SCI-CO+ Magazine

2024 January-March n°2

NEW FRONTIERS IN SCIENCE COMMUNICATION

INNOVATIVE MODELS, METHODOLOGIES, SKILLS FOR THE DIGITAL TRANSITION IN THE FIELD OF SCIENCE COMMUNICATION

n°2

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The SCI-CO+ Magazine

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Sci·Co+ High Professional Skills for Advanced Scientific Communication

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In this issue...

With this second issue, our magazine begins to take on the broadly informative character, that it has set itself, on the questions of innovation in the Science Communication sector. However, the subject of new technologies is not separate from that of communication and teaching strategies and methodologies. The article "**Communicating science with PCTOs**" presents the interesting experience developed by the Fondazione IDIS-Città della Scienza through the program of the Italian Ministry of Education named **Pathways for Transversal Skills and Guidance** (in Italian **PCTO - Percorsi per le Competenze Trasversali e per l'Orientamento**). The IDIS' project, entitled "*Apprentices .... science disseminators*", is aimed at giving young students personal experiences of science communication and structured themed educational activities that use new technologies.
Two specialised articles, on the other hand, address the theme of technological innovation from the point of view of the most suitable strategies and methodologies to ensure communication that fulfills its task of illustrating and explaining the world of science in an effective and broad way. The first – "**Digital science communication is changing - is exploranation the way forward?**" – focuses on the ways in which digital experience can enter science communication and illustrates the approach of the Visualisation Centre in Norrköping in east-central Sweden, which has focused its attention on *the exploratory* method and studying how the paths of scientific exploration and data collection can be used to communicate science results and how explanatory visualisation methods can enrich exploration itself through the implementation of new digital experiences. The second article – "**Celestial Gazes**" – explain new paths based on active experience between astronomy, technology and computational thinking to support not only the communication of science but also its teaching. Starting from the observation that communication and education in the scientific method are simply limited to the reproduction of historically established experiments, the article shows how this approach can be overturned by following a "constructionist" strategy that sees learning as a process of building mental models that help the individual to understand their environment and of actions to produce tangible objects that create paths of experiential learning. The article describes cases in which digital technologies create optimal conditions to carry out experimental laboratory activities in which the aspects of invention (personal contribution) and reproduction (the reconstruction of accumulated knowledge) are at stake in a correct balance.
The SPECIAL of this issue is dedicated to science communication in Ireland with the article "**The Role of Museums in Science Communication in Ireland: A History**". The ways in which scientific discoveries have been communicated in the country have their roots in the erudite societies of the eighteenth century and are intimately linked to the development of Science Museums. Let us remember that *erudite societies* are the organisations born, particularly in Europe, starting from the second half of the 1300s to promote an academic discipline, a profession or a group of related disciplines such as the arts and sciences. The article highlights how knowledge of the history of science communication is extremely useful to adequately guide future developments in the field.
From this issue we will also have specific articles on the founding themes on which the important results that the SCI-CO+ project aims for are based. In the article "**Paradigms, Models, Methodologies. For a conscious approach to the digital transition**" the fundamental aspects of the development of the SciCo+ Model are addressed. Any profound transformation in the contexts of human knowledge and action requires a change of point of view, and this is true not only at the scientific and technological level but also at the educational, social and cultural levels. Every new *point of view* on reality is called, as we know, a paradigm and changing the point of view means changing the paradigm of reference, that is, changing the knowledge, the strategies, the procedures, in part the language with which we see, study and act. The article provides a broad in-depth analysis not only on the concept of *Paradigm*, of which it offers a "constructivist" definition, but also on its specialisations, the *Models*, and on the *Operational Methodologies* that make the models usable. What is illustrated in this extensive article is then taken up in the NEWS FROM SCI-CO+ column which, in this issue, is dedicated to the important result achieved by the Project: "**The SciCo+ Model**".
The magazine closes with the usual news about some important events that will be held in the quarter in the field of science communication.

SUMMARY

NEW FRONTIERS IN SCIENCE COMMUNICATION

EDITORIAL

OPENING ARTICLES

SPECIAL

CLOSING ARTICLES

HEADINGS

EDITORIAL

AI and surroundings

by Luigi Amodio

The global debate on developments in Artificial Intelligence (AI), its possible applications and the impact it will have on various aspects of our lives, is now rampant. Even the United Nations has seen fit to set up a Committee on Artificial Intelligence consisting of some forty experts from around the world, which met for the first time at the end of October 2023 and whose aim is precisely to try to define common rules and shared approaches on AI. Similar initiatives are being pursued at the level of individual states or, in the case of our continent, by the European Commission and Parliament.

