

Executive Summary:

Nanotechnology is rapidly becoming a pervasive technology embedded within many different industries and business sectors giving rise to new medicines, textiles, electronic devices, and enhancements in sports equipment, packaging, and many other consumer goods. However, public knowledge and understanding of nanotechnology lags behind these developments, with many different surveys of public opinion revealing a majority of people never having heard of nanotechnology.

This deficiency is important to address as Europeans are investing vast amounts of public money into the development of new products and services based on nanotechnologies. The wider society must have the opportunity to discuss this discrepancy, and have access to the tools to weigh the potential advantages and disadvantages of these investments, considering the wider socio-economic impacts, as well as the ethical aspects and potential risks. An engaged public is more likely to support (and in some cases drive) policy on different technologies that it perceives to be leading towards greater societal benefit.

There are various motivations for engaging the public in dialogue towards future developments. Regardless whether the communication is downstream or upstream, the perceptions of all parties involved in the engagement activities are very important in the process of achieving the desired outcomes. The general level of awareness of Nanotechnology is considerably low, especially concerning information related to ethical, legal and social aspects of Nanotechnology applications, and also regarding Nanotechnology manufactured consumer products.

Science communication was at the heart of NANOCHANNELS: Communicating the complex science of nanotechnology to a wide audience. In that light, the purpose of the NANOCHANNELS was to design a programme of communication, dialogue, and provide engagement in issues of nanotechnology aimed at European citizens. The processes of this project provided stakeholders—specifically the lay public, young people, scientists, NGOs, opinion makers and educators—with opportunities to engage in nanotechnology debates, which were aimed at building trust and channels of contribution to achieve a social consensus in the development and implementation of nanotechnology.

NANOCHANNELS used a variety of channels to meet these goals. The channels included surveys, press supplements and microsites, project web portal, live interactive conferences, high profile live events, live school events, radio broadcasts, social media (including Facebook, Twitter, LinkedIn, etc.), video clips and interactive games, teachers' kits, virtual teacher training and student produced materials.

The NANOCHANNELS consortium, coordinated by ORT Israel, included partners with experience in mass media, educational methodology and science communication, as well as organisations highly suited and experienced in arranging outreach and communication activities for the public and for schools. The main recommendations, elaborated in this paper follow the outcomes of all the project activities that have been evaluated. We recommend using social media tools more intensively, producing materials in traditional media (newspapers and radio) without outside editing, conducting live events involving different stakeholders and introducing the subject of Nanotechnology in balanced manner.

The NANOCHANNELS project was designed to be a bridge between Seventh Framework Programme (FP7) and Horizon 2020. By building on the best practices derived in related FP nanotechnology CSA projects, and consolidating these with the results of NANOCHANNELS, the partners provided a series of recommendations to the EU on communicating and engaging the public in future nanotechnology issues in time for consideration in drafting the Horizon 2020 NMP topics.

NANOCHANNELS project has reached its final milestone, with a documented list of accomplishments and observations, in great part to the contributions of the consortium partners and well defined goals that had a well formatted plan of execution. The stakeholders that were identified within this project were informed, educated, engaged and brought into the realm of nanotechnology. This final report describes in detail a clearly defined summary of the NANOCHANNELS project.

Project Context and Objectives:

The aim of NANOCHANNELS was to undertake a well-designed programme of communication, engagement, dialogue and debate on issues of nanotechnology with a variety of European stakeholders, including the lay public, young people, researchers and scientists, NGOs, opinion makers and educators. This programme would therefore build trust in and contribute to achieving a social consensus in the development and implementation of nanotechnology.

In order to meet these goals, the project outlined the following objectives:

1. Inform and communicate with stakeholders and the European lay public using a blend of media, Internet applications, and live channels about day-to-day uses of nanotechnology and controversies associated with nanotechnologies.
2. Facilitate and encourage stakeholders and the public to participate in dialogues, debate topics concerning the applications, risks, ethical, legal and societal aspects of nanotechnology.
3. Engage the European public towards the negotiation of a responsible consensus and building social trust concerning nanotechnology issues.

In addition to outlining focused objectives in order to keep the NANOCHANNELS project in parallel with reaching its goals; well thought out pillars of activity were identified that would structure and help execute each goal. The NANOCHANNELS project used Outreach, Dialogue and Education activities as the three pillars of its program for engaging and informing the wider public on Nanotechnology topics. More specifically Outreach aimed at gauging knowledge levels, interest and opinion on nanotechnology; and raising awareness through providing information. Dialogue had the purpose of developing understanding and opinion, creating debate and moving towards public consensus. And Education sought out to raising awareness and ownership of nanotechnology amongst two key stakeholder groups (students and teachers), and providing the necessary tools and support for this engagement activity to self-perpetuate (and also bring in other societal groups through parents, other relatives, and friends).

In order to pursue the goals of each pillar of activity, specific activity channels were chosen that were both traditional and new, and represented different levels of engagement from light touch to full debate. This spectrum allowed a wide net to be cast, potentially capturing all relevant stakeholder groups. It was also taken into account that nanotechnology is a multidisciplinary topic affecting different societal groups, different generations, and the lay public in diverse ways; dependent on whether they are consumers, users, or producers and what the particular use is (e.g. health, food, or recreation). Therefore, the activity channels were carefully selected in order to inform, communicate, facilitate, encourage and engage each Stakeholder group. The chart below defines the three pillars of activity (Outreach, Dialogue, and Education) and the chosen activity channels for each pillar. Within this Final Report the three pillars of activities and the identified activity channels described above were the structure that defined the NANOCHANNELS project. Achieving the project objectives enabled the project to deliver sound recommendations to the European Commission and future researchers concerning governance and best practice for communication of issues related to nanotechnology within the EU.

Pillar of Activity Outreach Dialogue Education Activity Channels Press Supplements Microsites Web Portal Conferences Radio Broadcasts High Profile Live Events Live School Events Social Media Video Clips Interactive Games Teachers' Kits Virtual Teachers Training Student-produced Materials

6 Project Goals

The goals of the NANOCHANNELS project were to:

- Provide EU citizens with accurate information needed to achieve a well-informed dialogue on nanotechnology issues,
- Provide the general public with an opportunity to convey their opinions to scientists, industry, NGOs and regulators,
- Advise scientists and industry of published concerns; to provide social bodies and NGOs with information and access to dialogue with scientific professionals, regulators and politicians,
- Provide dilemmas and tools to stimulate debate on issues involving a wide range of stakeholders with the objective of building a social consensus, and to
- Involve students in the leadership of consensus building.

Each of the project tasks were designed to contribute towards reaching a European consensus on issues related to nanotechnology. The partners allocated adequate project resources to ensure that important parts of the debates used the kinds of media that are familiar to most European citizens. At the same time, resources were devoted to youth-focused media, in particular social media network sites such as Twitter, Facebook and YouTube. LinkedIn was used to reach the professional lay public. The major live debates and events were designed to bring together a diverse range of stakeholders.

Resources were devoted to ensuring that an audience with an adequate mix of ages and professional expertise would be reached and would hear a wide variety of opinions concerning nanotechnology issues. The school-based events were designed to appeal to families of school students as well as to the students themselves, and thereby engaged several generations in a friendly environment. The goals of the NANOCHANNELS project were well thought out, and executed with intent and purpose. Stakeholders were engaged and participated in the discussion of nanotechnology, making the project a success.

Stakeholders

In order to reach as many stakeholders as possible, the Consortium identified specific objectives tailored to match the needs and abilities of the different stakeholder groups. A set of media tools were selected to meet each objective and the selections were made on the basis of providing the most effective way of reaching each stakeholder group.

Lay public

nano consumers

To provide EU citizens with accurate information needed to achieve a well-informed social consensus on nanotechnology issues

young people

To provide EU youth with the opportunity to convey their opinions to scientists, industry, NGOs and regulators in NT
Researchers and scientists; industry; regulatory and standardisation bodies

To advise nanotechnology scientists and industry of public concerns

Civil Society; NGOs

To provide social bodies and NGOs with information and access to dialogue with nanotechnology scientific professionals, regulators and politicians
Opinion makers and influencers; information gatekeepers

To provide dilemmas and tools to stimulate debate on nanotechnology issues involving a wide range of stakeholders to build a social consensus on nanotechnology issues

Educators

To involve students in the leadership of consensus-forming

7 Work Packages

The NANOCHANNELS Work Packages (WPs) devoted significant resources to gathering a comprehensive set of responses concerning public opinion on nanotechnology issues, and followed their participation in the various NANOCHANNELS events and publications. These results have been analysed in order to determine the public consensus on these issues. Each work package was systematically defined to fall into a sequential order in order to provide the foundation for each task that would follow.

1. Survey and public opinion poll - The main objective of this WP was to survey various stakeholders' initial attitudes, opinions, concerns and expectations about nanotechnology in at least six EU member states and associated countries. The output from this work package became the basis for all the partners in producing the media (press, web radio and live debate events) content.
2. Development of all media materials and tools for press, web, social media and live events - The main objective of this WP was to develop well balanced materials by school pupils, media students, and professional journalists that will create a fair platform for public understanding.
3. Campaign and engagement in European press - The main objective of this WP was the publication of two press campaigns and a round table debate designed to engage young people, researchers, scientists, industry, social partners, funding bodies, regulators, standardisation bodies, insurers, NGOs, opinion-makers, influencers, information gate-keepers, educators, nano-consumers, and the lay public with the innovations of nanotechnology and the ethical, legal and social aspects of nanotechnology applications.
4. Social media debate/campaign and project web portal - Social media tools, such as Facebook, Twitter and LinkedIn, enabled the NANOCHANNELS partners to target a wider audience than traditional media tools can reach. They were used to engage with all stakeholders in the ongoing debate, and were used to publicise future project events.
5. Live and broadcast events - The objective of this WP was to host a series of dedicated live public debate events in several European centres. The debaters included scientific experts, experts in social policy, politicians, regulators and European students.
6. Evaluation - The objective of this WP was to develop a set of success indicators and evaluation tools for the different activities, to effectively assess project achievements.
7. Establishment of recommendations for future EU strategy concerning nanotechnology and the public - This WP specified the most efficient tools and medial channels for social engagement on nanotechnology, mapped the prudence and risk averseness amongst various stakeholders, and

recommended a process that will lead to better governance regarding nanotechnology issues.

