocol, in terms of Romanian involvement in eco-innovation, our country aligns to Members States to the implementation of energy-climate change package, that requires the development of "a new economic model to integrate environmental concerns into the production process and the resulting products" [2].
Romanian efforts are increased at eco-innovation level of enterprises by the participation in the "Framework Programme for Competitiveness and Innovation 2007-2013", the Eco-innovation component. The purpose to improve the competitiveness and innovation capacity of the European Community companies is achieved by supporting projects, that aim first application or reproduction on the market of eco –innovative techniques, products or services relevant to the European Union. A sub-program regarding entrepreneurship and innovation provides a 430 million euros budget, for investment activities in eco-innovation projects and facilitating the access to finance for the SMEs creation and development.
The importance of eco –innovation and attracting investments in new green technologies are relevant for the achievement of sustainable economic growth. Romania had some recent ecological improvements, but it is still lagging behind the European Union average, due to the poor encouragement and insufficient funds, also difficult legislation for the small and medium enterprises (SMEs) and eco-innovative companies.
However, data show that the SME segment is interested in obtaining grants for eco –innovation, on account of limited ability to access capital markets. Recent analysis of implemented projects reveals that more than 50% focuses on improvements processing facilities, equipment to increase productivity, optimization of the costs of raw materials, utilities, reducing CO2 emissions and creation of approximately 470 new jobs.
The development of Romanian clean technologies market is due to legislation, which obliges polluting companies and intensive resources consumers to retrofit. It is the key-role of research institutes to aid and built various consortia, in order to develop solutions and clean process technologies. Also, state and private companies have developed own solutions and green technologies in their research - development - innovation departments [4].

2. **The development of the eco-innovative technologies implementation model**

Creating a model for the implementation of eco – innovative technologies is a part of an extensive research, being a component of a virtual hub for eco-innovation in order to increase the organizational competitiveness in recycling of waste electrical and electronic equipment and the involvement of public and private entities in promoting eco-innovation for the development of green economy.
The eco - innovative technologies implementation model represents a tool to achieve this goal, its interactive approach leading to obtain a friendly eco - profile for the user organization, that can be visualized by potential partners and also, to the eco - innovative technology improvement by selecting the best solution, considering the ecological and technological points of view.

It is offered for the user an useful tool to verify his own eco-innovation technology, by drawing his own profile and by analyzing the influence factors in action; there are also presented several successful examples from Romanian industry concerning the eco-innovation technologies applied by companies and innovation centers with activities in the field [5].
By identifying Romanian successful examples and presenting them in the eco – innovation Library of the EcoInnEWaste platform - authors provide the opportunity for an analysis of a relatively wide large range of eco - innovative technologies. It is a chance for entrepreneurs to be informed and to find possible solutions, compatibility or cooperation possibility with other companies involved in waste field.

2.1 The methodology

The first step involves the successful log-on on the EcoInnEWaste hub platform, by entering the name and the password for an authorized user; this allows to access the Tool: *Implementing Eco-Innovative Technology.*
The structure of the model proves its usefulness by clear specifications in designing its components, friendly design of the interfaces, so a lot of business environment issues can have their answers (for producers, users, suppliers or companies interested in Waste of Electrical and Eelectronical Equipments problems), [5].
The development of the eco – innovative technologies implementation model is based on the analysis of Romanian enterprises with successfull green technologies and on the possibility to bring their influence factors to a common denominator. Thus, the model steps to be taken are following the imposed design specifications:

- Specifying the eco-innovation appliance areas:
- preventive eco-innovative technologies;
- Innovative eco-innovative technologies;
- eco-innovation technologies in Research – Development - Innovation;
- monitoring, surveillance and control,
- specifying the factors that have led to the adoption of eco-innovative solutions;
- specification of the existing resources (human, material, financial)- it is important to hire highly qualified personnel for the entity who has the appropriate technical and material endowment for eco - innovation;
- specification of the eco-innovative activity share in the entity's activities, that is necessary to determine the degree of possible involvement in eco-innovation projects;
- specification of the certification systems at the entity level: quality management and environmental management applied at the entity level;
- specification of the entity 's experience in eco - innovative activities;
- specification of the main developed eco - innovative solutions;
- specification of the costs and results of the implementation of eco-innovative solutions;
- specification of the relevance of the implementation results of eco - innovative solutions.