Obviously, the discussion soon also involved the world of science and technology communication. In our community, this is a very 'hot' topic, since AI is both an object of communication activities and the dissemination of scientific culture, but also a technology that can be applied to perform various communication activities hitherto carried out by humans.

With regard to AI as a subject of scientific dissemination, there are numerous instances of exhibitions, events, meetings, in which the main technological, but also and above all, ethical, legal and social aspects have been debated and brought into the public spotlight. The science festival itself 'Futuro Remoto' (Remote Future). A journey between science and science fiction', organised by the Cittá della Scienza (City of Science) in Naples, held from 21 to 26 November 2023 and with initiatives that will continue for several months in 2024, has not by chance chosen 'intelligences' as its main theme. One possible limitation of these initiatives is, surely, that of 'chasing' reality and arriv- ing late, given the sudden accelerations of technology and the goals it achieves, goals that, sometimes, surprise ourselves.

On the other hand, when discussing AI as a technology potentially replacing work activities in the scientific communication professions, we will limit ourselves here to two examples: the writing of texts, e.g. short journalistic articles, press releases, panels and captions for exhibitions; or, still in the museum field but at a more advanced level, activities of public orientation and guidance, for the understanding or use of exhibits, through generative AI applications.

Naturally, when a new technology appears on the horizon, it is very common to witness polarised positions; a character - istic that in our times, unfortunately, is increasingly accentuated in society, both due to the tendency towards an extreme simplification of the ideal, cultural, and political debate; and, in part, due to the effect of the venues to which this debate has progressively shifted, namely those digital media that demand extreme conciseness and speed. Attitudes of resistance, if not of fear, rejection and concern ("AI will bring about the end of mankind"); or, conversely, of uncritical enthusiasm ("AI will solve all of mankind's problems") will therefore be possible.

Those of us who are professionally involved in the communication of science and technology cannot, of course, fail to monitor what is happening with regard to the introduction of AI, even in our professional practices. Let us, however, maintain an attitude of balance; both because we believe it is wise to try to look at great transformations such as this with the right critical approach and as much documentation and knowledge as possible (which requires time to study, learn, confront); but also because, over the last few decades, we have seen many 'killer applications' and technological 'tools' in the field of communication, some of which - think, for instance, of smartphones - instead of 'killing' have only, and quite surprisingly, changed some of our ways of interacting with others or of 'inhabiting' that extraordinary universe that is the infosphere.

Hence the invitation, even with the tools of 'SCI-CO+', to continue to observe, experiment and above all understand, trying to take our time to do so.

(P.S.: this editorial was not written by an AI)

Luigi Amodio is the Director of the Science Centre of the Città della Scienza

COMMUNICATING SCIENCE WITH PCTOs

by Livia Capocasale

The article reports on the experience of Science City of Naples on Pathways for Transversal Skills and Orientation as an example of science communication realized through direct experience, socialization, sharing, and the use of technologies. The article highlights how Science Centers, places where learning and teaching are geared toward socialization and cooperation, where direct experience is the gateway to the laws and phenomena of science, become ideal places to carry out PCTO. During their stay in the exhibition areas of Science City, the girls and boys who carry out PCTO at Science City communicate, study, use new technologies and "work" as perfect science communicators and acquire elements to reflect on their post-graduation orientation.

The PCTO of the Lyceum "Giorgio Buchner" in Ischia (Naples).

PATHWAYS FOR TRANSVERSAL SKILLS AND GUIDANCE

SCI-CO+ Project wants to promote modes of scientific communication and outline professional profiles capable of implementing them.

Orientation of girls and boys in secondary schools plays an important role here.

In this regard, in Italy there are **PCTOs**, an acronym for "**Percorsi per le Competenze Trasversali e per l'Orientamento**" (*Paths for Transversal Skills and Guidance*), introduced by the Ministry of Education in 2015, in the wake of new European trends for the training of girls and boys.

From a European perspective, learning outcomes must be linked to the real world through action-oriented activities, by means of experiences gained during the course of studies, acquired through doing and real task-oriented projects.

Moreover, transferable transversal skills through the operational dimension of doing must play an important role in all training courses: the ability to interact with others, problem-solving skills, and the ability to communicate knowledge. These skills are necessary to cope with the complexity of the changes accompanying the evolution of societies.

The culture of orientation is also changing, moving from a traditional approach based on information, often delegated to external operators and experts, to one based on experiential paths centred on autonomous learning, also in a non-formal context.