8. Management and coordination - The main objective of this WP was to provide effective co-ordination of the project.

Project Reach

The NANOCHANNELS project touched across the vast geographic landscape of Europe through dissemination actions. Specifically, the project live events took place in 11 EU Member States (Austria, Croatia, France, Germany, Italy, Romania, Slovakia, Spain, UK, Belgium and Hungary), and two Associated Countries (Israel and Turkey) in order to offer the widest spatial coverage for live events. Because channels such as press, radio programmes and social media can reach beyond borders, the exposure of the project was international. For example, the microsite of El Mundo was available to Spanish readers in South America and the United States.

The NANOCHANNELS project was designed to respond dynamically to the needs of nanotechnology consumers and to address ongoing changes in media consumption patterns (i.e. away from traditional print sources and to a more diverse range, in particular online sources.) An ongoing process of monitoring and analysis, through a swift-response editorial centre, allowed the partners to adapt the programme to the feedback received (stakeholder and public responses) to ensure resources were directed to the most effective tools.

The project was designed to reach a variety of citizens via various media channels. The project incorporated the following channels:

- Three national newspapers (The Guardian [UK], El Mundo [Spain], Corriere della Sera [Italy]),
- Microsites of three media outlets (The Guardian, El Mundo, and TiConUni [IT]),
- One radio station (Radio24 [IT]),
- Dedicated web portal (see <http://www.nanochannelsfp7.eu> online),
- Social media web tools (Facebook, Twitter, YouTube, LinkedIn),
- High profile live events (London, Munich, Milan),
- Live events run in 20 participating schools throughout Europe,
- Conferences (Italy, Hungary, Belgium).

SIG (Scientists, NGOs, and Industry)

A Special Interest Group (SIG) consisted of representatives of stakeholders relevant to the social issues associated with nanotechnology and was designed to represent all external stakeholders, thus ensuring that all interested parties would be represented. The SIG was designed to play an advisory role in the project, and the members did not have managerial responsibilities. The SIG included environmental NGOs, industrialists, information gate keepers, regulators and health ministries. It was designed to represent all external stakeholders in the general assembly of the project and thus give weight to those stakeholders in project management, especially in formulating the required recommendations to the EU services as well as play a consultancy role throughout all phases of the project.

The initial goals of the Special Interest Group included:

1. Giving advice and supplying content for the live events,
2. Participating in panel of Live Debate Events,
3. Disseminating content developed in NANOCHANNELS events to their community,
4. Inviting suitable networking contacts to NANOCHANNELS events, and
5. Formulating and making recommendations to the EU for developing policy regarding nanotechnology.

As the project progressed, the number of SIG participants was increased to offer an even greater impact to the project. The SIG included many

well-known experts, including Dr Steffi Friedrichs, Director General, Nanotechnology Industries Association, Belgium; Ddr André Lecloux, ENVICAT Consulting / Nanocyl, Belgium; Dr David Santillo, Senior Scientist, Greenpeace Research Laboratories, Greenpeace, UK; Dr David Azoulay, Managing Attorney, Center for International Environmental Law (CIEL), Switzerland; and Dr Tom Wells, Policy Advisor, Science and Society Team, Department of Business, Innovation and Skills, UK.

Project Partners

Each of the NANOCHANNELS partners held a significant role in the overall project. Each partner not only allocated resources, they also offered a professional guiding role in executing out each of the projects goals. Below is a chart that identifies each partner and their key role in the NANOCHANNELS project.

Partner	Country	Specialties	Short Name
ORT Israel*	ISRAEL	School and college network (coordinators of NANOYOU)	ORT
EUN Partnership AISBL	BELGIUM	Coordination of educational projects (live events at school and teachers kits)	EUN
The Guardian News and Media Ltd.	UNITED KINGDOMS	Media/press/ website	GUARDIAN
Institute of Nanotechnology	UNITED KINGDOMS	Professional membership organisation offering socioeconomic and technology analysis	IoN
El Mundo: Unidad Editorial Información General	SPAIN	Media/ press/website	EL MUNDO
Corriere della Sera	ITALY	Press/ website	CORRIERE
TiConUno srl	ITALY	Media radio	TiConUno
The Centre for Social Innovation	AUSTRIA	SPS, statistics in academic papers	ZSI
Deloitte Brightman Almagor Zohar	ISRAEL	Project management	DELOITTE
* Project Coordinator			

Project Results:

The success of the NANOCHANNELS project was due to the detailed methodologies that were used in executing each of the project tasks. The mechanisms used were media, the web portal, social media, live events, radio events, and activities that encompassed the three pillars of activities (outreach, dialogue and education). Each activity channel engaged to deliver the NANOCHANNELS project goals was carefully decided upon and organized with great details.

The following sections outline how the activity channels were organised, which partners contributed to which channel, the successes that were achieved, and a review of how the various events were undertaken and delivered.

Pillars of Activity

The NANOCHANNELS project employed three broad strategies to achieve its goals of directing outreach, dialogue, and education in issues of nanotechnology to the various European stakeholders.

Press (Print Supplements)

5 supplements published in 2 phases, between 3-4 colour pages each

Press (Microsites)

3 microsites launched

Web Portal

Launched July 2011

Conferences

3 conferences; in Italy, Hungary, Brussels

Radio Events

10 broadcasts aired

High Profile Live Events

3 events; in London, Munich, Milan Dialogue

Live School Events

20 different events in 11 European countries

Social Media

9 social media outlets in 5 different languages

Video Clips

10+ video clips

Interactive Games

4 interactive games Education

Teachers' Kits

Made available in 7 project languages

Virtual Teacher Training

2 training sessions

Student-produced Materials

220 uploaded students files and 24 YouTube videos

With the pillars of activity identified the next step was to determine how to implement them into the project. It was determined that a three-stage strategy needed to be executed. The phases were: preparatory, campaign and evaluation.

The preparatory phase began in the first month with a survey and public opinion poll and began with a review of data from previous relevant projects funded by the EU. The surveys looked at the national contexts in the participating countries and at differing attitudes and needs of relevant stakeholder groups (including the scientific community, the education sector, industry, NGOs, governmental agencies, opinion makers, the media, the lay public, etc.). Socio-demographic characteristics were

taken into consideration for the analysis of general attitudes towards nanotechnologies and motivations to get informed.

Public opinion was evaluated by ZSI in several different countries through an online survey (translated into seven languages: English, French, German, Hebrew, Italian, Romanian and Spanish) and eight focus groups in Austria, Belgium, Hungary, Israel and the UK. A number of professional communicators (and academics involved in the study of science and technology communication and public engagement) were also interviewed.

The purpose of these activities was to:

- Gain an understanding of the level of understanding of nanotechnology in the wider public and in different countries.
- Identify what channels the wider public are already using to find out about science and technology.
- Identify 'trusted sources' and those types of individuals or organisations which motivate people to learn more.
- Make an initial evaluation of whether there are differences between different countries and stakeholder groups.
- Identify the 'hot topics' which hold the greatest interest and also the greatest concern for the wider public, and therefore would play a central role in the ongoing debate throughout the project's lifetime.

The outcome was intended to be a set of recommendations and best practices of how to engage the general public in the nanotechnology dialogue by identifying the most appropriate communication channels and outreach strategies.

Four major areas of interest were considered in the survey design: (1) general attitudes towards nanotechnology and media use, (2) major interests in different application fields of NT, (3) drivers for motivations to get informed or involved in nanotechnology, (4) preferences of media use and communication channels to get informed on nanotechnology. The survey received 1334 responses in total from almost 50 countries.

Once the survey and public opinion poll was complete, the preparatory phase continued with the development of an editorial plan, including media materials and tools for the press, web, social media, and live events. It ended with the establishment of management procedures and quality assurance standards for efficient communications between all the partners.

The campaign phase produced the core activities of the project. One of the first tasks was to establish working procedures and preparation of media content for the campaign. Once this was outlined the publications and websites (including press microsite) could be launched. In order for media activity to be delivered to reach the goals of the project, the campaign phase was divided into 2 sub-phases to carefully monitor for effectiveness and for the need to change the method of delivery. After the first phase feedback was assessed, changes were made to make the material being published more beneficial to each intended stakeholder.

Being the heart of the project, the campaign phase executed the events that would stimulate the outreach and dialogue elements. Careful preparation was made to ensure each event was met with the highest results possible. Advanced notice of all events was published through the

media and press partners. Buzz was made on the social media platforms to announce that an event was going to be happening; polls and interactive opportunities for Stakeholders to ask questions and become involved in at an early stage were provided.

The final phase was the evaluation phase and recommendations and was devoted to evaluating the different aspects of the media campaign. Analysis was completed to determine if the goals for reaching and engaging the stakeholder were met. The success of many of the projects' activities and output were measured and monitored in terms of 'reach'. After a thorough assessment of NANOCHANNELS was completed, a series of recommendations was produced for future Framework Programme and Horizon 2020 projects to consider.

The three-phase approach provided a clear system of operations that propelled NANOCHANNELS to a successful conclusion. In the sections that follow, the pillars of activity are discussed in detail and provide a clear picture of how each activity contributed to the success of the project.

Outreach

The outreach for NANOCHANNELS included press supplements and microsites, radio broadcasts, a web portal, and conferences. Each one of these channels of activity were intended to inform and engage the identified stakeholders. The objective of the campaign was to inform and engage the audience and disseminate the debate on nanotechnology using the different media platforms of the newspapers. In this way, a dialogue could evolve among EU citizens, providing them with the opportunity to convey their opinions and respond to the issues at hand.

