

Res4Net: the Italian Research Network to bridge the gap between science and society

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Abstract - In the context of science dissemination in Italy, the case study of Res4Net is presented. Res4Net is a network of Italian laboratories and research groups whose primary goal is to innovate, rethink, practice, and promote scientific communication without profit, with particular attention to collaboration and interdisciplinary integration. The structure of Res4Net includes an assembly, which defines strategic goals and coordinates the activities, and an editorial staff, responsible for producing content such as videos, blogs, and infographics. The main results of the group include the management of social media channels aimed at a broad audience, the creation of an informative blog, the production of divulgation videos on the member's activities, and innovative initiatives, such as video articles and short documentaries on PhD students' research. Furthermore, Res4Net has organized thematic seminars, which are recorded and made available online for easier access. The project culminates in a website that serves as an archive for the materials products and includes a

section dedicated to graphical abstracts developed in collaboration with experts. Res4Net represents a model of integration between research and society, promoting science as a common good and stimulating public participation through communicative, modern, and engaging modalities.

Index Terms - Dissemination of science, informative blog, scientific communication, interdisciplinarity.

INTRODUCTION

The expression "dissemination of science" refers to effectively communicating scientific knowledge, research findings, and discoveries to a broad audience, particularly a non-technically expert public. These actions aim at making complex scientific concepts accessible and understandable to everyone, promoting public understanding and engagement with science. Even though

often considered less important than scientific research, the dissemination of science is fundamental for many reasons [1]. First, disseminating scientific knowledge and demonstrating the actual impact of science on people's everyday lives is crucial to reducing the distance between scientists and the citizenry and garnering public funding support. Engaging citizens' interest is also essential to inspire young students to pursue a future career in science and research [2]. In a world where fake news is becoming more and more frequent [3], another fundamental goal of dissemination is to stem the flow of insufficient information and promote critical and scientifically sound ways of thinking.

In Italy, science dissemination is still an open challenge. Over 80% of citizens reckon that civil society should be more involved in science and technology [4], and many institutes (e.g. universities and research institutes) still lack adequate communication strategies aimed at the general public [5]. In contrast, other European countries, such as Germany and the United Kingdom, benefit from well-established strategies for science communication characterized by collaborative initiatives that engage a wide range of stakeholders, including government agencies, educational institutions, and nonprofit organizations [6]. These countries have successfully implemented comprehensive outreach programs that foster public understanding of science and encourage active participation in scientific discourse. On the other hand, in Italy, many efforts remain isolated or are launched by individual universities or single researchers, often lacking the coordinated support necessary to create a lasting impact on public engagement with science.

With the latest diffusion of social networks, an ever-growing community of science communicators have taken the lead in spreading science to a larger community. For instance, if, on the one hand, social networks such as Instagram, Snapchat, and TikTok allow a wider diffusion of complex scientific concepts to a larger community, they also pose some drawbacks and risks that need to be taken into account. First of all, a compelling need exists to avoid an oversimplification of the scientific concepts explained. If it is true that making science as accessible as possible is extremely important, it is also true that oversimplifying is a drawback which should be avoided at all costs. Moreover, the second aspect is the gap between science communicators and the research labs, which sometimes might occur. For instance, in the short videos or captions used for disseminating science, there might be no references to scientific papers or similar, which might entail a low-level outcome of the concepts explained.

To this aim, an interesting example is the "Superquark" series, an Italian television program of documentary and dissemination genre. Superquark was broadcast on the

Italian RAI 1, the first television channel or RAI, the Italian public company with exclusive concession for public radio and television service in Italy, from January 27, 1995, to August 24 2022, and was conceived and hosted by Piero Angela [7][8], following and extending a previous initiative called Quark, broadcast from 1981 to 1989, that also inspired the publication of a Magazine [9]. While Superquark was a virtuous example, occasionally involving scientists and showing research laboratories, this involvement was not systematic.

