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Nanotechnologies from the consumers' point of view

What consumers know and what they would like to know

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Synopsis



Background

In 2008 a qualitative consumer study revealed that consumers in Switzerland and Germany indeed have a thorough knowledge of nanotechnologies and generally a positive attitude towards them. At the same time, they still expected considerable improvement in the information available (Grobe et al. 2008). Back then, the consumers' recommendations and wishes were clear-cut:

- creation of two-tiered information in the form of an easy-to-understand overview and an in-depth scientific background
- diverse information provided by all stakeholders
- product-specific information about the functions and effects of nanomaterials or nanotechnologies
- user-friendly utilisation of television, newspapers and the internet as the most popular information media.

Here the authors warned of growing uncertainty among consumers.. As early as 2010, a major European survey (Gaskel et al. 2010) on nanotechnologies revealed that the general knowledge on nanotechnologies in Germany could not be increased in recent years. In contrast, the knowledge is considerably higher in Switzerland, as in the Scandinavian countries.

The purpose of this 2011 qualitative consumer study is thus to deepen the initial Eurobarometer findings and to provide comparative data for the qualitative consumer study conducted in 2008. The study focused on the following questions:

- 1. What do consumers know about nanotechnologies?**
- 2. How do they rate nanotechnologies?**
- 3. How do they obtain information?**
- 4. How would they like to be informed in the future?**

For the study, 103 qualitative in-depth interviews were conducted with randomly selected consumers in Germany and Switzerland in winter 2010 and autumn 2011. The sample was carefully balanced to the demographic situation of both countries, regarding age, gender and education. The interviews started with an open question, asking consumers what comes to their mind when they hear the word nanotechnologies. The topics

Consumers' recommendations and wishes, collected in a qualitative study conducted in 2008, were unequivocal: they demanded considerable improvement in the available information on nanotechnologies

The lack of such input, with consequences for the public perception of nanotechnologies, is clearly reflected in the results from 2011.

mentioned by respondents were elaborated on; subsequently the respondents were asked about their general attitudes, information consumption as well as their expectations and wishes. All interviews were taped. The consumers' quotes were transcribed, encoded and evaluated. During the process the argumentation patterns were counted and the results of the German respondents compared with those from Switzerland; the changes identified between 2008 and 2011 were documented.

What did consumers know about nanotechnologies in 2011?

The ratio of those ranking their level of knowledge as high (3% in 2011; 5% in 2008) or average (25% in both survey periods) has not risen in the past three years. Most consumers rate their knowledge as fairly low (42% in 2011; 64% in 2008) or are unable to evaluate it (30% in 2011, 8% in 2008). In 2011, interviewees often garnered a shrug, and many interviewees changed the topic or said they had "no idea" whether their knowledge was good or poor. In other words, they were unable to convey the subjective sense of being adequately or well informed about nanotechnologies. The ability to provide a reasonably sound definition of nanotechnology was analysed as a second indicator of consumers' knowledge. Here the amount of those who were able to e.g. define the size range correctly dropped by 13%, to 21%. The third indicator used to estimate consumers' knowledge was the number of fields of application which respondents listed without prompting. That number is still gratifyingly high – although consumers assert that their knowledge is poor, they are able to name five or six examples on average, largely independent of their age or education. The edge held by male respondents in 2008 has almost levelled out. At the same time, the fact that the average consumer in 2008 was able to name seven or eight fields of application, raises concerns. The level of public knowledge, as measured with this indicator, has decreased considerably.

In 2011, the five most commonly mentioned fields, where nanotechnologies are applied, were:

1. medicine, 2. automotive, 3. surface coatings, 4. food, 5. textiles

Regarding the quality of the consumers' statements, e.g. how detailed their descriptions of the individual examples are, it can be said that their

One nanometre (nm) equals 10^{-9} metres or one millionth of a millimetre.

The good news: On average, respondents are familiar with five or six fields of application of nanotechnologies.

The bad news: The level of knowledge has considerably decreased, compared to 2008.

knowledge about all fields of application has decreased. However, there are some exceptions:

- In the field of medicine, consumers are able to give a detailed account of cancer therapy with ferrous nanoparticles.
- They are familiar with many details on the functions and properties of automotive paints, polishes and care products used in car wash centres.
- They are well informed about nanotextiles which repel dirt and water, and
- They are virtually raving about the benefits of nano-based detergents which help them reduce their own cleaning efforts.