Press Supplements

With the participation from NANOCHANNEL's three main press partners, press supplements were produced. The Press Supplements were provided by El Mundo, The Guardian and Corriere della Sera. In total 5 press supplements were produced in two separate phases. The articles that were produced for the supplements were chosen from a series of topics the editorial board, led by ORT Israel, outlined in a plan for the press partners. The journalists were given the freedom to choose the articles they wanted to write and publish. Each article that was written was always written with two sides being presented: the benefits and the risks.

Applications in science and health; and new materials

1 page

25 November 2011

El Mundo

Main uses of textile nanofibers; new material; nanotechnology in clothes could improve health

1 page

28 April 2012

Articles on breakthrough nanotechnology applications in the scientific world.

4 pages

26 November 2011

The Guardian

Instigations of a nanotechnology debate by asking questions and making the reader think about nanotechnology

4 pages

31 March 2012

Explanations and information for readers on nanotechnology

3 pages

15 March 2012

Corriere Della Sera

The first press supplements were designed to inform and engage the audience and disseminate the debate on nanotechnology using the platform of the printed press. On 25 November 2011, El Mundo published a press supplement in more than 267,000 copies of their paper. This supplement was part of the daily newspaper. The Guardian supplement was published the next day, 26 November, and appeared as a special glossy spread in 425,000 copies.

Before the next series of press supplements were published, ZSI provided evaluation recommendations to help shape the editorial content for the next supplement.

The second series of press supplements took into consideration the feedback from the evaluation concluded from the first supplement. The objective of the second phase was to continue the engagement and dissemination of information including ethical, legal and social aspects (ELSA) of nanotechnology to the audiences through different newspaper platforms; hence, providing the opportunity for EU citizens to continue debating the topic whilst having the opportunity to engage with the newspapers via the microsite.

On 28 April 2012, El Mundo published a second press supplement that was distributed in 237,811 copies. Corriere della Sera published a 3-page supplement on 15 March, which was included in 696,032 copies of the paper. The Guardian published a 4-page supplement on Saturday 31 March 2012, which was included in 512,046 copies of the paper.

Each of the three newspapers had different tactics for preparing the supplement. El Mundo chose to work with a nanotechnology professional to write the features and check scientific accuracy, always treating each article as if it was breaking news. The Guardian prepared a general plan for the project with short synopsis. This plan was discussed and agreed on with the Editorial Board. Towards the publication of each feature, the Guardian sent a more detailed synopsis to gather feedback from the Editorial Board. After reaching consensus, the Guardian wrote their feature.

In order to encourage the public to take action and comment on the topics presented in the supplement, a special box was incorporated into the Guardian press supplement. This encouraged readers to visit the microsite and continue the discussion of nanoscience. In addition it provided a QR code that could be scanned to follow the trail of conversations from Facebook and Twitter.

Microsites

The press microsites of the mass media partners were launched during May 2011. In addition to professional and informative pieces about different fields of nanotechnology (health, science, medicine, industry, etc.) the microsites included opinion blog articles, opinion surveys, opinion polls and links to round table discussions. The sites were also made interactive by offering links to social media platforms such as Facebook and Twitter.

The Guardian

The Guardian launched its microsite on nanotechnology on 26 May 2011. The microsite is hosted on the Guardian platform <http://www.guardian.co.uk/nanotechnology-world>.

Since its launch, the microsite has been promoted across The Guardian through jointly branded – with NANOCHANNELS – advertisements in order to drive traffic from other sections of The Guardian website. In addition, a series of jointly branded advertisements have also run in the printed edition of The Guardian newspaper. The site has been a great success. Since the launch, it has had 55,956 unique users creating 98,202 page impressions.

On the microsite a reader can read about articles regarding how nanotechnology can provide clean drinking water; or they can take a poll regarding challenging questions like the one published on 30 May 2012: Should nanotechnology be used in further advances in areas such as stem cell research? The Guardian site offers not only articles that introduce nanotechnology topics, but they also make the site interactive by providing a link for readers to share the articles on Facebook and Twitter.

El Mundo

El Mundo launched a microsite about nanotechnology on 26 May 2011. The microsite is hosted at <http://www.elmundo.es/elmundo/nanotecnologia.html>. Since the beginning of the NANOCHANNELS project, the microsite has become a standard section of the El Mundo website (see <http://www.elmundo.es> online), being updated every three or four days.

Every month, El Mundo has developed opinion polls to engage readers in debate about nanotechnology and ELISA issues. Since March 2012, 2,860 people have participated in these polls. The success of the microsite has been significant, with 500,000 page views in the first 9 months (June 2011 – March 2012). The readers of this microsite spanned the globe, and attracted readers beyond Europe, including Mexico, Argentina and the United States.

One very surprising and proud moment happened for El Mundo with the NANOCHANNELS microsite. On 15 April 2012, El Mundo published an article titled Graphene, the supermaterial, which quickly became El Mundo's most viewed article of all-time (see <http://www.elmundo.es/elmundo/2012/04/13/nanotecnologia/1334331314.html> online).

TiConUno

TiConUno launched its microsite for NANOCHANNELS on 7 January 2012. Podcasts of the radio programmes from Radio 24 were uploaded for people to access. The site also included interviews with scientific experts of nanotechnology. The main population of this microsite was the Italian market.

Radio Broadcasts

TiConUno supported the NANOCHANNELS radio live events by broadcasting public live events on the topic of nanotechnology on Radio 24 (Moebius Scienza). TiConUno surpassed the requirements that were set by the DOW which required 5 radio broadcasts; however, a total of 10 radio broadcasts were aired. Between 10,000 and 12,000 downloads were recorded

for each podcast, making the broadcasts very successful. Each broadcast focused on topics that were highly relevant to the lay public. Radio 24 has an average of 180,000 listeners over the two airings (on Saturday evening, and repeated on Sunday evening).

Each NANOCHANNELS radio event was self-standing, lasting about 10 minutes. During the show they were interconnected to several other narratives, making the broadcasts though ones. According to the outcomes of the preliminary survey, the topics chosen were: communicating nanotechnology in the wider context of consumer perception of risk; development of "responsible innovation" and its meaning; relationship and dependence of people to technology; request for transparency and regulation. To engage public response and reaction to the dilemmas there were questions raised during the program and polls were designed and implemented. The radio show was broadcasted (aired twice, the day of the broadcast and the following weekend) and the recording was made available for download on the TiConUno website.

As part of the radio broadcasts, interviews with experts were broadcast and made available as iTunes podcasts, supported by an article published on Radio 24 and NANOCHANNELS websites, and promoted through the Radio 24 (Moebius Scienza) Facebook page (around 3160 friends). Dedicated surveys were created on the Moebius Scienza website to follow opinion/ comments and short videos of discussions were published on YouTube.

The radio shows also incorporated students participating in the NANOCHANNELS project, which was not initially planned. An entire class belonging of one of the 20 NANOCHANNELS schools was invited to the radio station and interviewed on the topic of nanotechnology, and its applications and ELSA implications. The engagement with students through radio was effective and rewarding, both for the students and for the journalists. Students were given a chance to learn "hands-on" the communication activities of an important communication media—the radio—and to have a chance to express their expectations and concerns on nanotechnology.

Both aspects of the radio events were successful, and the main reason was due to choosing controversial issues and involving a diverse audience. Social media and live streaming enhanced the engagement with the lay public and NGOs.

The main reason for the success in this channel was its circular format; that is, all of the channels were engaged. For example, a topic in nanotechnology was introduced on the website and/or via social media, and then was broadcasted on a radio and finally recorded into a downloadable podcast on the station website (link to podcasts: <http://www.radio24.ilsole24ore.com/player/player.php?filename=111218-moebius.mp3>).

With this format the topics were dealt with on different levels and from different angles. The radio events were interconnected with the web and podcasts as well. Prior to the radio shows being aired, questions

Web
Radio
Podcasts

would be posted on the TiConUno microsite that would stimulate the topics that would be discussed in the upcoming radio broadcast.

Web Portal

As part of the NANOCHANNELS Outreach pillar, a web portal was launched. The NANOCHANNELS project website was launched by ORT Israel in July 2111 for the lay public. The website's address is: <http://www.nanochannelsFP7.eu>. The website's content was available in a wide range of European languages, including English, Spanish, French, Italian, German, Romanian and Hebrew.

The website includes the following section headings:

- Homepage: This section featured highlights and news regarding the NANOCHANNELS project including links to discussions regarding nanotechnology across the web, links to media partner's microsites, such as The Guardian's microsite. In addition, news articles specifying details regarding the project's advancement are provided.
- About Section: This section included all public information regarding the project such as press information, details and contact details for the project partners.
- News: This section contained articles with recent news regarding the project.
- Opinions: This section contained public opinions polls regarding nanotechnology issues. It also invited visitors to vote and comment on issues. Visitors and participants were able to take part in the discussion using the commenting feature available on this section of the site.
- Student Materials: This section featured student materials such as articles, videos, and presentations by students all over Europe.
- Live Debates: This section contained details about future nanotechnology debates conducted during the NANOCHANNELS project.
- Teachers Area: This section contained project information for teachers and educators that could be used in class and generally throughout the project.
- Learn Nano: This section contained extra information and learning materials for students and website visitors.

Conferences

Euro Forum Nano 2011

Six months after the official launch of the NANOCHANNELS project the ENF (Euro Forum Nano) conference was held in Budapest, Hungary. This conference incorporated the NANOCHANNELS project as well as four other Seventh Framework Programme (FP7) projects all focusing on outreach issues of nanotechnology. Within this workshop the activities that were accomplished up to that point were introduced by the coordinator (ORT Israel). Special emphasis was given to the newly aired websites and media micro-sites at that stage.

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This conference provided the NANOCHANNELS consortium with a chance to reveal the project to a group of like minded researchers and professionals. Much discussion and networking was done to help promote NANOCHANNELS and the consortium as a whole.

EC Workshop 2012

From 28-29 March 2012, an EC Workshop took place in Brussels. The topic was Communicating outreach in Nanotechnology actions, challenges and

prospects. The workshop focused on introducing and highlighting the most successful communications projects in nanotechnology research and innovation, including and those that focused on nanoscience in society and were funded by the Seventh Framework Programme. There were also panel discussions that focused on three stakeholders (youth, media/lay public, and NGOs/Industry).