The information management interface for eco - innovative technologies is represented by a screen; the user registers by specifying his organization data, having the possibility of selecting answers for each step (ticking the buttons), the number of the chosen situation being automatically passed to the corresponding box on the screen. This situation is presented in Figure 1, the information to select being written in Romanian, due to the fact the device is offered to the Romanian business environment.

3. Results and discussions concerning the eco-innovative technologies implementation model

As a result of design specifications, the interfaces were friendly designed, so, by clicking one of the presented options, the page with successful / good practice models for the appropriate eco-innovative technologies can be opened, in pdf format.

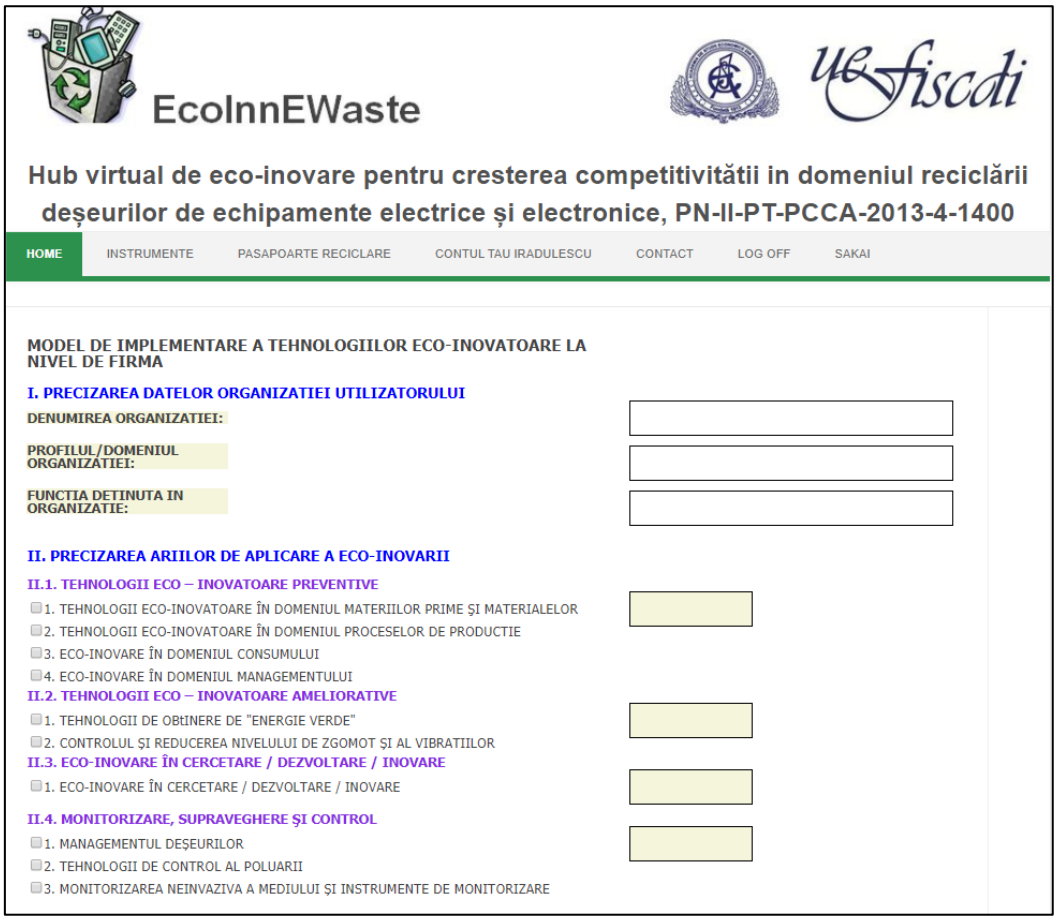

Fig. 1. The Interface of the eco - Innovative technologies implementation model

Design specifications aim to complete the steps mentioned above, to record the data and to obtain the user's profile, in order to be visualised. So, it is possible to obtain an user-friendly "business card" by providing information to application owners, also for data management for the users interested in this domain. With the user's consent, this profile can be made public, after that being possible to establish business rellations, the user can be contacted by potential partners / collaborators in the field or himself can represent a model to follow for other users.
There is an wide range of areas where eco-innovative technologies can be applied, design specifications were made for, ready to take account in viewing profiles.
Areas of eco-innovative technologies that can be consulted and they give business information include (Figure 2):