On the other hand, a significant innovation that relies on the systematic involvement of active researchers is the TED Talks international initiative, introduced in 1984 by Richard Saul Wurman and Harry Marks [10]. The original TED Talks, based on video recordings, was ahead of times and initially met limited success, but faced significant development in the following years, leading from 1990 to the organization of an annual conference, and currently makes use of streaming channels available on the internet, also in the form of podcasts [10-12]. TED Talks explicitly aim at merging technology, entertainment, and design.

Equally crucial as dissemination is, on the other hand, communication of science. Science communication focuses on sharing research findings with targeted audiences likely to use this information, such as other researchers, professionals from industry, and policymakers. Science communication can connect scientists with different backgrounds and work in various fields, thus promoting interdisciplinarity. Indeed, scientific research is increasingly called to tackle complex problems and address significant societal challenges [13], which can only find proper answers and solutions by integrating knowledge from different fields. Interdisciplinary studies have been rapidly increasing in the last 30 years [14] and have proved to be able to attract a strong interest and a significant number of citations. Interdisciplinary is also strongly encouraged by many calls for funding, where including researchers working on very different topics to reach a common goal or addressing a specific scientific question is evaluated as a rewarding element. On the other hand, the interdisciplinarity of science also poses substantial challenges. One of the most evident is represented by communication barriers, where differing terminologies and methodologies across disciplines can lead to misunderstandings, making it difficult for researchers to collaborate effectively. Additionally, allocating resources can be problematic; interdisciplinary projects often require more time and funding than traditional research, hindering their feasibility. Moreover, there is a risk of superficiality in research outcomes when disciplines are integrated too quickly without adequate depth, potentially compromising the quality of findings. Researchers may also struggle with evaluation and recognition since traditional academic structures tend to

favour discipline-specific achievements in many countries (e.g., Italy), leaving interdisciplinary efforts undervalued. Hence, many actions can be performed to promote communication and interdisciplinarity of science further.

Within this framework, in this paper, we present the case study of Res4Net, a network of Italian laboratories and research groups whose primary goal is to innovate, rethink, practice and promote, without profit, scientific communication, with particular attention to collaboration and interdisciplinary integration [15-20]. Res4Net represents a unique experience in the Italian scenario since it includes researchers from different universities and research centres working on various research topics. In particular, this paper details the genesis and structure of the Res4Net initiative, its activities and the main results achieved in 5 years.

GENESIS AND STRUCTURE

In 2021, over a year after the onset of the pandemic, a group of researchers from more than 15 Italian universities and research centres identified a significant transformation in scientific communication. The adoption of new channels and languages had become increasingly prominent. At the same time, longstanding challenges re-emerged, including the persistent gap between science and society, obstacles to interdisciplinary research, and the pressing need to innovate teaching methodologies. The global rise of new media further underscored the necessity for critical reflection and strategic action. In response, the Res4Net group was established.

The researchers came from different disciplinary fields, including engineering, computer science, medicine, law, and the humanities. Through regular meetings, they began planning the first activities. Soon, the group received support from communication science students who chose to complete their university internships with Res4Net. The IEEE Italy Section granted patronage to Res4Net in December 2021.

Res4Net does not formally bind its members and offers them the opportunity to increase the visibility of their scientific production. Members are provided support services for developing multimedia products and guidance on the effective use of new media. Res4Net has two governing bodies: the Assembly and the Editorial Staff.

I. Assembly

The Assembly is the primary decision-making body of Res4Net and consists of representatives from affiliated research laboratories. The Assembly defines the strategic goals, oversees its activities, and ensures transparency in decision-making processes. Regular meetings facilitate evaluating initiative progress and adapting operational

strategies, ensuring dynamic and participatory management.

II. Editorial Staff

The Editorial Staff is the operational heart of the Res4Net. Composed of a multidisciplinary team, the Editorial Staff is responsible for producing and supervising all published content. This includes articles, videos, infographics, and social media materials. The editorial team works closely with the affiliated laboratories to translate research results into clear and engaging messages suitable for a non-specialist audience. Furthermore, the Editorial Staff coordinates the different laboratories, ensuring stylistic uniformity and quality in the content production.

