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THE ROLE OF RESEARCH IN RESHAPING TEXTILE INDUSTRY

Case Study

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Abstract

Apparently, the international competition seems to be moved to the area of investments in new technologies waiting for results in the near future. Nanotechnology is by far the most wanted by investors. The last twenty years the investments in nanotechnology became the priority for all the developed states and this trend was followed by the less developed countries. At the opposite side, there are countries as Romania that seem to lose the start in front of those very active in this field. This paper tries to present the role of the Romanian Research and Development activity to reshape the textile industry through new technologies and nanotechnologies especially. To gather the proper information, the in-depth interview method was used. The conclusions reveal that state keeps the key for a good research activity by offering stable and consistent support. At the same time, a lot of measures or recommendations could be a pragmatic solution to take seriously the role of the research activity to bring its contribution for this big challenge.

INTRODUCTION

Due to the international changes, traditional textiles are produced in cheap labour countries, while more sophisticated and technical ones are the result of technology evolution and are propagated to all the industrial activities. These last ones incorporate very new technologies and they are produced in developed countries where the competitive advantages are kept inside the borders where they can be produced in big quantities efficiently from the cost point of view.

New technologies suppose huge investments and long term and sustainable research activity. During last years, the nanotechnologies seem to be more attractive for projects and investors in comparison with other technologies, but at a certain level they all can interfere.

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This paper tries to present the role of the Romania Research and Development activity to reshape the textile industry through new technologies and nanotechnologies especially.

Since the statistical data is poor and cannot offer a quantitative image of this subject, the qualitative method is welcome. For this reason, the most suitable way to concentrate proper information is by using the in-depth interview method.

This paper is structured in five main parts: introduction, literature review, methodology, results of the research and conclusions.

LITERATURE REVIEW

From all the future technologies, nanotechnologies are the most well-known and a huge literature is dedicated to them, even if they are not always on the market. The researches could not catch relevant statistical data that is why most of the books, articles and reports use predominant qualitative methods to gather information from this field. From the theoretical point of view, nanotechnologies are defied as technologies creating new properties by using raw materials at the nanometric scale, this means dimensions between 1-100 nm (Ramsden, 2009, p.10; OCDE, 2010, p.17).

Nanotechnologies generate new products and new materials and they replace the existent traditional ones. That is why they require a careful analysis from the cost point of view since they have a great impact on the value chain configuration. The main problem is that they are difficult to be anticipated and they are very dynamic.

As the European Commission (2013) shows, the entire industrial landscape will be affected by these technologies and entire our life will change. So, sooner or later, all of us will feel the impact of nanotechnologies in our life.

Studies (Rădan Ungureanu, 2015) show that discontinuous technologies suppose fundamental research based on inter-disciplinary. From the theoretical point of view, the Community framework for state aid research and development (2006/6/323/01) defines the fundamental research as a theoretical and experimental activity in order to gain knowledge by enlighten phaenomenon and facts without practical applications. In this way, the experimental development allows the use of the scientific, technologic knowledge to propose plans regarding the production, design new architectures to improve products, processes, or services.

Nanotechnologies, in their fundamental research stage do not suppose a technology tradition, but they require a very developed research infrastructure specialized on physics, chemistry and others brought to a level when they all cooperate. The first discoveries were continuous, but step by step they became discontinuous due to the large cooperation caused by interdisciplinary scientific needs.

The research (Rădan Ungureanu, 2015) show that nanotechnologies are born in places where state invests a lot in the research and development activity, where the education level and the work force are very high. Multinational companies are willing to invest and develop new technologies where the state offers advantages and this could be an opportunity to be explored by those interested in entering to an innovative value chain.

As FMER (2013) shows, during last years the nanotechnologies applications were developed for textile field and they are applied to wear items as well as to technical ones. The most innovative discoveries are those from fibres and fybers with successful applications in health, environment, and industries. The future researches (ObservatoryNano, 2011, p.39) are concentrated on improvement proprieties for traditional textiles and obtaining durable and thin fabrics for all the existing industries.

The nanotechnologies literature is expressed by using always the future tense. Even the figures and tables show estimations for the future. Even so, there is a big interest from the states to invest since (Radan Ungureanu, 2016) they will replace the traditional industries, they are designed as the future industries and they are putting together companies, states, and the entire society.

Finally, these technologies have a great impact on employment, involve a very qualified work force and they generate value added inside a country.