A summary presentation of NANOCHANNELS was given by the coordinator as well as a clear description of the scheme and a clear description of the pillars of activity (outreach, dialogue, and education). An account on how the ELSA issues were addressed was given as well.

PCST 2012

At the PCST (Public Communication of Science and Technology) 2012 conference in Florence, Italy on 18-19 April, Dr. Luisa Filipponi (scientific consultant of NANOCHANNELS) presented the NANOCHANNELS project to an audience of approximately 50 people, which included experts in science communication, journalists, postgraduate students, museum curators and science writers. During the presentation Dr. Filipponi explained the aim and scope of the project, its structure and partners. In addition, she showed the work of the media partners (microsites, press supplements, radio broadcasts), the activities of the schools (school debates and articles written by the students), as well as the use of social media to engage the public in the debate around nanotechnologies. Dr. Filipponi presented some preliminary results with regards to the use of social media.

The public who attended the presentation was very interested in the project and reacted by asking many questions. The use of different interlinked communication channels was assessed as very interesting. The use of social media to engage lay public in ELSA-related debates also received much interest, and several attendees reported having similar experiences in using Facebook as a platform to stimulate dialogue. Overall the project was seen as very interesting and attendees said they would look for the Final Report once it was published. At the end of the presentation Dr. Filipponi distributed copies of the printed supplements produced by The Guardian.

Dialogue

The Dialogue for NANOCHANNELS provided a way for the stakeholders to participate in the discussions being introduced about nanotechnology. Through the activity channels high profile live events, live school events, social media, video clips and interactive games; stakeholders were brought into the discussion and encouraged to offer their opinion and listen to others.

High Profile Live Events

THE GUARDIAN, LONDON 2012

In order to engage with a larger group of stakeholders, The Guardian hosted a live high-profile NANOCHANNELS round table in London on 31 January 2012. Utilising a wide range of media resources to promote and publicise the event, including the NANOCHANNELS portal, The Guardian, El Mundo, Facebook, Twitter and partner websites, it was envisaged that awareness of the NANOCHANNELS project would be raised, and there would be an increase in use and readership of the various media. The Guardian's high profile round table used the chosen topic NanoMedicine. The focus was identified as: "Can Nanotechnologies Contribute to Living a Longer and more Productive Life?"

The objectives of the London event were as follows:

1. To engage scientific experts, experts in social policy, politicians, industry, NGOs, social partners, funding bodies, opinion-makers, influencers, information gatekeepers, nano-consumers, educators, regulators, students and the lay public in a discussion that would generate the widest-possible range of views on the nanotechnology issue in question: "Can Nanotechnologies Contribute to Living a Longer and More Productive Life?"
2. To raise public awareness of nanotechnology through the media resources available to the partners by promoting the Round Table event.
3. To exploit the media and social networking resources created by and available to the project partners in order to reach and capture a large, wide-ranging, interactive audience, thereby enabling the public to voice their opinion regarding the debate. Resources include: a live webcast of the event, Twitter and Facebook.

Key high level political figures were in attendance including the UK Minister of State for Universities and Science, RT Hon David Willets MP. The scientific experts who took part in the debate were:

- Prof Peter Dobson (Director Oxford Begbroke, and Strategic Adviser to EPSRC),
- Prof Mark Morrison (Head of Materials research group at KCL and broadcaster and writer on science and engineering issues),
- Prof Shervanthi Homer Vanniasinkam (Consultant Surgeon, Leeds and Bradford General Hospital),
- Dr Leonard Fass (Director of academic relations, GE Healthcare),
- Prof Kostas Kostarelos (Chair of Nanomedicine University of London).

The event was streamed live online, which allowed world-wide exposure in real time. In fact, media from Australia contacted the Guardian to get a copy of the recording of the event so that they could analyse and use the contact.

Debaters and the target audience from a wide range of interest groups as well as the lay public were invited to freely debate NT controversies in general. During the event Prof Mark Morrison, in consultation with the Institute of Nanotechnology (IoN), various stakeholder groups were identified for representation within the audience body. Care was taken to ensure that there would be significant representation from each of the targeted stakeholder groups, including scientific experts, experts in social policy, politicians, industry, NGOs, social partners, funding bodies, opinion-makers, influencers, information gatekeepers, nano-consumers, educators, regulators, students and the lay-public.

Some of the audience members included:

- Diana Barbosa, Managing director, SEAS Nano;
- Dr Bojan Boskovic, Director, Cambridge Nanomaterials Technology Ltd;
- Mr. Mike Childs, Head of policy, research and science, Friends of the Earth;
- Ms. Sue Dunkerton, Director, Healthtech and Medicines KTN;
- Mr. Teck Yong Eng, Professor of marketing, head of entrepreneurship and innovation group, associate research director, University of Essex
- Dr. Shareen H. Doak, Nanomedicine and medical devices research group, University of Wales;
- Dr. Robin Hart, Director of Programmes, National Physics Labs

In summary, a wide range of stakeholders participated in the live event as panellists, attendees in person, and as online participants via

Twitter and Facebook. The live audience was engaged and responsive, presenting valid and challenging questions to the panel. As an added benefit, questions that were sent via Twitter during the event were answered by the panel. The webcast was attended by over 80 participants, and hundreds watched it in the following weeks.

One month before the conference, on Thursday 15 December 2011, speaker Prof. Mark Miodownik hosted a question and answer session on the Guardian Microsite to help stimulate the topic of nanotechnology. Questions were asked by teachers, 14-year-old students, researchers and others members of the lay public. Prof Miodownik gave a response to every question and comment and also provided links to further research to help provoke a greater understanding of nanotechnology.

TiConUno, MILAN 2012 (BEYOND THE DOW)

NANOCHANNELS project partner TiConUno, in cooperation with the web TV Triwù, organised a roundtable event in Milan on Monday 2 April 2012 among relevant stakeholders. The roundtable took place at the Politecnico di Milano. The topic of this event was Nanotechnology and international law: how companies should behave in this phase that still lacks regulations?

It was broadcast live (in Italian with an English overlay) and was made available for download as well. Nanotech company CEOs, researchers, social scientists and lawyers sat together to share and discuss for more than an hour regulatory issues related to nanotechnology. As a starting point, participants agreed that regulators have a rather complex task to accomplish, primarily because nanotechnology is a broad "concept" that embraces a very large number of materials and applications. Even defining what a nanomaterial is has proved to be a challenge (and still is). The event was chaired by Federico Pedrocchi along with Dr. Luisa Filipponi.

The list of participants represented a very wide variety of leaders in Nanotechnology. They were as follows:

- Enrico Sabbioni (Scientific Director of European Centre for the Sustainable Impact of Nanotechnology),
- Roberto Cafagna (CEO of Nanto, a company who specialized in nanotechnology based high performance coatings),
- Luca Ravagnan (CEO of Wise, stretchable electronics for implantable biomedical devices),
- Denise Archiutti (Group Controller of Gruppo Veneta Cucine, a company engaged in manufacturing kitchen appliance),
- Paolo Gasco (CEO of Nanovector, working with nanodrugs),
- Elena Angeli (CEO of Nanomed, working in early and non invasive diagnosis of diseases, genetic screening, personalized medicine),
- Prof. Dario Narducci (University of Milano Bicocca, Dept. of Material Science), and
- Prof. Franco Ciccacci (Professor of Quantum Physics, Milan Polytechnic).

The objectives of the Milan event were as follows:

1. To gather nanotechnology business leaders to host an open discussion regarding the complexities of nanotechnology and the regulatory issue that accompany the topic.
2. Provide live recording of the round table discussions for the lay public and radio listeners to be engaged and stimulated.

There were no live attendees in this high profile live event. The intention was to provide a recording of the event that could be

downloaded from the TiConUno website. NANO DAY at DEUTSCHES MUSEUM, MUNICH 2012, (BEYOND THE DoW)

NanoDay was hosted by the Deutsches Museum in Munich on Monday 25 June 2012. The day consisted of two separate events, one in the morning that targeted secondary school students, and the second one in the evening that targeted the general public. The audience consisted of about 90 secondary school students and their teachers, as well as other museum guests who stopped by to listen to some parts of the presentations and experiments.

The objectives of the NanoDay Deutsches Museum event were as follows:
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1. Introduce and engage school students and teachers in discussions regarding the topics of nanotechnology and the sciences that are developed in this context.
2. Provide hands on experiments that would show students examples of nanotechnology and to provide explanations to foster the understanding of nanoscience.
3. Promote the public participation in a open dialogue regarding the topic of "Nano in the Body".

The topics of Nanosciences and Nanotechnology were introduced to the audience by using examples as well as demonstrations of products that already use nanoparticles, such as the Nano socks. The students had the opportunity to participate in a guided tour through the exhibition and viewed Nano and Art, Nano products, and Nano effects, which they seemed to enjoy. The exhibition showed a mix of examples from everyday life and a scientific description about each.

The Scientific experts who helped facilitated Nano Day event were:

- Prof. W.M Heckl, the director of the Deutsches Museum
- Yoel Rothschild, Director of the ORT Moshinsky R&D Centre, NANOCHANNELS Coordinator
- Barbara Schwarzenbacher, representative from EUN
- Paul Hix, Manager of DutecheMusieam
- Dr. Manfred Lobjinski, author and researcher within nanotechnology
- Prof. Dr. Manfred Ogris, Head of Research Group Vectorology at Ludwig-Maximilians University
- Dr. Stefan Thalhammer, researchers nano-biotechnology
- Dr. Antje Grobe, Project Manager and Senior Researcher at ZIRN within University Stuttgart

The scientific experts led a student-focused discussion on the following topics: "implanting memory chips in our brain", and "making DNA modifications to our unborn children". In general, the majority of students were mostly against using nanotechnology in our body to increase our capacity, life-expectancy and health, especially after watching the animations depicting the negative aspects of doing so.