- Technologies for sieving and recycling household waste;
- Technologies for water treatment and purifying;
- Research - Development – Innovation;
- Waste sorting systems;
- Technologies for terrestrial works, power stations, environmental protection;
- Research - development in engineering and technology;
- Systems to obtain "green energy";
- Exhaust and industrial filtration installations;
- Integrated industrial ecology services (integrated waste management services);
- Absorbent petroleum products;
- Waste management - treatment and co-processing, energy recovery, WEEE treatment, incineration disposal, recycling, medical waste management, sorting and transfer stations;
- Noise and vibration monitoring;

- Decontamination technologies;
- SIP Integrated Construction System, EVOTHERM thermal insulation system;
- Complex technological equipment for refineries, chemical and petrochemical plants, power plants, environmental engineering;
- Heating systems;
- Environmental Engineering;
- Energetic services;
- Containers for chemical industry, surface coating and galvanotechnics, water and air purification;
- Design and execution of electrical installations, automation (intelligent buildings and industrial automation) and electricity;
- Ecological reconstruction services;
- Technologies for monitoring and control the pollution of environmental factors;
- Applications for industrial automation;
- Technology Information Centers, Technological and Business Incubators.

Fig. 2. Profiles visualization to access a good practice model for eco - innovative technologies

The eco - innovative technologies implementation model also offers a component structure that allows the access and the visualization of a model for choosing the optimal version of an eco - innovative technology, by two - steps design specifications within the application.
First step introduces the user in a model worksheet by learning how to analyse and obtain an optimal version of an eco – product: *"eco product application model".* It provides the explanation of file completion for the product case, having the possibility to materialize several functions, taking into consideration several possible versions of product design and construction, analyzing the

possibilities and product functions. This is a demonstration how to choose the optimal variant to obtain an eco - innovative product.
In the case of an eco - technology the situation is similar, being presented in the second step: the second workheet - *"eco technology application"* - provides the workspace for the algorithm presented in the previous worksheet, with the cell connections made ready for the calculations of user's data. This interface guides the user in solving the problem, allowing to introduce the specific influence factors of own eco-technology, guiding the user towards an optimal choice of eco-innovative technology, (Figure 3 and Figure 4).