With this understanding of training and orientation, Science Centres, places where learning and teaching are geared towards socialisation and cooperation, where direct experience is the gateway to the laws and phenomena of science, become ideal places to conduct PCTO.

THE PATHWAY "APPRENTICES... SCIENCE DISSEMINATORS'"

Since 2015, Città della Scienza has carried out PCTOs for schools from Campania, for schools from Sicily and for schools from Veneto, thus embracing the whole country.

The PCTO "*Apprentices ……. science disseminators*", proposed by Città della Scienza, is aimed at secondary school classes (age 14-18) and has the objective of enhancing and promoting scientific knowledge as an instrument of growth and training for girls and boys, in coherence with their course of study.

During the course, the girls and boys experience science dissemination activities and thematically structured teaching activities using new technologies. It is aimed at acquiring transversal skills such as working in groups and communicating knowledge, and vertical skills in physics, biology and earth sciences.

The overall objective of the PCTO is to make young people understand the importance of scientific research, the importance of deepening information in order to be able to acquire strategic tools to deal with the increasing complexity of our age.

The programme, spread over several days to be spent at Città della Scienza, includes (a) an initial part aimed at acquiring disciplinary knowledge through guided tours of the exhibitions and the performance of thematically structured scientific didactic activities, (b) a formal study part, (c) a preparatory part to acquire the basic methods for interactive museum science communication, and (d) a final part during which the girls and boys, suitably prepared, "experience" the work of a science animator by personally carrying out the scientific animations aimed at the public who attend Città della Scienza on weekend.

The Città della Scienza PCTO training project, as indicated by the Ministry of Education, balances

• The curricular dimension with the didactic activities of earth sciences, physics, mathematics, but also astrophysics with the Planetarium and biology with the visit to the Interactive Exhibition on the Human


The PCTO of the Lyceum "E. Torricelli" in Somma Vesuviana (Naples).

Body "*Corporea*" and with the other temporary exhibitions that from time to time are present at Science City. The girls' and boys' stay at Città della Scienza, during the days of the course, also represents a training ground for stimuli and reflection that consolidates previous experiences.

• There is an experiential dimension both in the guided tours of the exhibitions where the girls and boys are invited to interact with the exhibits and in the science workshops where the girls and boys carry out experiments themselves and use new technologies. The guided tours and science workshops are "preparation" activities for the role of science animator, which, at the end of the course, the boys carry out first-hand with the public who attend the Interactive Museum of the Human Body "Corporea" on Saturdays and Sundays.

• The guidance dimension: The course also represents a fundamental opportunity for students to experience post-diploma orientation by being in contact with work realities characterised by multidisciplinary and not only scientific skills and by being in contact with the public.

Al termine del loro percorso a Città della At the end of their time at Città della Scienza, the girls and boys answer a satisfaction questionnaire, the main objective of which is to detect perceived usefulness and to check whether their participation was useful for post-graduate orientation.

The questionnaire (given below) consists of open-ended questions due to the qualitative nature of the survey and the need to uncover a variety of opinions and behaviours that one is not aware of, as well as the need to have information necessary for any subsequent quantitative research.

THE RESULTS OF A 2023 EXPERIENCE

Very significant were the responses of forty students from a Scientific Lyceum in the province of Naples, which carried out a PCTO at Città della Scienza in April 2023.

Almost all of the students expressed particular appreciation for the experience for different reasons: for the didactic approach, for the training, for the socialisation, for the communication with the public, in particular with the children's public with whom the students experience an educational relationship as equals.

Many also emphasise the fun and innovative aspect of the experience.

The students felt a great sense of responsibility in having to communicate science to the children, and emphasised that, in communicating with the children, their personal approach played an important role, allowing them, among other things, to reflect on their post-graduation orientation.

The PCTO experience not only introduced them to 'work experience' for the first time, but also to specific experiences with scientific content.

Those students who were inclined to choose a scientific career for their studies confirmed their choices with conviction, some students, on the other hand, confirmed that they had no aptitude for scientific subjects, although they treasured the educational experience lived, others were positively amazed at their interest in working with children and therefore thought of a course of study oriented towards education and training, and others again considered a specific course of study in Communication Sciences.

The testimonies of these young people confirm how through scientific communication it is possible to educate and orientate through study, experience, socialisation, sharing, and taking responsibility.

All students report an emotional and affective return from their PCTO experience.