Dr. Manfred Lobjinski, provided many hands-on experiments, such as the lotus effect, the gecko effect, the ferrofluid and the coke-mentos bottle; providing a scientific explanation for each experiment.

The last event at NanoDay was a public dialogue about "Nano in the Body" and was hosted by a number of scientists who presented the current status of nanotechnology research and their current work. Because the audience was not necessarily up to date in this field of scientific research, speaker Paul Hix showed some hands-on demonstrations to help the audience

understand what nanoparticles are and how small a nanometer is. Prof. Dr. Manfred Ogris, and Dr. Stefan Thalhammer presented research in fields such as radiology and cancer research that use nanotechnology.

In conclusion the students all seemed to enjoy their experiences at NanoDay and their curiosity about Nanotechnology was certainly stimulated. The public dialog was a successful addition as well. In general, the fact that the audience could discuss with the experts and ask specific questions was well received. The audience consisted of about 25 people from various backgrounds. NanoDay at the Deutsches Museum successfully introduced and engaged school students and teachers in discussions regarding the topics of nanotechnology, provided nanoscience experiments to help understand the science further, and supported a live public dialogue regarding "Nano in the body".

Live School Events

Between January and May 2012, live school-based debates took place at 20 different European schools (located in 11 European countries). They were geared towards students who were between 11 and 16 years of age. The main part of these events was the student round-table consisting of a well structured debate, in which each protagonist presented arguments for or against the debate's topic and question. Each debate included participation from local and regional scientists and industry, parents, teaching staff, students and friends as much as possible. The audience participation was encouraged (asking questions, voting, discussion, and debate) and local press was contacted in order to engage the widest possible range of regional public opinion.

During these events students debated nanotechnology innovation topics, controversies regarding Ethical, Legal and Societal Aspects (ELSA) issues of nanotechnology. Special emphasis was placed on cooperation with the Project's Special Interest Group.

The students were encouraged to scripted scenarios that would included expert presentations, role-plays, stakeholder interviews and student "speakers' corner" presentations, regarding a chosen nanotechnology dilemma from different stakeholders' viewpoints (e.g. industrial manufacturers, nano-consumers, environmental protection advocates, governmental regulatory agency managers, politicians, religious leaders, media writers, etc).

The teachers were engaged and supportive throughout each event. Prior to each live school event teachers were supplied with an intensive virtual training that would prepare them for the format and material that was intended to be incorporated. A representative from EUN attended each event to ensure each teacher was supported and comfortable with the material.

There were 10 different dilemmas that the teachers could choose for the students to base their activities on. Each event put the emphasis on discussing Ethical, Legal, Social aspects (ELSA) of each of the nanotechnology topics. Once the teachers choose the dilemma the students participated in a round-table role-play, in which each protagonist presented arguments for or against the debate's topic and question.

Dilemma 1:

GPS jacket

Should we buy jackets with built in GPS systems

Safety vs. Privacy

ICT

Social and ethical

Dilemma 2: Antibacterial socks

Is it right to buy antibacterial socks containing nanoparticles while it is not yet known if they are entirely safe for the environment?

Elimination of bacteria causing smelly feet vs. particles that may be hazardous to our water

Energy and the environments

Social

Dilemma 3: Improve human brain capabilities

Is it ethically acceptable to use technologies developed for specific medical treatments for other scopes like improving human capabilities?

Medicine

Ethical

Dilemma 5: Nanoparticles to detect food freshness

Should nanoscience be used in our food or pharmaceutical packages to detect freshness when we still do not know the full ramifications of using nanoparticles

Energy and the environment

Legal

Dilemma 6: Cancer Therapy

Should gold-coated nano particles be used for human bodies' treatment before possible health risks have been explored?

Medicine

Ethical

Dilemma 7: Nano sensors used for medical diagnostics

Should nano sensors be used to diagnose medical conditions in the early stages when there are still no definite restrictions in place to protect patients' privacy?

Medicine

Ethical

Dilemma 8: Nano based solar cell benefits and risks

Should nano based solar cells be used before all associated risks are established?

Energy and the environment

Social

Dilemma 9: Internet for everything

Do we want to live in a world where everything is observed and open to scrutiny?

ICT

Social and Ethical

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Dilemma 10: Revolution for the light bulb

Do we pursue quantum dot technology even though health and environmental risks remain unanswered?

Energy and the environment

Legal

EUN ensured that there was a balanced distribution of all dilemmas. To ensure that each of the 10 dilemmas was addressed, the teachers were asked to choose their top three choices for their school debate, then a dilemma was assigned to each teacher. Most teachers were offered their top choice.

18 Jan

Israel

ORT-RAMAT YOSEF High School

Nano Sensors for medical diagnostics

19 Jan

Israel
ORTEBIN
Improve Human Brain Capabilities
7 Feb
Romania
Clubul Copiilor Zimnicea
Antibacterial Socks
1 March
Germany
Jakob-Fugger Gymnasium
Nano sensors for medical diagnostics
5 March
Austria
BORG 3
Improve humans brain capabilities
6 March
Austria
BG/BRG Klosterneuburg
Internet for everything
13 March
Italy
LICEO SORBELLI (Isis Cavazzi)
Nano based solar cell benefits and risks
14 March
United Kingdom
Smithycroft Secondary School
Nanoparticles to detect food freshness
15 March
Italy
ISS 'Piana di Lucca'- Liceo 'E. Majorana'.
GPS Jacket
20 March
United Kingdom
St Mary Redcliffe and Temple School
Nano sensors for medical diagnostics
20 March
France
Lycée Camille Claudel
Nano Sunscreens
3 April
Romania
COLEGIUL NICOLAE TITULESCU - Craiova
Internet for everything
5 April
Romania
COLEGIUL NICOLAE TITULESCU - Pucioasa
Nanoparticles to detect food freshness
13 April
Slovakia
Spojená škola Martin
GPS Jacket
19 April
Spain
Institut Verdaguer
Nano Sunscreens
19 April
Spain
Colegio Pedro Poveda de ITAC

Nano sensors for medical diagnostics
21 April
Croatia
Prirodoslovno tehnicka gimnazija Split
Want to be a superhuman?
14 May
Turkey
Kirimli Ismail Rustu Olcay Lisesi
Revolution for the light bulb
15 May
Turkey
Sainte Pulchérie Fransiz Lisesi
Nano Sunscreens
25 May
Spain
IES José Marhuenda Prats
Nano Sunscreens

The most important outcome of the debates was the creation of a "NanoCarta" by the students. This document became the school's "ethical codes of NT". In this document the students wrote a list of "actions" to be taken at the end of the role play that they agreed upon after the school live debate took place at the school.

Each of the 20 NanoCartas was posted on the project portal and was made publicly available and open to comments and discussions. Examples of two NanoCartas are given in Annex 1.

In conclusion, the events were considered to be a great success because they engaged the lay public as well as other stakeholder groups (young people, decision makers, educators, researchers and industry) reaching almost 2,000 participants across Europe. The participation of parents and experts was good, and the debates produced thought-producing outcomes (as shown from the high quality of the NanoCartas produced at each event). The reaction from the teachers and students was enthusiastic, and the teachers found that the debates often provided students with the ability to participate in meaningful ways.

Social Media

In the NANOCHANNELS project, social media was used to reach a wide range of different stakeholder groups and the lay public, to spread reliable information and to engage the public in a dialogue about nanotechnology. Social media's special characteristics enable it to supply an interactive sphere in which the users not only consume information but also create it themselves, engage in conversations and share knowledge. Social media supplied NANOCHANNELS partners with a useful tool to spread professional content and reach a wide audience, and at the same time the lay public and stakeholders are able to create their own content as part of an entire process of learning and creating knowledge.

The social media campaign led by the ORT team supplied an interactive sphere in which the users not only consumed information but also created it themselves, engaged in conversations and shared knowledge. Social media supplied NANOCHANNELS partners with useful tools to spread professional content and reach a wide audience, and at the same time the lay public and stakeholders were able to create their own content as part of an entire process of learning and creating knowledge.

The social media campaign was officially started in October 2011, as required by the DOW. Before the official launch, several moves were made in order to lay the ground for the upcoming activity. The NANOCHANNELS page on Facebook was set on March 2011, and the first content items were published as early as May 2011. The purpose of the preliminary activity was to take care of technical requirements and to gather a base of fans and followers to start the campaign. The NANOCHANNELS Twitter account was launched in September 2011 for the same reasons.

The campaign was supported in 5 languages: English, Italian, Spanish, German and Hebrew. The social media campaign was conducted consecutively until the end of May 2012.

Social media platforms were determined based on the following criteria:

- Relevance to nanotechnology,
- Popularity and reach,
- Relevance to project's target audience, and
- Relevance to project's target countries (Note: In the campaign, not only European platforms were used, also global platforms that reach European audiences were used).

NANOCHANNELS used the following social media tools as part of the social media campaign. The three most popular were: Facebook, Twitter and YouTube. The NANOCHANNELS' Facebook page was established in May 2011. The Facebook page has more than 523 fans and reached more than 16,839 individuals. The Twitter account has more than 477 followers and hundreds of references from members of the social network.

The school groups performed beyond all expectations as teachers and students created and used their own pages. In addition to the NANOCHANNELS page on Facebook, 18 of the 20 schools that participated in the project also had Facebook pages that promoted the activities from the live school events, resulting in 1315 group members in total. Students and followers were able to continue the conversations of nanotechnology beyond the borders of the live events.

In the NANOCHANNELS project, social media was used to reach a wide range of different stakeholder groups and the lay public, to spread reliable information and to engage the public in a dialogue about nanotechnology.

Some of the issues regarding the social media campaign included:

- Virally spreading NANOCHANNELS content among students, addressing the risk that we might witness lack of motivation among students to develop the campaign materials.
- Developing a contingency plan for various types of comments and feedbacks from the lay public. We created a protocol that could be used by all partners, which included best practices to handle and respond to criticism or incorrect information.
- Creating a content plan to prevent the possibility that materials developed for one media partner could not be easily migrated to other partners or to other media platforms.