Even though the knowledge about all fields of application has decreased, particularly striking is the decline in the fields of surface coatings, construction materials and environmental engineering. In sum, it can be hypothesised that consumer communication on the part of product manufacturers has decreased considerably, or that the information does not reach the target group to the same extent. The public knowledge on nanotechnologies has become more abstract. As the only field of application, chemistry rose from 17% to 25%, here consumers associate nanotechnologies with innovative research.

All in all, nanotechnologies have become more abstract for the majority of consumers in the past three years. According to the Eurobarometer, the number of those who are able to generally discuss nanotechnologies has remained constant in Germany (Gaskel et al. 2010). Yet the quality of consumer knowledge has deteriorated considerably compared to the 2008 qualitative consumer study (Grobe et al. 2008). With few exceptions, consumers know less about nanotechnologies' fields of application, and the knowledge they do have is less precise.

Consequently, it is not surprising that consumers refer to deficits in the information available and that 37% believe that the public at large has "no idea" about nanotechnologies either.

There is hope:

Consumers are considerably better informed in some areas, where they are able to provide accurate and detailed accounts, and they rate these applications very highly.

The awareness of other fields of application is much lower than in 2008. They include surface coatings, construction materials and environmental engineering.

It appears that especially corporations have reduced their communications regarding the use of nanotechnologies in their products compared to three years ago – or they are not reaching the consumers.

Assessments of Nanotechnologies

In general, it cannot be said that attitudes towards nanotechnologies would have clearly become more negative. Only 4% rate nanotechnologies as negative; 42% view them as positive. However, compared to the 2008 study, this means a drop by 22%. At the same time, the ratio of ambivalent consumers has risen by 18%, to 49%. Interestingly, even those who generally express themselves ambivalently, give positive accounts on the specific applications they are familiar with. Consumers in both countries were clearly curious. Nearly two-thirds (64%) would purchase nanotechnology products or are open-minded about nanotechnology-related innovations.

At the same time, consumers find it very difficult to assess the benefits and risks of nanotechnologies as a whole or their individual applications. .

Benefits and risks from the consumers' point of view

Concurrent with the decrease in knowledge about the fields of application, the consumers' knowledge about the benefits of these applications also has faded. Quotes about the benefit of cancer therapies stand out – their health benefits are emphasised by 40% of respondents. With respect to consumer products, the cleaning agents mentioned by 20% of respondents are considered particularly useful in helping reduce the cumbersome task of cleaning. Lagging behind are textiles and cosmetics, to which only a few comments were made. Compared to 2008, statements about the benefits of nanotechnologies have significantly declined (health benefits by 18%; private convenience by 21%); assertions on nanotechnologies making an important contribution to innovation processes dropped by 30%. At the same time, risks are expected more often: 67% fear health risks (2008: 55%); 40% forecast risks for the environment (2008: 29%). Again, particularly striking are the differences in the quality and in the "depth" of the statements. While the comments on the benefits and on the specific fields of application have become more imprecise and vague, consumers appear to be more informed about details of the risk debates and are able to describe the risks better than in 2008. Here they mention topics such as the inhalation of nanoparticles, issue of occupational protection, the

Only 4 % rate nanotechnologies negatively.

However, the positive assessments are not rising. In fact, they have dropped by 22%, to a mere 42%.

At the same time, the ratio of ambivalent respondents compared to 2008 rose by 18%, to 49%.

In spite of the growing ambivalence, respondents are curious: 64% would try nano products.

The comments about the benefits have become more vague, while those about the risks are more accurate and detailed. They fairly accurately reflect the debate among experts.

invasion of cells or penetration through skin, or the unknown effects on the environment.

A new communication pattern, not yet observed in 2008, relates to comments that nanotechnologies are not (no longer or not yet) an important topic in the public arena. Fully 40% of respondents expressed themselves like this. Half of them believe that nano is no longer a topic of interest and assume that the products have not worked. The other half think that nanotechnologies are a topic for research and that their implementation is still in its infancy.