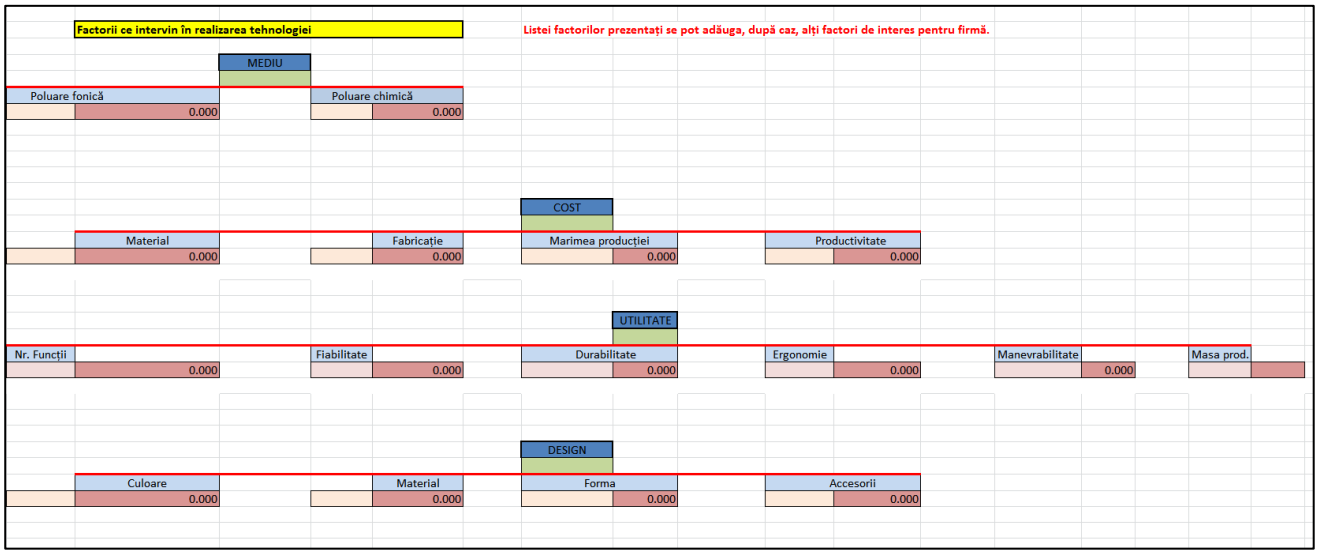

Fig. 3. Influence factors involved in achieving the eco-innovative technology

Analiza variantelor tehnologiei

Factori de influență (utilizatorul îi alege)	Pondere (fracție)	Pondere zecimale	Varianta 1 Punctaj (de la 1 la 4)	Varianta 1 Pondere	Varianta 2 Punctaj (de la 1 la 4)	Varianta 2 Pondere	Varianta 3 Punctaj (de la 1 la 4)	Varianta 3 Pondere	Varianta... Punctaj (de la 1 la 4)	Varianta... Pondere	Varianta "n" Punctaj (de la 1 la 4)	Varianta "n" Pondere
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Poluare fonică		0.000		0.000		0.000		0.000		0.000		0.000
Poluare chimică		0.000		0.000		0.000		0.000		0.000		0.000
Material		0.000		0.000		0.000		0.000		0.000		0.000
Fabricație		0.000		0.000		0.000		0.000		0.000		0.000
Mărime producție		0.000		0.000		0.000		0.000		0.000		0.000
Productivitate		0.000		0.000		0.000		0.000		0.000		0.000
Număr de funcții		0.000		0.000		0.000		0.000		0.000		0.000
Fiabilitate		0.000		0.000		0.000		0.000		0.000		0.000
Durabilitate		0.000		0.000		0.000		0.000		0.000		0.000
Ergonomie		0.000		0.000		0.000		0.000		0.000		0.000
Manevrabilitate		0.000		0.000		0.000		0.000		0.000		0.000
Culoare		0.000		0.000		0.000		0.000		0.000		0.000
Material		0.000		0.000		0.000		0.000		0.000		0.000
Forma		0.000		0.000		0.000		0.000		0.000		0.000
Accesorii		0.000		0.000		0.000		0.000		0.000		0.000
SUMA				0.000		0.000		0.000		0.000		0.000

Varianta optimă este: Varianta.....

La analiza variantelor tehnologiei sunt enumerați toți factorii, cu ponderile lor totale.
Pentru fiecare variantă propusă se va aprecia fiecare factor cu o notă, apoi se va calcula ponderea corespunzătoare aferentă, ca produs între notă și ponderea inițială.
Prin însumarea ponderilor factorilor variantelor analizate se va alege varianta optimă - varianta cu cea mai mare valoare a sumei ponderilor factorilor.

Fig. 4. The analysis of technology versions

The eco - innovative technologies implementation model applies a relatively new method used in the innovative products and services management for obtaining best managerial decision, in a rapid manner, with minimal risk, [6], [7]. It is necessary to achieve technologies versions or enhancements by using morphological analysis based on functions involved, describing their performance. This is the path to improve enterprise technology and to find its optimal version, but the SMEs manager must know all information related to specific parameters and influence factors involved in the analyze and he must decide about the optimum solution (the variant with the highest value of the influence factors shares sum).

4. Conclusions

The model of implementation of eco-innovative technologies at company level is based on research on Romanian business environment, by assessing the level of the environment protection and eco-innovation technology level, identifying successful examples and drawing up possible ways to follow up new possible users. By presenting the methodology and the component structure of the eco - innovative technologies implementation model, authors invite users to access the tool to discover succesful eco-innovative examples, also to choose optimal eco-innovative technologies variants for their own companies. Specifying components, planning interfaces and design specifications have the role to build an easy-to-access and user-friendly interactive environment tool, that provides current and useful information about eco-innovation technologies, at national level, with the possibility to be extended at international level.

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