Here is a particularly significant one: «*through the PCTO science communication experience, carried out together with my classmates, I learnt what it means to do an activity I enjoy, what it means to engage in the work I am doing, I learnt how to grow. I was impressed by the many different activities that go into science communication. I did not expect that I could enjoy such an experience so much*».

1. What does disseminating science mean to you?

2. In your opinion, is it useful to popularise science? Argue your answer

3. Science Centres, such as the Museum of the Human Body 'Corporea' that you visited in your PCTO, provide visitors with a considerable amount of scientific phenomena without going through formulas and conceptual difficulties. For the purposes of your scientific knowledge, was this experience useful?

4. Did you feel personally involved in the science workshop 'Earthquakes, how and why', which you carried out in the Science City lecture rooms?

5. Of the following types of seismic waves, which are the fastest?

S-waves - surface waves - P-waves

6. Which seismic waves cause so-called 'wave motion'?

7. What is a direct fault?

8. 8During your stay at Città della Scienza, you played the role of 'science animator' with some primary school classes in an educational game on seismic risk. How did you perform this role? What did this experience mean for you in particular?

9. Was contact with a working reality such as Città della Scienza, characterised by multidisciplinary experiences, an opportunity for you to reflect on your post-graduate orientation?

10. Briefly describe how you found your PCTO experience at Città della Scienza

11. What did you like the most?

Livia Capocasale is a member of the Teaching Innovation Office team at the Fondazione Idis-Città della Scienza.

DIGITAL SCIENCE **COMMUNICATION** IS CHANGING – IS **EXPLORANATION** THE WAY TO GO?

by Anna Gunnarsson

Perspectives are changing as well as how we look at digital content and the way we use it. Exciting things are being developed. We are in the middle of some kind of paradigm shift. Exactly where it is heading is hard to know. New expressions are being created. New methods are being used. At Visualization Centre in Norrköping, Exploranation has become a new field to explore; showing how methods from scientific exploration and data collection can be used to communicate results and how methods in explanatory visualisation can enrich exploration. A curios group of researchers are leading the way into the possibilities of new digital experiences.

INTRODUCTION

The use of Exploranation when it comes to science communication is in many ways new. When walking into the Visualization Center in Norrköping in Sweden it is obvious that this is their area of expertise. The rooms are filled with interactive visualisation experiences for the public to use and explore. Different areas from sustainability to criminal investigation are available to anyone with a curious mind. Areas that can be hard to grasp are being explored in a way that makes it more accessible (and fun!) to the user. This is not a coincidence. At Visualization centre, a group of researchers[1]. have identified what they call a "disruptive change in science communication"[1]. and "have started to systematically approach the challenges involved in bringing interactive data visualization to the public"[1], using a variety of storytelling approaches and technical possibilities.

Young visitors at the Mediterranean Museum in Stockholm using a visualization table to explore the details of an ancient Egyptian mummy.

A VARIETY OF THINGS TO EXPLORE

A closer look at the details

When realising "that the same data and underlying methods can be used for both experts in professional tasks and audiences in public settings"[1]., the researchers identified a starting point for Exploranation - the use of large size touch tables. The tables can display museum artifacts (and other objects that are hard to study in everyday life) not only in detail on the surface, but also giving a complete picture of what is inside. This approach is making it possible for the user to explore everything in detail by changing points of view, the ability to add or remove layers, go into extreme details and more. When studying users and their behavior in this situation, the researchers found that by using interactive tables, the users also became more interested in the actual artifacts that are present in the museum. An example of this is the Gebelein Man mummy at the British Museum[2]. But making this happen was not an easy task, as it is generating large amounts of data and specific challenges when it comes to long lasting installations that will last for general use. The researchers say that they have "developed methods to deal with data sizes and to improve quality and speed of volumetric lighting. We also implemented our software on large-scale multitouch tables. This work targeted medical-domain experts, clinicians, and medical students"[1].

A live astronomy event, connecting sites from all over the world.
OpenSpace visualized how the New Horizons spacecraft transferred images of Pluto,14 June 2015.

The researchers are clearly showing us why Exploranation in a digital context is possible right now (and has been harder to achieve before).

• "Science communication can now be directly based on real, large-scale and/or complex scientific data".

• "Advanced visualization and interaction methodology has reached a high level of maturity and can be used on standard GPUs, making it possible to use the same visualization approaches in both exploratory and explanatory visualization".