ACTIVITIES

Res4Net has implemented a manifold communication strategy to enhance the dissemination of scientific research to a broad and diverse audience. By integrating digital platforms, multimedia content, and participatory initiatives, the network has effectively increased the visibility of the affiliated research groups while promoting knowledge transfer and public engagement. Through targeted use of social media, an official blog, and video-based content, Res4Net has facilitated the translation of complex scientific concepts into accessible formats, fostering an inclusive dialogue between academia and the public. This comprehensive approach underscores the network's commitment to advancing the impact of research on society and encouraging interdisciplinary collaboration. The following sections detail the key activities undertaken by Res4Net as part of its communication and dissemination strategy, such as the official blog of the network, dedicated social media channels, videos about the members, video articles, seminars, graphical abstracts, and video series on PhD students.

I. Website

The official Res4Net website [15] is the foundation of the scientific dissemination of the group. It provides information on the research groups of the network, providing updated content on articles, projects, and success stories from academia.

The content is curated to ensure accessibility and engagement, focusing on issues of social interest such as sustainability, technological innovation, and public health. This approach aims to foster public understanding of complex scientific issues, demonstrating the real-world impact of research initiatives. In Fig. 2 the home page of the website is reported.



FIGURE 1: THE HOMEPAGE OF THE RES4NET WEBSITE

II. Social media channels

Res4Net has exploited the power of social media to implement a dynamic digital communication strategy. Platforms such as LinkedIn (Fig. 3) [16], Facebook [17, 18], and YouTube [19] have been used as key tools for engaging the audience with regular posts, short videos, interactive campaigns, and surveys regarding network activities. These measures not only increased the visibility of the Res4Net members but also promoted scientific knowledge exchange and encouraged interaction with the public. The use of social media has also facilitated a bidirectional exchange of ideas by collecting feedback and suggestions, leading to tailored activities for the audience.

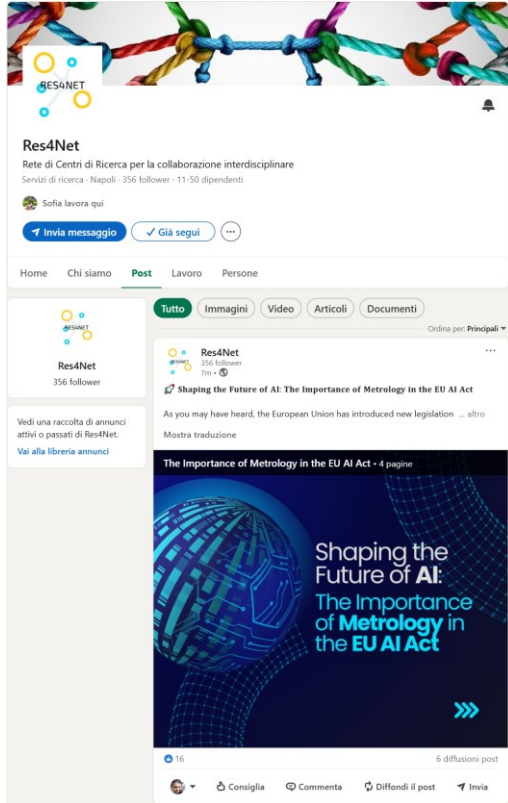


FIGURE 2: RES4NET LINKEDIN CHANNEL

III. Video about the research group's activities

One of the most impactful initiatives undertaken by Res4Net is producing a video to present each research group as part of the network and showcase the activities of the affiliated research groups, not only among the members but also among the general audience.

These videos provide an overview of the laboratories' infrastructure, highlight past and ongoing research projects, and demonstrate the practical impact of research on society's challenges. Each video is designed to be informative and visually appealing to capture the interest of a broad audience.

The videos (Fig. 4) are shared on all the Res4Net social media channels and are available on the website within the page related to each research centre.