The addresses for the NANOCHANNELS web outlets are:

- NANOCHANNELS website (see <http://www.nanochannelsfp7.eu> online),
- Facebook (see <http://www.facebook.com/nanochannels> online),
- Twitter (see <http://www.twitter.com/nanochannels> online),
- YouTube (see <http://www.youtube.com/user/nanochannelsEU> online),
- LinkedIn (see <http://www.linkedin.com> online),

- Nanopaprika (see <http://www.nanopaprika.eu/profile/NANOCHANNELSeu> online),
- XING (see <http://.http://www.Xing.com> online),
- NANOCHANNELS internal portal for partners only (see <https://nanoc.ort.org.il> online).

Video Clips

Understanding that the public uses a much wider variety of media channels beyond classical media platforms, such as newspapers and magazines; a series of web-based, interactive content was produced.

Short movies presenting the youth opinion and attitudes on nanotechnology dilemmas encouraged the public to engage in the opinion polls. Questions for the opinion polls and traffic drivers were produced after each live event, usually with both a short and a long version. This content provided the basis for electronic media dissemination (including links to social platforms), enabling a dialogue with EU citizens and providing them with opportunity to convey their opinions and respond to the issues at hand. In addition, four short animated video clips were produced by ORT.

The short videos presented dilemmas on usage of NT products or applications that influence young people's daily life, addressing in a direct way different points of view and questions concerning the issue. The movies were launched on the project website, on the project YouTube channel and on Facebook. The purpose of these movies was to encourage the public to engage in the opinion polls. More than 10 short movies were uploaded to the various channels.

Interactive Games

Interactive games were developed by ORT to engage the school age population to think about the topics they were learning in a more cooperative manner. The idea was to prepare games in such a way that students could prepare their own games from templates. The templates were prepared using MS Office programs like Excel and PowerPoint. The four interactive games were: "Test Yourself (attitudes toward nanotechnology)", "Maze", "Jeopardy" and "Who Wants to Be a Millionaire". For each interactive game, two files were published: an example and a template.

Education

The education part of NANOCHANNELS enabled the topic of nanotechnology to enter the classroom using the activity channels such as the teachers' kits, virtual teachers training and student-produced material. Engaging and encouraging the school age population stakeholders were very important goals of the project; these are the individuals who will be shaping our world tomorrow.

Teachers' Kits

In order to prepare the teachers for the live school events, teacher kits were prepared by EUN with the assistance of ORT. These kits were designed to support the teachers in their preparation and throughout the implementation of the tasks expected from the schools. They were available for download on the NANOCHANNELS portal (see <http://www.nanochannelsfp7.eu> online) in all seven project languages: English, French, Spanish, Italian, Romanian, German and Hebrew to enable many teachers throughout Europe to use these activities in their school, even if they were not part of the project.

The kits introduced the rationale, aims and objectives of the NANOCHANNELS project and were designed to give the participating teachers a clear picture of their role in the project and to explain the tasks they would be responsible for during the school-based events. In addition, the kits offered background information on teaching nanoscience and nanotechnology, information on the project portal and microsites, tips on the basics of article writing, guidelines for preparing internet and social media content for the students, and general information on social media and how to use it in the classroom.

The kits were arranged with a section regarding the school debates, explaining how the event should be organised, the rules for the debate, the role of the facilitator, the debate's structure, some tips and tricks, examples of issues for the debate, and more. It also included the expected outcomes of the debates and what the students should retain from the event and what they would produce, to be later made available on the NANOCHANNELS portal. It gave a structure for the NanoCarta encompassing the schools' own ethical code for nanotechnology plus a list of suggested public actions to be taken. The 11 debate scenarios ("role plays") were also listed in the Teachers' kit. The project prepared the teachers by producing a teaching kit at the beginning of the school year. Later, teacher training sessions were organised to allow the members of the NANOCHANNELS teacher team to prepare for the implementation in the schools. In each school, a debate scenario was prepared with the students focusing on a nanotechnology dilemma. In addition, each school participated in the NANOCHANNELS social media campaign to build online discussions on nanotechnology. This campaign included students deliverables including press articles, written with the help of professional journalists from prestigious newspapers.

Virtual Teachers Training

The virtual training was meant to complement the teachers' kit. The first virtual training session took place in September 2011, and consisted mainly of instructions on writing press articles and how to prepare the live debate in the schools. The second virtual training took place in October 2011 and focused on the use of social media for the schools and again preparing the live debates. These meetings were done using the Elluminate teleconferencing software programme. During those online meetings particular attention was paid to giving participants time to intervene and ask questions, as shown in the agendas below. All 20 teachers attended and showed interest in stimulating their children with nanoscience topics.

Overview of the activities for the school year

How to write press articles

Participation to the social media campaign

Organizing a debate in your school during the 2nd semester: dilemmas and debate scenario

Press authorization regarding pictures of students and video recordings

Organizing a debate in your school:

- Step 1: Confirming the choice of 1 dilemma per school
- Step 2: Finding a date
- Step 2: Sending invitations to local actors for the advisory panel
- Step 3: Preparing the debate scenario (interviews with local actors, studying the dilemma, making videos and PPTs, Q&As,...)
- Step 4: D-day: Ensuring logistics and keys to a successful event

- Step 5: Producing the NanoCarta and sharing materials resulting from the debates
- Step 6: Providing feedback from the event organisers and reporting to the EU

With the support of the Teachers' kit, the two virtual trainings, and the coordination done by the EUN team, the NANOCHANNELS teacher teams were ideally placed in order to implement successfully the activities involving the participation of the schools in the NANOCHANNELS project.

The teachers expressed a need for more clarification regarding the school events, so in response the NANOCHANNELS consortium conducted a third virtual training in February 2012. In this training event a teacher from Israel who had already taken part of a live school event was present to answer questions and provide support to the teachers.

The Consortium saw it appropriate to conduct a fourth event to review all the work done in the project. This event took place in May 2012 and almost all of the teachers attended it.

Student Produced Materials

Each teacher and his/her group of students actively participated in the NANOCHANNELS social media campaign, which encompassed the core activities of the project. Each school conducted its own campaign and was encouraged to collaborate with other schools in their own country. The students used the Project Web Portal as an organizational platform; bringing input into the design and development of the content of the campaign (along with professional journalists). As many people as possible were invited to join the discussion groups established in the social network sites. And virtual events were organized to facilitate small debates concerning nanotechnology issues. Students uploaded 220 files and inserted 24 YouTube URL videos.

Language	Number of posts	English
	85	Spanish
	37	Hebrew
	7	German
	23	Italian
	20	Romanian
	21	French
	37	Turkish
	14	Total
244		
Topic	Number of posts	Consumer products
	24	Education
	2	Electronics and ICT
	4	ELSA
	18	Energy and Environment
	16	ESH
	2	General Nanotech
	42	Health and Safety
	0	Nano in Nature
	1	Nanomedicine
	34	Public Opinion
	0	Textiles
	6	Total
149		

THE POTENTIAL IMPACT

Nanotechnology is an area of science which is developing at high speed. It comprises a large variety of science and engineering fields. The future prospects of nanotechnology will affect citizens in all areas of life. Its impact is currently being felt in areas such as such as: information technology, medicine, energy, and new materials, although members of the public are not necessarily aware of these developments. Developments in nanoscience have largely taken place in recent years, and advances are taking place rapidly. The effects of nanotechnology can be felt in almost every sphere of our lives, including health-care, energy, IT, and the environment. The objectives of the NANOCHANNELS project encompassed informing, communicating, facilitating, encouraging and engaging stakeholders about all aspects of nanotechnologies.

NANOCHANNELS employed a variety of means to engage with stakeholders, through the broad light touches of social media, to informing through newspapers, websites and radio, and building consensus through school debates and panel discussions. The numbers of different stakeholders across several different European and Associated States was ambitious; and indeed, the project succeeded in raising awareness and building consensus in key groups. Through the various activity channels accessed by the project, stakeholders where approached and invited into the discussion of nanotechnology. Readers were provided with information that introduced nanotechnology in common consumer items like sunscreen and clothing fabrics; listeners were provided with industry-related discussions about nanotechnology in the everyday world, and students and teachers were asked to give their opinion on the ethical implications of nanotechnology.

The impact of NANOCHANNELS is significant. Thousands of people have been introduced to ideas of nanotechnology with the induction of NANOCHANNELS. The innovative approach of using social media to deliver topics of nanotechnology helped to foster a greater understanding of topics once thought to be 'too scientific'. The lay public was brought into the world of nanotechnology and shown how it touches their lives with the purchase and use of consumer goods.

Demographic Outreach

The demographic outreach of NANOCHANNELS was significant. To begin, the nine partners provided the framework for dispersal. They were located in Israel, Belgium, United Kingdom, Spain, Italy and Austria. Their locations enabled NANOCHANNELS to branch out from those starting locations in Europe, and begin the dissemination of the projects to the rest of Europe and beyond.

With the use of the media supplements published in English (The Guardian), Spanish (El Mundo) and Italian (Corriere della Sera), stakeholders with different demographic backgrounds were able to read about nanotechnology as it related to them—the consumer public. Additionally the press microsites were available in English, Spanish and Italian. Offering both print and online material in three languages for stakeholders to become informed and engaged. The El Mundo supplement and microsite received hits from all over the Spanish speaking world, including North and South America. In addition, a Brazilian (Portuguese) blogger used information from the supplement and microsite for his posts, providing added value to the project as it opened the project to the Portuguese speaking population.

Further strengthening the demographic outreach, the social media campaign was available in 5 languages: English, Italian, Spanish, German and Hebrew. Allowing the campaign to provide participation, connectivity and "sharability", aimed at broadening the online conversation about nanotechnology with the goal of increasing audience involvement in a geographically dispersed manner.