Because consumers no longer really know whether and in which products nanotechnologies are applied, the regulatory question has lost in importance. Despite the very specific statements on risks, 75% of the respondents do not address the issue of regulation at all during the interview. In Germany, only 2% of those who see regulation as important regard the current regulation of nanotechnologies as sufficient. The level of trust is slightly higher in Switzerland, with 18% of the respondents feeling comfortable with the level of public regulation. Moreover, it is interesting to note that consumers in Germany do not have a clear idea which institutions are responsible on national or state level. In Switzerland, the Federal Office of Public Health and the Federal Office for the Environment are mentioned in this context.

Where do consumers obtain information, and how would they like to be informed?

Print media, television and the internet are the three traditional information media consumers most commonly use for getting information on nanotechnologies. Here the interviewees describe their information consumption as somewhat random. They are rarely aware of websites delivering general information or of information from manufacturers. Some consumers watch shopping channels and are thus familiar with detergents marketed with the label "nano".

Since many consumers assume that nanotechnologies are not yet ready for wide utilisation, they do not feel the urge to search for information independently. Therefore, awareness of the stakeholders involved has

Nearly 40% of respondents state, without prompting, that the amount of available information about nanotechnologies has decreased.

They develop their own theories about the lack of communication:

1. Nanotechnologies have not worked at all.
2. Nanotechnologies are still a research topic and not yet fit for the market

The knowledge about the relevant stakeholders and the importance of regulations has decreased correspondingly.

declined too, simultaneously with the knowledge about nanotechnologies as a whole. Still, many respondents formulate clear requests to scientists, to the media, to the public authorities and the industry about what should be communicated and how.

So far, no stakeholder has taken over the field of nano-communication, neither in a positive nor in a negative way. Surprisingly, the same also applies to consumer organisations, which are mentioned only by 10% of the respondents, as the environmental organisations, named only by 5%. As sources of information, the scientific community and the public authorities are trusted the most, although better communication is wished here as well. The fact that the discussion is not dominated by any players can be considered an opportunity for the future: all stakeholders still have the opportunity to position themselves.

Recommended actions

Generally, nanotechnologies have been and continue to be a positively connoted topic. The majority of consumers are curious and express future expectations. Their desire for improved information is clearly articulated and directed to a variety of stakeholders. The consequences of lacking or inadequate communication, from the consumers' point of view, are already apparent. The more the knowledge about the products, their functions and benefits dwindles and the trust in processes (regulations) and stakeholders drops for a lack of visibility and communication activities, the more consumers will assume that nanotechnologies are unable to meet the high expectations placed in them, while, at the same time, the debate about the risks moves to the foreground. Some may find it regrettable that the benefits of nanotechnologies in the consumers' opinion are essentially limited to cleaners and car paints, because it means that at the very least the communication of nanotechnologies in consumer products as an important topic of innovation has been inadequate. However, perhaps the interviews simply reflect the known consumer product examples and hence render an accurate image of the perceivable reality.

Respondents are still open for information. No stakeholder has taken over the playing field yet.

No polarising attitudes towards different stakeholders can yet be observed.

Recommendations

- 1. The communication strategies of industries, public authorities and the scientific community urgently need to be re-evaluated if nanotechnologies are to be communicated as an important topic of innovation.**
- 2. The examples of good consumer communication, as mentioned by respondents, could be used as a model for developing communication strategies.**
- 3. The results of the interviews could be used to reflect on which questions about the benefits and risks are particularly important and which criteria should be communicated to examine the quality and sustainability of the benefits.**
- 4. Different stakeholders perceived as neutral should clearly communicate the state of scientific research, who is monitoring the risks and what regulations nanomaterials in products are subject to, in order to build trust in processes and stakeholders.**
- 5. Easy-to-understand, entertaining and exciting information needs to be developed for the media. Consumers identify TV science programs, news reports and articles in the print media, together with neutral, science-based websites are identified as cornerstones of balanced, yet interesting communication.**
- 6. Product-specific information on functions, properties and contents, as well as on the benefits, quality and durability or the product and its health and environmental effects needs to be delivered in a comprehensible way. This is expected particularly from corporations.**
- 7. The different stakeholders should link their information resources: consumers express an interest for websites with a good overview and further links to information provided by other stakeholders.**

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