The bigger picture

Many of us have been a visitor to a planetarium show, exploring space beyond our reach. Over recent years, the quality of such shows have improved tremendously, making the experience more interactive, immersive, and mind-blowing. This is mainly due to the digital possibilities of using data coming from real observations, space operations and simulations. Putting this into advanced computer graphics and settings will give visitors the possibilities of coming closer and sometimes even to take part in actual space missions of unmanned spacecrafts or happenings on a space station, all while staying safely on the ground. Events like these now become more and more accessible to regular visitors in museums/science centers – from schools to the general public. Science communication events like these can also connect many different sites, such as the 11 sites that were connected to the New Horizons mission to Pluto in 2015, inviting the visitors to actually fly with the aircraft and speak to the experts involved[3]. But as always, when a learning situation involves more advanced technology, it also acquires advanced skills and deeper knowledge from those guiding these events; digital and operational as well as being able to work with a well-planned storyline aimed at mesmerising the audience.

Smaller than we can imagine

Trying to grasp and explore the molecular scale of reality has always been a challenge for humans. When trying to overcome this obstacle, many, not so detailed models have been created throughout history and the need for better ways to explore have been obvious. Therefore, the possibilities of visualisation, has played an important role in communication methods for cell/ molecular/biology research when large amounts of data need analysing as well as clear and understandable models. Aiming at very small objects, on the nanometer scale, the researchers found that new measures were needed; "This called for a new model named MolDock, where molecular coordinates are imported from the Protein Data Bank (PDB files), where a 3D model is created"[1]. When examining the use of this model, it became obvious that both students and the general public got better knowledge after using it; "Through evaluation, it was concluded that the system helped students learn more about the processes of proteins. It changed the way they reasoned about molecules"[1].

But why is visualisation such an effective way to help us understanding the world? The researchers found that the digital possibilities of our time (and it will likely not slow down any time soon) really opens up new perspectives; "Until now there has been a clear division between visualization enabling effective data analysis leading to scientific discovery (exploratory visualization) and visual representations used to explain and communicate science to a general audience (explanatory visualization)"[1]. Now it seems possible and accessible to do both at the same time – an exploranation. The direction of Exploranation methodology can really help us as curios users to experience the real thing; coming from real data, presented to us in a digital context that makes it possible to explore areas that, before, where beyond our reach. An educated guess is that the cross-over between real data and digital resources presented in a hands-on way can become more common in science centres and museums – leaving more limited use of screens behind. The researchers claim that " further research is needed on technology, communicative strategies, and application domains to understand the possibilities and limitations. From a learning perspective, data-driven interactive visualization is a relatively new medium, with opportunities as well as challenges with new requirements for visualization tools and how to guide the experience."[1]

Let's hope that we all will have the opportunity to follow this further in a near future, at Visualization Centre in Norrköping or elsewhere. I know that I would be ready to participate as a volunteer in any such Exploranation experience – for research or just for fun!

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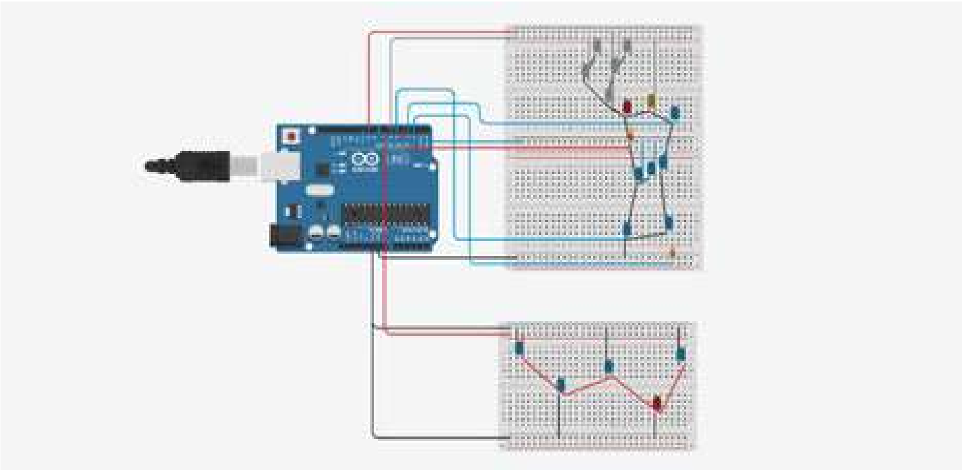
New experiential paths between astronomy, technology and computational thinking for the communication and teaching of science