The NanoChannels project website (see <http://www.nanochannelsfp7.eu> online) was launched for the lay public on 12 July 2011. The website is based on Wordpress technology and serves as a CMS (Content Management system) in various project languages: English, Spanish, French, Italian, German, Romanian and Hebrew. The NANOCHANNELS website was visited by people from 140 countries, proving the demographic reach of the project was beyond the European borders.

Potential Impact:**Potential Impact on Stakeholders**

Careful consideration for how to reach each stakeholder group was used to provide the biggest impact through each activity channel. It was understood from the beginning that media consumption patterns were not absorbed by all segments of the population in the same way. This led to the various activity channels that were chosen, and how each channel was used to reach each stakeholder.

The targeted Stakeholders for NANOCHANNELS were:

- Young people - particularly those aged 12 to 18 (secondary school) who are the next generation of decision-makers, practitioners and consumers;
- General public - both nano-consumers and those that have not heard about nanotechnology;
- Scientists and industrialists - those researching and developing nanotechnology enabled products and services;
- Non-governmental organizations (NGOs) - who may have a stance on specific nanotechnology applications;
- Educators - who are strong multipliers and are critical to the effective engagement with young people; and
- Opinion leaders - from all societal groups (industry, media, academia, politics, sport, etc) whose opinion people listen to and respect.

NANOCHANNELS used the different channels to access each of these stakeholders. Various activity channels were required because each group was responsive to a particular channel of material. This is important to recognize in order to maximize the impact of each activity. So, for example, social media channels were used largely for broad dissemination and as calls for action - informing people of the presence of a news item, or an opportunity to get involved (such as submitting an article or a media item to the website, or completing a survey or poll). As such, information delivered through social media needed to be succinct, and slick to ensure immediacy and get people involved. In contrast, the focus groups and debates required much more information, and the direct involvement of several different stakeholder groups, to deliver a solid approach and improve the probability of successful outcomes in terms of an informed and engaged group.

All channels interacted with each other to a certain extent and below we summarize what happened with each in the project:

- Facebook and Twitter - stimulated interest and directed people to sources of further information (calls for action were the most popular postings on both).
- Newspapers and microsites - engendered tweets, Facebook postings, comments, contributions to surveys.
- Radio - engendered Facebook postings, comments, contributions to surveys.
- High profile and School Events - allowed in depth discussion and consensus building, with information then shared through Facebook, Twitter, and YouTube.

This linking of channels was important to widen the audience engaged with each topic. Over time we observed a steady increase in the numbers of individuals engaged for the channels with regular activity (newspapers, and radio in particular) that were also making use of other channels to promote their activities. The parallel newspaper campaigns by the Guardian and El Mundo, and the 20 school debates organized in eight different countries, afforded us the opportunity to compare the opinion

of different nationalities, and to a certain extent stakeholder groups. Each of these channels also made extensive use of social media and overlapped with the radio (for the Italian schools).

Project Success Criteria

NANOCHANNELS project achieved its objectives as laid out in the DOW and in terms of the Critical Success Factors, but it exceeded output expectations whereby a number of additional public engagement activities over and above those prescribed were successfully carried out. The project determined that there is no 'quick fix' for engaging the public in nano-related issues; therefore, a variety of channels must be addressed. Nanotechnology has a wide impact, potentially affecting many different business and industry sectors, thus giving rise to a complex picture of public understanding.

Press: all supplement published and distributed according to the media plan and circulation figures of the media partners (challenging)
Achieved!

(2.1M copies were distributed of 5 supplements) Participation in live events (school and round table) by at least 1,500 participants (very challenging) Achieved! (more than 2K participants)

Radio: at least 30 minutes content aired; 5 unique broadcasts (very challenging)

Achieved!

(more than 100 minutes of content aired);

7 unique broadcasts Total participation by at least 1 scientist or 1 industry representative or 1 NGO at each of the live events. (very challenging) Achieved! (more than 60 experts participated in 22 live events)

Social media campaign: At least 10 relevant Social Media groups, with a total number of members of at least 1,000 and 750 talk-backs or publication on the groups' Board (highly challenging)

Achieved!

(17 groups and thousands of likes and comments) Total participation by at least 5 NGOs from different disciplines in the interest group. Joint participation of at least 5 NGOs and regulators in the NANOCHANNELS live events (challenging) Achieved! (at least 20 NGOs participated in the events)

Social media campaign: At least 3 NGOs specialised Social Media groups (challenging)

Achieved!

(participation in 7 groups) Student-led school debates successfully conducted. At least 20 events with students playing leadership roles in the debate (very challenging) Achieved! (20 events in 11 countries)

Participation in talk-backs and forums of at least 2,000 entries from the public (challenging)

Achieved!

(more than 10K entries)

Project Outcomes

The NANOCHANNELS project was a unique public experiment of democratic dialogue in action. It was an example of concrete attempts to engage the general public in debating nanotechnology by exploring a range of media channels. The basis for the activities of the project; which included press campaign, a web portal, conferences, high profile live events, radio broadcasts, live school events, a social media campaign and both video clips and interactive game; were designed to raise awareness about nanotechnology and the issues related to it to the targeted stakeholders.

The NANOCHANNELS project aimed to develop scenarios and approaches that would inform and engage the stakeholders through better understanding, appreciation and greater involvement in debates on nanotechnology: how, why, where and when it should be applied.

This is important for two principle reasons:

1. Understanding issues and having a sense of being engaged in the debate on nanotechnology provides individuals with a greater sense of confidence that new technologies are being developed appropriately. This increases the level of trust in government actions, as citizens perceive a time and space for them to voice their opinions (participative democracy), thus decreasing the likelihood of a public opinion backlash later.
2. Engagement can instil greater appreciation and excitement in technology and its applications, this in turn can encourage more people (especially young people) to become consumers, supporters, or view developments as potential career opportunities (which is important to reverse the declining numbers of Europeans studying science, technology and engineering).

One important focus of the project was to identify how people with a generally low interest in techno-scientific debates could be better reached and informed about new developments in nanotechnology. At the same time, information and communication preferences and needs of those people who already have a certain stake in the nanotechnology debate were looked at in comparison. An additional focus was laid on the role of social media and participatory approaches in engaging the public in the nanotechnology debate.

We observed that medicine; ethical, legal and societal aspects (ELSA); and environment, health and safety (EHS) issues stimulated the greatest interest in all channels (measured in terms of feedback [from participants in live debates], views, comments, shares/tweets). We also observed that a number of different channels interacted well with each other, either feeding in directly to the debate taking place within that channel, promoting the activity, or taking away the conclusions to disseminate to a wider audience. This integrated approach worked well, nevertheless it required time to gain momentum. We also mapped out the impact and reach of various channels and determined that there is no single channel which can achieve this effectively across different stakeholder groups and nationalities. That said, the traditional media perform well when allied with social media and other ways of directly engaging with the wider public (through focus groups and panel discussions for example).

In general, the results from the NANOCHANNELS project, in terms of knowledge, concerns and interest in nanotechnology, mirror what has already been observed by other research, as described above. What is interesting is the key role that schools and media play in conveying

information and knowledge, and in engagement activities. The activities leading to consensus building included one or both of these as the core activity.

Whilst it is not practical to review all of these activities here, it is worthwhile recapping on the key outcomes and consensus that has evolved on how the wider public understand and engage with science and technology (ST) in general and nanotechnology (NT) in particular.

1. Most people remain largely unaware of what NT is and how it can be applied. While an increasing number have heard about NT, most of these may only be able describe it in very general terms (e.g. as 'something to do with very small things').
2. Most people are only interested in ST that has a direct impact on their own lives, i.e. what is of material or moral value to them (defined as the 'me and mine' effect). They have little time or enthusiasm to engage on topics outside these boundaries.
3. Most people will follow the opinion of a trusted (to them) source on ST subjects they perceive to be too complex or technical, or which they feel they have little time to fully understand;
4. People find out and learn from a much wider variety of information sources than ever before; however, these sources are not all given the same level of trust.
5. People expect balanced and complete scenarios to be presented - there is a good deal of cynicism regarding decision-makers, and the presence of balanced debate (proponents, opponents and neutral/objective participants) can aid the wider public to understand and develop an opinion on quite complex ST topics, and have faith in the outcomes.
6. People also have different attitudes towards information- some want to be informed, some want the right "not to be informed" (because of lack of time, interest, "not my problem", etc.).

The work performed within NANOCHANNELS indicates that there are many different publics, or target audiences for engagement in debate on nanotechnology. The use of the various channels of activity offered a deeper understanding into how different groups used and responded to the different activity channels.

All channels interacted with each other to a certain extent and below we summarize what happened with each in the project:

- Facebook and Twitter - stimulated interest and directed people to sources of further information (calls for action were the most popular postings on both).
- Newspapers and microsites - engendered tweets, Facebook postings, comments, contributions to surveys.

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- Radio - engendered Facebook postings, comments, contributions to surveys.
- School debates and panel discussions - allowed in depth discussion and consensus building, with information then shared through Facebook, Twitter, and YouTube.

This linking of channels was important to widen the audience engaged with each topic. Over time we observed a steady increase in the numbers of individuals engaged for the channels with regular activity (newspapers, and radio in particular) that were also making use of other channels to promote their activities. The parallel newspaper campaigns by the Guardian and El Mundo, and the 20 school debates organized in eight

different countries, afforded NANOCHANNELS the opportunity to compare the opinion of different nationalities, and to a certain extent stakeholder groups. Each of these channels also made extensive use of social media and overlapped with the radio (for the Italian schools).

In conclusion, NANOCHANNELS project exceeded its objectives to engage a variety of different stakeholder groups across a number of European countries. Key stakeholders in this engagement process were the educators, media, and school students. Each of these groups is critical as they have the potential to directly influence a large number of others (the educators to students, and students to friends and relatives) and indirectly (media to readers, listeners, and viewers). The application of social media as a 'web' linking stakeholders and channels together, served to strengthen the impact of the project. Ultimately, the NANOCHANNELS project engaged with all relevant stakeholder groups: educators, media, school students, policy makers (through the panel discussions), scientists and industry (through panel discussions, school and radio debates, and newspaper articles), NGOs (through the panel discussions, and newspaper articles). Moreover, the project effectively engaged with a large number of individuals across the target countries: upwards of 5000 through the project website, over 1300 through the survey, over 1800 through the school debates, 180,000 through the radio programmes, and several hundreds of thousands through the newspapers. These numbers would not have been achieved without the active collaboration of key stakeholders driving the different channels.