METHODOLOGY

Even if the reports regarding the research activity in Romania are not optimistic, Romania used to be one of the top suppliers for textile workforce. The innovation is incremental and very poor due to the loan activity concentrated on the fashion products and less on the technical or sophisticated products. The main research projects at the European level are dedicated especially to technical products. That is why the Romanian researchers cannot keep the step with the trends and so less actors are interested in developing and applying Romanian discoveries.
As it can be seen in the Table 1, Germany is by far the leader in nanotechnologies and from the non-European countries Switzerland keeps the most important results. At the opposite side, Romania and Bulgaria are the last in this field, but it is obvious that the publication activity seems more intensive in comparison with patents register. The number of publications could be translated as an intensive trial to obtain and to be involved in the activity. That is why this paper aims to understand the role of research environment to help nanotechnologies implementation into the textile industry.
As Chelcea (2001, p.21) says. choosing a research method depends on the objective and the subject analysed, but sometimes studying the objects in their natural environment could be more helpful.
Seidman (2006, p.9) says that sometimes personal experiences are relevant to obtain a picture of the reality that is why the in-depth interviews method are the most suitable in the dynamic fields.
The qualitative research creates a holistic image based on the real stories that is why this method was applied during this study.
For this reason, this research is focused on getting information directly from the best Romanian subjects able to offer us a holistic image of the research applied to textiles. Thus, the main objectives of this research are:

- Identifying the level of knowledge for new technologies in the textile field
- Identifying some personal experiences to define the advantages and obstacles from different research and development projects
- Identifying the value added that could be brought into the innovative value chain.

Each goal was reached through a set of five questions. The research was applied to the most important 20 Romanian actors involved in textile field; they use to activate as entities from research and development, state, and private companies.
This paper will present only the results obtained from 9 actors (the only ones involved in textile research).
The limits of this research are identified as following:

- The lack of the statistical data does not allow a quantitative analyse
- This field is very new in Romania and the history is short and the technology diffusion is very difficult to follow even because of a weak industrial environment
- The cooperation with the textile institute was very difficult during this research; regarding general topics, the questions were sent first and after a proper documentation the answers were received. At the opposite, the most cooperative ware the private companies interviewed.

The interview was structured on three parts. The first one there were questions guided to obtain an idea about the level of knowledge regarding the technologies applied to textiles. The questions asked about the type of technologies known, why nanotechnologies seem to present more interest to researchers in comparison with other new technologies, if the Romanian textile future will be nano or different one, what projects are known to develop new technologies in this country.
The second part of the interview was structured on questions that allow to get a picture of personal experiences that could be used as strength in a partnership. In this way, the questions were concentration on getting details from own experiences, scientific or information sources, own opinions about how could new technologies be implemented in their workplace.
The last set of questions was dedicated to catch the potential value added in a partnership. In this way questions were focused on obtaining details from the day by day activity, regarding lobby for new ideas or own opinions, brainstorming for what it could be done to convince investors to develop business and research activity in Romania.

RESULTS OF THE RESEARCH

The research gathered opinions divided in three categories as following:
a) Knowledge of new technologies applied to textiles
Generally, new technologies are not known under the name of ”KET’s” – key enabling technologies, but they are known under their original names: nanotechnology, biotechnology, advanced materials, photonics, advanced manufacturing system. Most of the information comes from own experience or other colleagues’ experience, then from journals, conferences, doctoral thesis, own articles or from the European Union strategy. In this way, all the persons interviewed are aware of

the advantages and disadvantages of the new technologies.
The attempt to orientate the research towards nanotechnologies more than the other technologies is an effect of a fashion, following the international trends being aware of their impact on increasing competitiveness. The reason for weak results in patents is a consequence of long procedures for patent register as well as the high level of costs for registration. An intensive publication activity is more an effect of the pressure to disseminate the results as a condition for being a part in a project, rather than a concrete result. The common opinion regards nanotechnologies as a ”fashion” in research, but it is very important to observe their impact on health in time.
It was expected to discover the weak communication between the Romanian research institutes – it was a misinformation about the existence of an institute dedicated to nanotechnologies. Another lack of information is about the universities curricula, if this dedicates courses for new technologies or not. In fact, there are such courses, but the communication between institutes is generally weak.
There are doubts regarding the large-scale implementation of nanotechnologies on textiles arguing that they are dangerous for the health. A better solution comes from biotechnologies. The human being was compared with ”a robot with feelings” and new technologies could interact with physical and chemical emotions that could influence the health. ”If the medical science could not control the human body, how could do it some particles?” it was a question coming from a subject interviewed and she was right since the practical and theoretical reality could not offer the answer.
Most of the opinions sustain that every new technology will dominate the textile landscape through diffusion. The trend shows that a mixture of two or more technologies (known as ”cross cutting technologies”) will fulfill the range of solutions.
Most of the subjects were involved directly in national or international projects (European or EUREKA), but only in one case a smart product was born as result of one project. Most of them were marked by weak results.
When there is a centralization of all the projects, the communication seems more efficient at the inter- human level, especially between the researcher that built a strong relationship in time.
b) Identifying personal experiences that could define the advantage and disadvantage of research projects
The interviewed subjects from the academic environment own a high-level professional expertize being involved in projects for 3-5 years. The projects were small or medium size, starting from some thousands of euros until 500 000 euros. The national projects were very problematic since they were cut up until 60% of the initial budget and this measure affected seriously the results. The international projects have a stable budget and they are easier to respect deadlines.
Nanotechnologies exist in Romania since 1996 when micro-technologies were oriented towards nanotechnologies being the first institute from East of Europe with such profile. About 40 nano-projects existed in Romania and it was an opportunity to get the most modern equipment dedicated to these technologies.
In the last years, the success rate to win projects is weak, for example in case of Horizon 2020, from 10 projects, only one was accepted.
When the projects are, over, there is no follow-up for the results and this is another weakness of the projects.
There was interested to realize that research institutes buy the same equipment and they become competitors instead of partners.
The partners are selected in two ways: previous experience and competences. Another criterion regards the interdisciplinary required by the subject of the project.
During collaboration a lack of infrastructure, missing of authorizing institutes (to certificate the results) and weak interest to the problem of intoxication were identified.
The projects require a lot of time to gather the raw materials, a huge correspondence activity, that put pressure finally to the time for obtaining results since the deadlines are important.
A difficult collaboration with business environment was identified.
The advertising is very important. Who does this becomes well-known.
Generally, the researchers admit that they are involved only in what fundamental research suppose, they are not able to develop products because of the weak industrial environment they have no conditions to test and there is no requirement for this.
Unfortunately, the national research strategy does not sustain at all the researcher in spite of some measures concerning the taxes policy, they are used more to get political image instead of pushing the research activity.
c) Identifying the potential value added that could be an advantage for a partnership
Maintaining the same relationships during many projects could guide to a routine. But in the same time, new interdisciplinary collaborations were very difficult to be managed. Textiles will always be the a common subject for everybody no matter in which fields is involved.
The instituted for nanotechnologies opened a graphing department where new developments will be born.

