

The Analysis of Innovativeness-related Needs Among the Polish Protective Clothing Manufacturers

Abstract

Innovativeness is believed to be a basic prerequisite for firms to gain and maintain sustainable competitiveness on the global market. Based on a questionnaire survey, the innovativeness-related needs of Polish protective clothing manufacturers were analysed. By identifying their major needs and the level of firms' competence in individual areas, gaps could be determined, that is, areas where competence and skills fell short of the needs. A very important component of the survey was demonstrating the extremely positive influence of firms' innovativeness on their competitiveness.

Key words: protective clothing, innovativeness, competitiveness.

The role and character of innovation in the protective clothing market

In the literature of the subject, innovation has been given at least several dozens of different definitions. Readers' attention is also drawn to the ambiguities and unsolved problems connected with the concept of innovation [1]. All this causes difficulties in explaining this very complex idea by means of a single, commonly-accepted definition.

Because of the specific character of the product we are investigating (protective clothing), our further analysis will be based on a definition which combines both social and economic dimensions of innovation.

Therefore, innovation will be understood as a purposeful and meaningful novelty-type change introduced to a process, product or society whose intended and achieved goal is broadly interpreted as benefit, and/or economic progress, and/or social progress [1].

Regarding protective clothing, every innovative solution improves the protection of human workers' life and health, and should thus be automatically perceived as having both social and economic dimensions.

Protective clothing is designed to safeguard its users against factors that might be hazardous to their life and health. The diversity of possibly dangerous and harmful factors, their varying intensity of occurrence and the ever more strongly

emphasised importance of protective clothing ergonomics all necessitate its continuous improvement, quests for new and better solutions and extended functionality. The field seems particularly broad and worth exploring, as is confirmed by the number of investigations, an increasing volume of relevant publications and increasingly innovative solutions that find practical applications.

Let us re-emphasise that every achievement in this field translates into better safety and health protection of workers.

Despite its significant successes, the huge technological progress that has taken place in recent years has not solved the problem of human safety inside and outside the work environment; at the same time, modern technologies have given rise to new sources of hazards that need to be addressed by new and more sophisticated generations of protective clothing. The whole situation seems to be some kind of a self-sustaining mechanism, and the needs for innovative solutions and continued progress cannot be fully or even partially met.

An analysis of the innovation-related needs of Polish protective clothing manufacturers

The research conducted was intended to identify the manufacturers' main needs and their levels of competence in pre-determined areas (Figure 1). This approach allowed us to find gaps, i.e. spots where competence and skills did not match the stated needs¹⁾.

Based on the survey's results, the following conclusions can be formulated:

Firms indicate that their competence is most limited in the following areas:

- cooperation with research and development centres (2.1),
- application of patents, licenses and know-how (2.1),
- international cooperation (2.3),
- seeking new technologies (2.7), and
- introduction of innovations (2.7).

According to the entrepreneurs, they have very good knowledge of:

- production management (3.7),
- financial management (3.6),

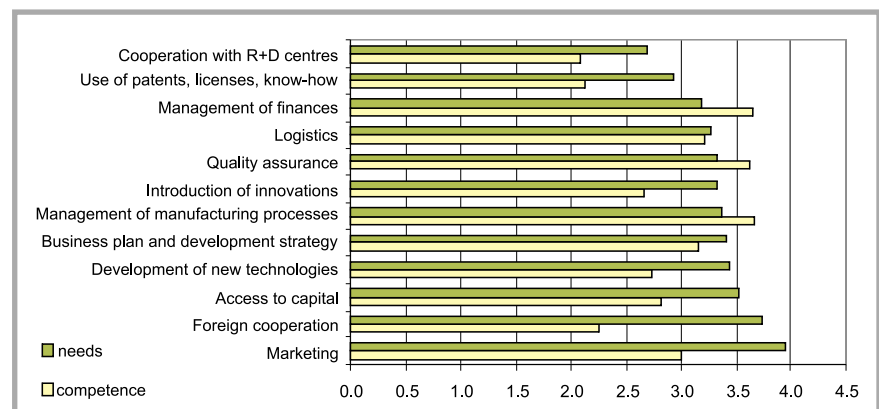


Figure 1. Manufacturers' needs versus competence (average of indications).

Table 1. The level of innovativeness and its influence on export activities: results of statistical analysis based on the Kruskal-Wallis test; **Source:** calculated by the author using the Statistica package.

The influence of innovativeness on export	
Kruskal-Wallis test value	Significance level
H = 12.51	p = 0.0515

- quality management (3.6),
- logistics (3.2), and
- business plans and expansion strategies (3.2).

The largest needs were unambiguously indicated in the following areas:

- marketing (3.9),
- international cooperation (3.7), and
- access to capital (3.5).

By comparing the respondents' knowledge against their needs in particular areas, we were able to identify the gaps.

The areas where gaps between competence and needs were the largest were the following: international cooperation (1.5), marketing (0.9), application of patents, licenses and know-how (0.8). Other identified problem areas were access to capital (0.7), internal development of new technologies (0.7), and introduction of innovations (0.7).