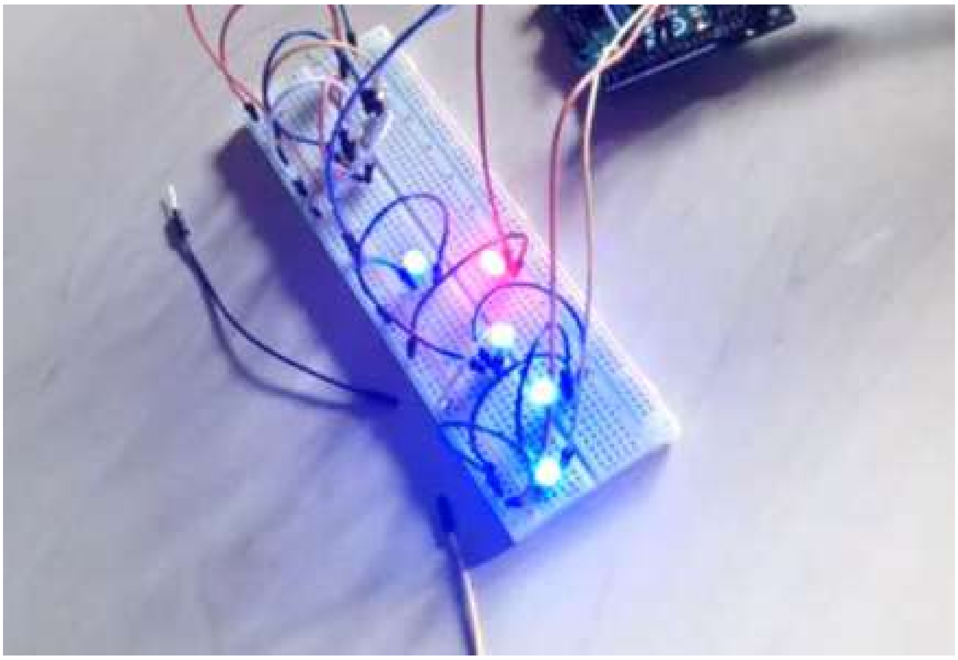
CELESTIAL GAZES

by Federico Di Giacomo and Annaleda Mazzucato

The progress of new technologies permeates every aspect of our lives, both social and working, assuming an increasingly crucial role in the educational and didactic sphere as well. We think, for example, of the use of interactive simulations, virtual and augmented reality, which allow complex scientific phenomena to be explored virtually, thus making learning not only engaging but also tangible. In this context, there is a growing need to develop new models for the communication and teaching of science, which support the construction of knowledge in science, transferring digital knowledge, and all the essential skills related to logical and critical thinking. New technologies and various hardware and software platforms, for example, make it possible to develop playful, immersive and engaging learning environments, where communicating science becomes participatory experimentation of scientific knowledge, opening up opportunities for collaboration between science and society.

Communication and education in the scientific method is sometimes limited to the reproduction of historically established experiments, transmitting knowledge instead of encouraging the active and participatory construction of knowledge. This logic can be reversed by following a constructionist approach, according to which learning is the result of a relationship between ideas and the construction of related objects on the one hand, and the comparison and sharing of concepts and objects on the other. From this point of view, the use of hardware platforms, such as Arduino, represents an element of novelty by creating the ideal conditions for carrying out experimental laboratory activities in which the aspects of invention (personal contribution) and reproduction (the reconstruction of accumulated knowledge) are at stake in a correct balance. The multi-perspective scientific paradigm of embodied cognition introduces new models that integrate the dimensions of theory and practice, looking at the learning experience as a personal and customisable formalisation of the experience of knowledge originating from in-action reflection, in which the role of intersubjectivity, manipulation, experience linked to real-life contexts, simulation, acquire a key role in development and learning.





A LINK TO THE STARS

As part of the open community of the Teachers of the School of Us, promoted by the Fondazione Mondo Digitale [mondodigitale.org], innovative paths with a didactic approach to scientific communication have been proposed and tested. A significant example of these methodologies is the educational path entitled "**A link to the stars**", which focuses on the study of the main constellations of the celestial vault through digital tools for comparing and sharing ideas, 3D simulations (e.g. software such as Stellarium, Solar System Scope or Celestia) and the use of hardware platforms such as Arduino[1]. During the first phase of the course, students explored the concepts of star, constellation and stellar distances, using digital simulations of the celestial vault. This phase, characterised by an active, cooperative and operational approach, enabled them to realise that although the stars may appear to be located at a uniform distance from us, in reality they are literally 'astronomical' distances from each other, giving the celestial vault a three-dimensional nature. Next came the actual realisation of the constellations. Using different coloured LEDs and Arduino boards, the students programmed the electronic boards to turn on the light-emitting diodes and faithfully recreate the main celestial constellations. The use of different coloured LEDs also allowed them to appreciate how stars have different characteristics and how their colour intrinsically depends on the temperature of the star (bluer stars turn out to be hotter, redder stars colder). This project not only provided a practical and engaging perspective on astronomical science, but also played a key role in cultural inclusion, allowing students to explore and recreate constellations from different cultural traditions.