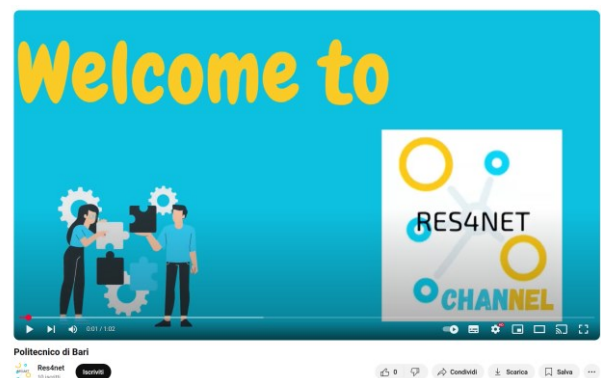


FIGURE 3: TYPICAL FORMAT FOR INTRODUCING THE VIDEOS ON RESEARCH CENTRE ACTIVITIES POSTED ON YOUTUBE

IV. Video articles

Video articles are innovative in science communication since they integrate images, narration, and text to elucidate complex scientific topics in an easily consumed format. The editorial staff's contribution has been fundamental to this aim, significantly assisting the researchers in combining visual storytelling and detailed explanations to engage a non-specialist public on scientific content. Res4Net produced one video article, titled "Anthropology of the Algorithm: How Stereotypes, Biases, and Cultural Belonging Influence AI", presented by Professor Alessandra Castellani, that sheds light on a crucial and often overlooked aspect of AI development and the influence of cultural biases in machine learning training [20].

V. Seminars and related videos posted

Res4Net has organised several thematic seminars featuring leading experts and researchers to discuss current scientific topics. These seminars are recorded and made available online, thus extending their reach to a global audience and supporting a long-term engagement with the scientific community.

The following is a list of the organised seminars during 2024: (i) Data Quality and Ethics, (ii) Teaching Communication Skills to Engineering Students: Lessons Learned from 20 Years of Experience, and (iii) The Role of Measurements in the National Recovery and Resilience Plan (NRRP) of Italy.

Among the Res4Net activities, the collaboration with "Animate Your Science" is worth mentioning for organising the best graphical abstract competition within the IEEE MetroXRAINE conference [21]. The competition involved researchers presenting their scientific results through an engaging graphical abstract. This approach allowed us to summarise and visualise the data, increasing the interest and understanding of the results by a broad audience, including non-specialists and users on social media.

VII. Video series on PhD students

Recently, Res4Net has introduced a new series of divulgative videos titled "Speed Science-a PhD in 10 questions". The aim is to share the experiences, challenges, and aspirations of young PhD students, offering the public a unique opportunity to understand the educational and professional path within academia. Designed to be short, engaging, and shareable on social media platforms, these videos target young audiences, fostering a connection to the research community and inspiring broader participation in the scientific fields.

PRELIMINARY SCIENTIFIC PRODUCTS

Res4Net aims to advance research in scientific communication through an interdisciplinary approach. To this end, some Res4Net members, experts in database management, are developing new models to better characterise the context of scientific communication. As previously discussed, scientific knowledge can be disseminated across diverse contexts and for various purposes. Fig. 4 shows a schema based on the Context Dimensions Tree (CDT), a conceptual model for context awareness formally defined in [22, 23]. A star-shaped white node is the CDT name; the children of the root are black nodes, which represent the context dimensions, i.e., the perspectives relevant to contextualize the data; each dimension node can have, as children, one or more white nodes, called concept nodes, which represent the values related to that dimension. Concept nodes can feature one or more sub-dimensions, also described as black nodes, and the structure can be repeated down to the required level of detail. Note that context does not necessarily contain values for each dimension of the tree. Attributes, represented as little square nodes, can be attached to both dimension and concept nodes; an attribute attached to a dimension node is a shorthand adopted when the possible children of that dimension are many; attributes attached to a white node represent specific instances in the set of values of the node. A context is defined by choosing a set of pairs <dimension, value>; for example, the context of a scientific lecture in English for professionals, held in the morning in a conference hall at Politecnico di Milano, is the following: <audience, professional>; <type, tutorial>; <location, conference hall>; <time, morning>; <language, English>; <media, oral presentation>.