The above information highlight the apparent gaps in the marketing sphere as broadly understood by the enterprises. Realising their insufficient competence in the indicated areas, the organisations were also aware that it was necessary for them to bridge the existing gaps, which should be viewed positively. Nevertheless, it is disconcerting to realise that Polish protective clothing manufacturers do not feel the need to improve their cooperation with the R&D centres, even though the self-evaluation of their skills in the area was the lowest. This attitude suggests that they do not quite understand the role of research & development work.

Innovativeness and competitiveness of Polish protective clothing manufacturers

In the ongoing trade liberalisation and the 'opening of the markets' in both developed and developing countries, a special role is ascribed to relationships between competitiveness and innovativeness. The

role of innovation in creating so-called permanent competitiveness is particularly emphasised, beside the importance of technological competitiveness [5, 6].

The research conducted was aimed at demonstrating the extremely positive influence of innovativeness on the protective clothing manufacturers' ability to improve their competitiveness.

Indicators of the degree of innovativeness

The firms surveyed were divided into three groups according to their levels of innovativeness. The groupings were made based on the following criteria:

- Has the firm made investments in innovative products or processes over the last two years?
- Has the firm introduced a new product to the market or upgraded an existing product over the last two years?
- Has the firm set up a new production line over the last two years?
- Has the firm introduced new marketing methods over the last two years?
- Has the firm introduced new management methods over the last two years?
- Does the firm hold patents or reserved trademarks?
- Has the firm participated in development projects in cooperation with R&D institutes?
- Does the firm plan to add new types of clothing articles to its range of products in 2005.

The answers to the individual questions were scored appropriately. The firm's total score generated the variable called RESULT. The firms surveyed were then divided into three groups according to the score they were awarded (i.e. by the value of the variable RESULT):

- I. the most innovative firms,**
- II. medium-innovative firms,**
- III. low-innovative firms.**

Following that, statistical tools were applied to find variables exhibiting the strongest relationship with innovativeness.

Table 2. The influence of innovativeness on financial result.

Level of innovativeness	Financial result, %		
	negative	positive	no response
High	0	89	11
Medium	25	58	17
Low	50	50	0

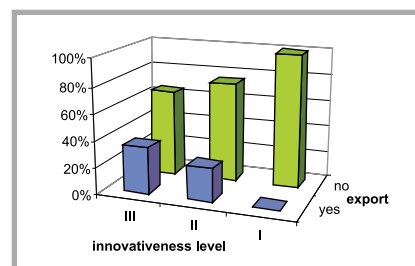


Figure 2. The influence of innovativeness on export.

Innovativeness and export (a propensity to export)

First of all, we set out to identify whether the level of innovativeness affects the number of exporting firms in a statistically significant way. To do that, the Kruskal-Wallis test²⁾ was applied (Table 1).

At a significance level $p = 0.05$, the hypothesis H_0 (assuming an unchanged percentage of exporters, regardless of the degree of innovativeness in a given group) was rejected; in other words, a conclusion was drawn that the degree of innovativeness is statistically significant for export activities.

We then attempted to establish how the character of innovativeness influences the number of exporting manufacturers.

According to Figure 2, a higher degree of firms' innovativeness clearly increases the number of exporting organisations, whereas the group of non-exporters shrinks. It is also worth underlining that there were no exporters in the group of the least innovative firms.

Innovativeness and financial results

Another issue investigated was the correlation between innovativeness and firms' financial results. In this case, a significance level $p = 0.0074$ allows us to conclude that the degree of innovativeness is statistically significant for the financial results which the firms achieve (Table 2).

From the data presented in Table 2, it follows that the higher is the degree of firms' innovativeness, the notably lower

is the share of manufacturers with a negative financial result in the previous year. It is noteworthy that none of the most innovative organisations indicated a negative financial result, and among the least innovative ones, as many as half had had negative financial results in the previous year.

Innovativeness and the number of certificates held

Another investigation aimed at identifying whether a relationship existed between the level of firm's innovativeness and the number of mandatory and optional certificates it held.

As before, the first to be verified was a null hypothesis assuming no connection between the level of innovativeness and firm's holding of the mandatory CE certificate. The verification tool applied was the Kruskal-Wallis test. A statistical analysis rejected the hypothesis at a significance level of $p = 0.0379$.

According to Figure 3, a definite majority of the high-innovative firms holds the mandatory CE certificate (almost 80%), but among those showing a low degree of innovativeness, the situation is much worse; as many as half of them have not yet been granted the CE marking, even though it has been mandatory in Poland since 1 May 2004.

The next subject examined was the connection between the degree of firm's innovativeness and whether it holds the optional certificates (e.g. confirming the products' quality (see Figure 4), their environmental safety, etc.) or not.

Again, the results of analysis allowed us to conclude (at a significance level $p = 0.02$) that the level of innovativeness is important for firms which have additional, non-mandatory certificates.

The mechanism is similar to that in the previous cases: the higher is the number of firms which hold additional certificates confirming their product quality, the more innovative they are.