This activity, as well as many others[2], offers a unique opportunity to communicate science, initiate processes of co-participation in research, as well as learning, stimulating creativity and enabling everyone to give form and substance to their own ideas. Some activities realised with the same methodology for younger children can also be found in **Integrated Digital Citizenship and Sustainability at Primary School**, published by Erickson[3]. The book collects ten easily replicable didactic paths that precisely reflect the experiential model of communicating science.

THE OPEN TEACHERS COMMUNITY

For some years now, the Fondazione Mondo Digitale has been involving teachers and trainers in an important innovative teaching project, enhancing their role as agents of pedagogical and social change. Groups of teachers, coming from schools in various parts of the country, work together to build didactic pathways that leverage the use of digital solutions to transform subject learning into an engaging and transformative experience, capable of stimulating knowledge, skills and values central to the Education for Life model[4]. The teaching modules or paths devised must present real added value for the mixed (online and/or in-presence) teaching of the disciplines. Several groups of teachers from primary and secondary schools, adult education centres, as well as researchers, experts, facilitators and disseminators are already at work in this 'facilitating context'.

We know from international comparisons that experiences like this work. In Shanghai, for example, the best education system in the 2012 OECD-Pisa report, a large open source community of teachers has been created, who make creative contributions and are valued for what they do and share. In contrast, Pisa 2015 reveals the fast growth of Estonia's education system, which increasingly values professional practice. Teachers spend a good amount of time working together to study and structure practical plans for teaching. Just as it happens in the small community of 'School Teachers of Us'. It would be important to start scaling up the best Italian experiences in this direction as well..

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The Role of Museums in Irish SciCom: A History

by Eleanor Q. Neil

Ireland has a long history of scientific exploration. The ways in which these discoveries were communicated have their roots in the learned societies of the 18th century and are intimately linked with the development of museums. Understanding that history is paramount to future developments in the field and in Ireland, specifically.

INTRODUCTION

Looking for the beginning of science communication is like asking how long is a piece of string? A literal understanding of the concept would trace it back to the 4^{th} century BCE and Aristotle. However, deliberate, thoughtful theories of science communication as a tool, intertwined but distinct from education, are relatively new and saw their advent at the end of the 20th century.

These conceptual beginnings are also interlinked with political values of the time and the growing understanding of public scientific literacy as integral to economic and political health, especially within the United States (Tobey 1971, Logan 2001). Though not yet in wide parlance, the deficit model was very much in educational vogue, and was applied beyond the classroom and to public information about science. Science communication was also primarily being undertaken by scientists themselves, as opposed to communication experts. Though, many of these scientists also lobbied newspaper publications to create science columns, covering scientific discoveries and developments and integrated into the news cycle, a practice that gained significant momentum after the 1957 launch of Sputnik (Logan 2001, 166).

Interestingly, the turn of the century shift towards an interactive model of science communication also drew heavily on political science, especially strategies like public dialogue (Carey 1989). While the scientific literacy focus of the early 20th century concentrated on accuracy, context, and methods of transmission from expert to the public, the interactive models were more interested in the cultural contexts in which the communication was happening and deconstructions of one-way, expert to consumer pipelines.

These deconstructions are ongoing processes and the current trends in science communication have furthered explored them through collaborative and participatory methods. Coupled with an increased interest in the development of ethical and responsible communication, there is an increasing emphasis on transparency and accountability of experts and expert knowledge. Across academic fields, there is also a budding recognition of the varieties of knowledge types and knowledge-sharing, not necessarily rooted in European, Enlightenment ideals. Museums participate in fostering collaborative learning and knowledge-production through their place as “third spaces” (Oldenburg 1989), places that are neither work, nor home, but informal gathering spots that engender social cohesion and civic engagement.

Just as literal interpretations of science communication date back to the ancient world, literal interpretations of the beginning of museums would trace the etymology of the word to ancient Greek *museion*. However, the *museion* had a distinctly religious purpose; it was a place for contemplative worship of the muses. Similar to science communication, the contemporary understanding of a museum came much later. In the 18th century, when the development of contemporary understandings of museums and what their function should be began to solidify. This is the beginning of both private collections opening to the public and, importantly, governments beginning to see the social value of museums and the desire for increased public institutions.