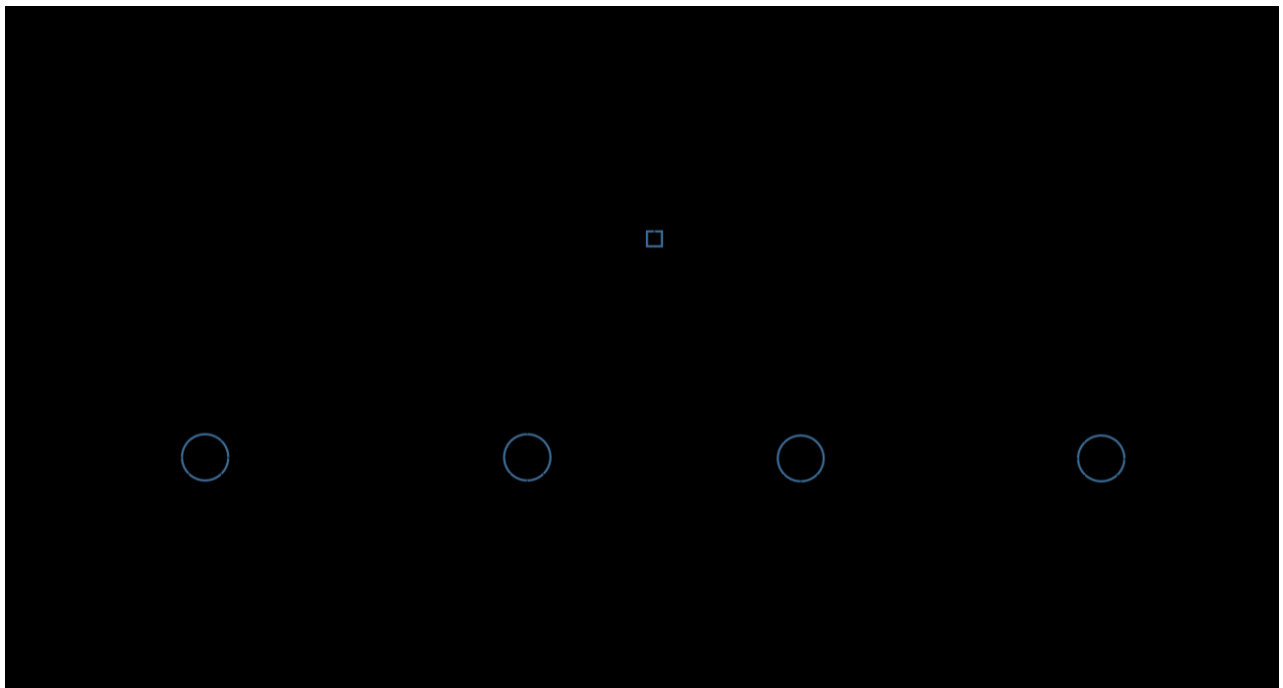


FIGURE 4: PRELIMINARY PROPOSAL OF A CONTEXT DIMENSIONS TREE FOR SCIENTIFIC COMMUNICATION.

DISCUSSION AND FUTURE PROSPECTIVES

The Res4Net Italian network was developed to address gaps that encompass both the dissemination of scientific knowledge and results to society and the interconnection of researchers from different areas, favouring interdisciplinary activities. The organisation, formed in 2021, explicitly favours using up-to-date communication channels like social media. To this aim, various initiatives have been developed, starting from a video presentation of project activities, including seminars, and preparing graphical abstracts and short videos produced by young researchers.

Significant attention was given to modern social channels like LinkedIn, Facebook, and YouTube. To further support researchers willing to disseminate their results, support from students and young researchers from the communication science area was explicitly included, filling a gap in the background of researchers active in other fields. It is worth noting that the heterogeneous background of the Res4Net partners and the lack of technical skills in professional communication were the main challenges to be dealt with.

The activities developed by the Res4Net group led to an effective aggregation of researchers from various fields, leading to promising results and encouraging further initiatives. One of the most remarkable was the discovery of the IEEE Professional Communication Society, eventually leading to the formation of the Italian chapter of this organisation. The facilities offered by IEEE ProComm are seen as potent enhancers for dissemination activities because of the existing dissemination network and the significant knowledge background.

Future initiatives will include a sustained effort in disseminating research results, possibly supporting research projects and the internationalisation of Res4Net by progressively involving foreign researchers.

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