Obstacles were identified as a weak range of equipment, high costs of experiments, poor textile landscape to test and to cooperate with.
The strength comes from personal expertise of some researchers, some unique equipment, experience from former projects.
A direction to be improved is the mentality, but it could be changed through education and the desire to change the environment.
The research environment considers that smart products could be sold, but only those with a minimum complexity to be cheap.
Another good opportunity for investors should be the high Romanian technical expertise in textiles.
To implement new technologies the role of state becomes crucial and it could offer considerable financial support and stable budgets for projects dedicated to research. More than this, it could be better to offer a more specific and clear expressed research strategy to engage people with very high expertise to manage better this field.
The research environment could improve the working style, the communication and the cooperation between all the research institutes and finally to work very hard to recover the lost time.

CONCLUSIONS

The research identified a good knowledge of the new technologies, experiences that could help in case of partnerships and some more arguments or recommendations to improve the research activity in the process of the textile industry evolution.
All the opinions and recommendations gathered from this research are concentrated into the SWOT Matrix Table 2.
The main conclusions could be synthetized as following:

- National programs could be created to complement the existing equipment and to avoid the situation when every research institute has the same sort of it.
- A better propagation of information between institutes
- A new curriculum in universities and to work hard for a mentality change
- A more dynamic and entrepreneurial behavior in the research field
- The lack of institutions for certifications could be compensated by others from European Union
- A better cooperation with the business environment for tests and research projects
- Advertising the results of the research to improve the image and the trust
- Stable national budgets for research

LIMITS OF THE RESEARCH

This paper presents aspects connected to the research environment, but the research regards the business environment and the state. All the information collected and analyzed (Radan Ungureanu, 2015) together offers a general landscape of what each entity could do to implement new technologies in the textile field and to bring own contribution to its evolution.

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ANNEXES

Table 1. Nanotehnology evolution between 2011-2014

Countries	**2011**		**2012**		**2013**		**2014**	
	Patents	**Publications**	**Patents**	**Publications**	**Patents**	**Publications**	**Patents**	**Publications**
Germany	665	6834	693	6987	775	7494	759	7868
UK	130	3440	136	3628	151	4098	170	4359
France	368	4554	344	4823	379	5204	394	5220
Italy	60	3004	92	3225	70	3669	89	3743
Sweeden	45	1149	58	1244	55	1381	60	1546
Switzerland	168	1408	158	1554	219	1599	233	1712
Holand	157	1288	188	1332	182	1553	176	1473
Finland	12	645	24	695	23	753	32	859
Spain	24	3055	24	3429	31	3687	32	3894
Belgium	76	1032	84	1034	76	1169	92	1217
Danemark	54	628	51	628	51	699	45	840
Norway	11	424	13	296	12	338	11	290
Austria	26	711	40	676	40	739	50	771
Romania	**0**	**796**	**0**	**761**	**1**	**922**	**1**	**812**
Poland	0	1294	7	1486	4	1740	7	1930
Czech Republic	7	613	3	669	9	808	11	915
Bulgaria	0	209	0	189	0	230	0	199
Greece	3	522	1	565	5	598	5	619
Total	1806	31606	1916	33221	2083	36681	2167	38267

Sourse: StatNano (2015)

Table 2: SWOT Matrix

STRENGH	**WEAKNESSES**
-new technologies awareness -international information access -personal experiences in research projects -technical expertize -high level of education -equipment -cheap research workforce	-infrastructure -communication -relevant research results -financial support -interdisciplinary cooperation Mentality -raw materials -cooperation with business environment -certificates institutions -competition instead of cooperation
OPPORTUNITIES	**THREATS**
-wide range of technologies -important role of research in technological transfer -extending cooperation -legal opportunities -graphen -rethinking the national programs dedicated to education and research	-impact on health -research budget uncertainty -weak successful rate for the research projects -governmental support -cooperation between researchers -financial support -instable fiscal policies

Source: the author