Recommendations for the Future

We are at a point where society at large is getting information from an ever increasing range of channels, many of which are immediately accessible through mobile devices regardless of location. In this backdrop, we need to work with the architects and users of such channels to ensure that messages, information, and opportunities to contribute are specifically designed and adapted to be complementary. At the core of this must be a plan that involves and empowers those individuals with the necessary communication skills (in particular media and educators) who act as the 'glue' bringing together all other necessary stakeholders, and at the same time are effective multipliers, reaching out beyond their immediate communities. With this it is also important to recognize the knowledge and experience of such individuals who will lead activities through each of the three key structures, and thus for decision and policy makers to follow their lead, with agreed objectives.

This can perhaps best be exemplified by the following observations from one of the journalists involved in the NANOCHANNELS project:

- Articles in the press are written to inform and engage readers, not to provide a high level of technical detail;
- The editing process within newspapers has evolved to meet the needs of their readership. Changing this, by including external editorial control, dilutes the impact of the end article, thus hindering the original purpose of the communication and engagement activity. It may cause some level of suspiciousness within the readers, that they are actually reading advertisement; and
- Newspapers have a good understanding of how different media channels (including social media) interact. Changing this process can cause delays or affect the outcome of integrated engagement campaigns.

To be relevant this process must also consider how and where information is presented, and the involvement of key stakeholders (especially

'trusted sources'). From our assessment and that of others, the most important aspect of the message is that it must focus on the 'me and mine' effect, and be presented in a carefully pitched approach (neither too technical, nor too little detail) and with imagery that links to real-life. The presentation of information also needs to consider the channels most important (and trusted) to the target group, making most effective use of each (in serial and parallel). Furthermore it needs to consider that in some cases people (especially on social media platforms) may not be interested in 'finding out' or 'learning more', and here employ new ways of informing and engaging (such as video-only content, interactive games, and community events). The involvement of 'trusted sources' who are independent of producers, yet have the drive and enthusiasm to move debate and engagement forward, will increase the exposure of the wider community to Nano technology. These individuals can be public figures (from politics, NGOs, industry, or media) or known personally, such as teachers, community leaders, and students. Each has an important role to play in building trust, particularly amongst the 'hard-to-reach' public.

Information and engagement channels may begin as broad activities (i.e. national newspapers), reaching a wide audience, but quickly they must focus in on where active stakeholders are engaged (schools, social media groups etc.). In addition to broadcasting messages through social media and wider press, information should be targeted at special interest groups to demonstrate that Nanotechnology is a practical, a platform of technology capable of being embedded in many different products, rather than an abstract scientific concept. Thus, for wider exposure of the topic it is important that nanotechnology should be discussed not only in the science sector of the media platforms (press, radio, TV, websites etc.), but in other sectors as well (e.g. for fashion, food, motoring, or consumer sectors). As a result, those who read, view or listen to such messages will become more interested and engaged ('me and mine' effect). These people are the producers, sellers, and buyers of the goods who in turn influence others, building up a momentum that becomes self-perpetuating.

The live events that were conducted by the campaign were successful in for a variety of reasons. Firstly, many of the participants were a hard to reach audience, that usually is not interested in science in general and Nanotechnology in particular - this includes the students' parents who came to watch their children debating the topic in the 20 schools across Europe. Secondly, it brought together different stakeholders to discuss the ELSA issues of Nanotechnology. At the live events there were representatives of science centres, industry, national and municipal politics, educators etc. who expressed a variety of points of view on the subject. The feedback showed great enthusiasm from these events. Therefore, our recommendation is to use the live events (in schools and in a high profile way) as a main channel in every outreach project.

This whole landscape is one of interconnected hubs of activity, performing different but overlapping and complementary functions, through which a variety of stakeholders can variously be informed, engaged, and educated. By mapping and understanding the flow of information and means by which individuals access these; policy and decision makers can better contribute to raising awareness of and building consensus on Nanotechnology.

Although we can report on high numbers of exposure in part of the channels used in the project, not all of the platforms we used were proved to be efficient. The platform that had the poorest results is the project's portal (less than 10K visits in 10 months). Most of the communication in the project (partners, teachers and students participated) and with the project (outside visitors) was made via different platforms, such as the basecamp website (i.e. teachers) and social media. It seems that the use of a portal as the main hub of an entity has passed. Today people want to communicate with the brand, and the best way to do that is via social media platforms. We do not argue that a project should not have an official portal, but its role should be minor.

Another channel that had poor results was the project's Facebook page. Eventually we had about 550 fans for the main page, negligible number compared to the EU population. We believe that the low budget (in person months) and the short time did not allow higher exposure. Yet, we cannot ignore the impact of this popular social media tool. Even though the number of fans was low, it brought a huge number of users who were exposed to the content that was seen as "liked". This makes our recommendation for much more intensive use of social media even stronger. Even though there were poor numbers of fans for the project's page, the reach was enormous. In addition, the schools' Facebook pages had large numbers of fans (almost 2000) with impressive activity.

A strategy for effective public engagement on nanotechnologies needs to consider five critical aspects:

1. Timing - it is widely accepted that engagement activities should start at the earliest possible time, before developments have reached a stage where opinion is largely irrelevant (i.e. it is not likely to influence the outcome of a development that has already proceeded beyond any checkpoint)
2. A roadmap for each activity needs to be produced, which allows timing of different activities and involvement of different stakeholders to be coordinated (see below), and desired objectives mapped, i.e. the schedule of the academic year needs to be considered when designing school activities.
2. Stakeholder involvement - the wider public do not necessarily have the time or inclination to fully understand complex scientific or technological arguments, instead they look for sufficient information to allow them to make an informed decision, or the presence of people or organisations that they trust, as a proxy for their judgment. Thus, it is important to ensure a balanced and wide range of voices within the debate so that discussion is not seen to be polarised, or worse - one sided. Again, these individuals must be encouraged and prepared to use the variety of channels employed in a particular engagement campaign, which may include sustained or sporadic levels of engagement.
3. Topic - from our analyses and those of others, it is clear that the topic being discussed must be chosen based on the values of the audience being targeted. In general, topics such as medicine and everyday products attract large numbers of readers - again, the 'me and mine' philosophy. However, to engage effectively with different groups within society requires the selection of more specific topics that are carefully aligned with the interests of the audience. Engagement requires the individual to consider 'this is important to me, I agree/disagree with that statement'. In other words, there needs to be personal linkage or some controversy or strong statement with which to spark debate. Only through achieving this level can we expect wider society to take ownership of a development's impacts and as a result move towards building consensus in society.

4. Presentation - the way information and engagement activities are presented is also important. Work from NANOCHANNELS and others, indicates that images and messages perceived as too technical or far removed from everyday life, quickly disengage people. It is important that engagement appeals to the audience directly using images they can relate to and at a level of detail that provides sufficient information without being overwhelming. For this aspect, video clips, infographics, and other visual means proved to be attractive for wide audience (i.e. the second supplement of the Guardian which included fewer words and more engaging illustrations).

5. Channel to be used - different channels engender various levels of trust, impact and reach. They were also used in diverse ways by those engaged. Our analysis reveals that there is a hierarchy of channels through which increasing levels of awareness raising can be achieved and trust can be built. Each channel involves specific stakeholder groups, has a unique role to play in this process, and needs to be used appropriately (timing, actors and frequency) with others to be most effective. For example, a mass media campaign to raise awareness and discussion on a topic of interest to a broad public will have a very dissimilar profile and level of engagement than that of a campaign targeted towards a narrower interest group. The latter would be recommended to use a targeted campaign via social media (i.e. group in LinkedIn).

Through the judicious application of each of these aspects, we can envisage a process where we start with long reach, low impact activities at an early stage to raise awareness, followed by high impact engagement activities (but shorter reach) to move towards a situation where wider society believes that:

- i) there is access to sufficient and necessary information to make an informed choice;
- ii) all relevant stakeholders (as far as wider society is concerned) are involved (thus there is trust in the outcomes); and
- iii) Developments are progressing in an appropriate manner, taking account of all aspects (even if individuals do not necessarily agree with all decisions).

Achieving this may not lead to widespread excitement and enthusiasm amongst wider society (although it should excite more individuals), but it will eventually decrease the probability of there being a public backlash against Nanotechnology.

These key points need to be developed in the context of several other aspects. The first of which is to build on what is already there. New activities and new approaches take time to be embedded in societal groups that we want to engage; however, adapting existing channels or building on what has been done before allows momentum to be built up more quickly and sustained. Secondly, the way the engagement is framed needs careful attention: use of images, interactive elements, evocative (or controversial) language is important to spark interest and enhance the numbers engaged. NANOCHANNELS was an experimental project. The consortium partners tried a variety of channels, some proved to be efficient in informing and engaging EU lay public. Some tools had lower than expected results (i.e. social media) due to circumstances such as time and budget, and tools (especially the project's portal) and experienced challenges because of their place in the second decade of the 21st century.

All of our insights and recommendations can serve the EU decisions makers in designing the future strategy of informing and engaging the citizens in the new pervasive technology of Nano.

List of Websites:

NANOCHANNELS website (see <http://www.nanochannelsfp7.eu> online),
- Facebook (see <http://www.facebook.com/nanochannels> online),
- Twitter (see <http://www.twitter.com/nanochannels> online),
- YouTube (see <http://www.youtube.com/user/nanochannelsEU> online),
- LinkedIn (see <http://www.linkedin.com> online),
- Nanopaprika (see <http://www.nanopaprika.eu/profile/NANOCHANNELSeu> online),
- XING (see <http://.http://www.Xing.com> online),
- NANOCHANNELS internal portal for partners only (see <https://nanoc.ort.org.il> online).