Innovativeness and directions of changes projected to improve firm's competitiveness in the future

Among the entire examined population, the group of most innovative firms is distinguished by the unambiguously largest percentage of organisations that intend to take the following steps:

- to enhance their brand (71%);
- to extend their existing cooperation with domestic research centres (64%);
- to expand their range of products (57%).

In addition, every fifth firm in the group has plans to:

- introduce new technological solutions to the manufacturing process;
- expand into new geographical markets;
- improve customer service quality;
- show price elasticity.

New products on the Polish protective clothing market

Any product put on the market has to confront ever-changing customer demands as well as the products already manufactured by competing manufacturers. Depending on the results of this confrontation, some actions related to the product usually have to be taken. The alterations may involve their modification, or even total innovation [4].

The survey's results suggest that a definite majority of producers (over 70%) plans to introduce a new type of protective clothing in 2005 (Figure 5). In addition, the producers examined reveal considerable flexibility regarding their adjustment to changing customers' needs. Every second firm surveyed needs less than 14 days to accommodate customers' demands, and 37% of them require around one month (see Figure 6).

Conclusions

1. The survey outcomes presented above re-emphasise distinct inefficiencies in the broadly understood marketing activities of organisations. Suffering from insufficient competence in the area, firms are aware that the inefficiencies have to be overcome, which is a very positive sign. What is worrying, though, is that while they give the lowest scores to their ability to cooperate with the R&D centres, Polish protective clothing producers do not feel any need to change the situation. This may suggest that the firms are not completely aware of the role of research & development work as a commonly recognised vehicle of technological and economic progress.
2. The conducted survey confirmed the positive influence of innovation on

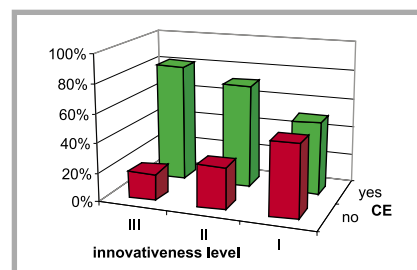


Figure 3. The level of innovativeness and its influence on being granted the CE marking which is mandatory in the EU market.

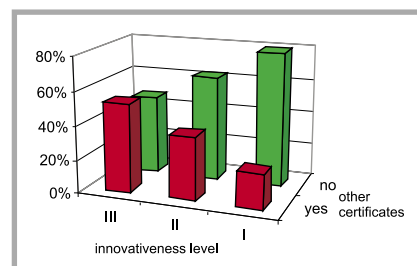


Figure 4. The level of innovativeness and its influence on whether firms have additional certificates confirming product quality.

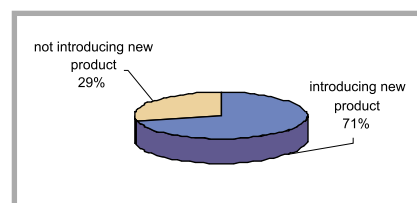


Figure 5. Range of products extended in 2005 to include new types of clothing articles; Source: developed by the author based on survey's results.

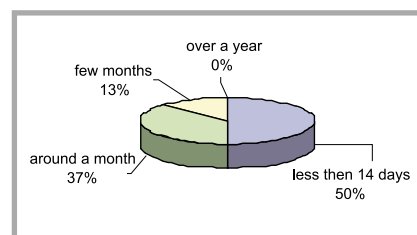


Figure 6. Adjustment time to varying customers' needs; Source: developed by the author based on survey's results.

competitiveness. A favourable relationship was found between the level of firms' innovation and their propensity to export, their financial results, the numbers of certificates they held (both obligatory and optional), and the directions of changes planned to improve the firm's competitiveness in the future. Both the frequency and targets of actions planned allow us to conclude that it is the group of the most innovative firms that faces

the best opportunities of not only surviving in the demanding European market, but also of gaining a strong competitive position there. Notwithstanding that this survey was finished in 2005, this conclusion is farther almost up-to-date.



Editorial notes

- 1) Respondents characterised their needs using the following scale: 1. unimportant, 2. rather unimportant, 3. moderately important, 4. very important, 5. crucial. Averaged results for each area made it possible to indicate the greatest needs.
- 2) The Kruskal-Wallis test is a non-parametric equivalent of a one-factor analysis of variance. This test allows verification of whether n independent samples (in this case $n=3$ – three levels of innovativeness) come from the same population, or from a population with the same median. This specific test was selected because individual samples do not have to be of the same size. The test is identical with parametric Anova for a single classification, the difference being that it is based not on average values but on ranks [2,3].

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INSTITUTE OF BIOPOLYMERS AND CHEMICAL FIBRES
ŁÓDŹ, POLAND

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Instytut Biopolimerów i Włókien Chemicznych
 - Institute of Biopolymers and Chemical Fibres
 ul. Skłodowskiej-Curie 19/27, 90-570 Łódź, Poland
 tel. (48) 426 380 300, (48) 426 376 510, fax. (48) 426 376 501
 http://www.ibwch.lodz.pl, e-mail: ibwch@ibwch.lodz.pl