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IRELAND

Let us now turn to the focus of this article, which is the intertwined history of museums and science communication in Ireland. Ireland has a robust history of scientific inquiry that by some accounting dates to the Neolithic (ca. 3200 BCE) astronomers who were able to build passage tombs such as Newgrange to align with the winter solstice's sunrise. This, like the *museion* and Aristotle is perhaps too far back to be a useful accounting.

It is more useful in this context to begin in the 17th century when Robert Boyle was conducting his foundational experiments in chemistry and the Dublin Philosophical Society was founded, which hosted many of the most contemporary, cutting-edge scientific experiments. This link between the drive for scientific advancement and the desire to share those advancements that is the throughline of the history of science communication in Ireland.

In the 18th century, the role of museums began to take shape and the learned societies, and the newly fashionable museums of Europe began to negotiate their roles in public life and education. In 1753 the British parliament passed an act calling for the creation of the British Museum, which opened its doors in 1759. This moment, of public, collections-based education is the starting point of the process by which we would arrive at the definition of museums as the International Council of Museums (ICOM) would define them in 2022: "a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage. Open to the public, accessible and inclusive, museums foster diversity and sustainability [...]" Towards the end of the 18th century the Royal Irish Academy was founded as was the Armagh Observatory.

It is impossible to extricate Irish history from colonialism and class-bias, though a more nuanced examination of their role in Irish science communication is beyond the scope of this article. Nonetheless, in the 19th century, Britain took a more involved approach to science communication and education in Ireland, driven by a renewed desire to tighten control, not only politically, but socially over Ireland and Irish people (Crooke 2000).

Nonetheless, John Tyndall's experimental physics and his extremely popular lectures on the topic (meant for lay-audiences) brought him away from his native Ireland to the United States and won him a regular spot, lecturing at the Royal Institute of London. Tyndall is often credited as being the first science communicator.

In 1877, the Museum of Science and Art, Dublin was established by the colonial government, taking the responsibility for public collections out of the hands of the Royal Dublin Society (RDS), and putting it under direct government control (Crooke 2000). The collections in this new museum were drawn from the RDS itself but were also supplemented by the Royal Irish Academy (RIA) and Trinity College Dublin. This was the inception of a centralised museum network in Ireland.

In 1890, a new building was erected on Kildare Street to house coins, medals, and significant Irish antiquities from the RIA, including the Tara Brooch and Ardagh Chalice, and ethnographic collections with material from Captain Cook's voyages from Trinity's collection, and the collections of the Geological Survey of Ireland. Throughout this period, a wide variety of material was amalgamated into centralised organisations and the learned societies' collections began to wane. While not envisioned this way, this also represented the inception of a more democratised vision of public education. The learned societies were markers of social class and class-based education in ways

National Museum of Ireland – Natural History Museum
Eric Jones (https://www.geograph.ie/photo/1872624)

that publicly-funded museums are not. Though, decolonisation and democratization of museums, even publicly-funded and free-of-charge museums, is an ongoing process that requires more than open doors.

The 20th century was a pivotal time in Ireland and for museums and science education. In 1900, the Dublin Museum of Science and Art, changed departments and came under the remit of the Department of Agriculture and Technical Instruction. In 1908, all the Dublin Museums officially became the National Museum of Science and Art, Dublin, indicating the changing political conceptions of Ireland as a nation. Despite a long and storied history of scientific discovery in Ireland (see Murphy (2020) for a more detailed accounting) it was not until the initial fight for independence (1916) and the establishment of the Irish Free State (1921), that modern science communication in Ireland began to gather steam.

The latter half of the 20th century saw formal, systematic training in science communication developed globally. In 1960, the first MSc degree was offered in the United States, indicating the beginning of the definition and professionalisation of the field (Schiele and Gascoigne 2020, 18). In Ireland in 1963, the Young Scientist Exhibition began. Today, it is open to all secondary schools and remains extremely prestigious, regularly seeing up to 600 entries. Then in 1967, the Irish language TV program *Teilifís Scoile* aired on Ireland's national television broadcaster Teilifís Eireann (now RTÉ), and Ben Sherry asked his audience 'What is Physics?' leading them on a meandering, philosophical discussion (Murphy 2020).

As technology advanced throughout the 1970s and Irish TV receivers were able to provide an extended reach, more international science education TV shows began to be aired: BBC's *Horizon* and *Tomorrow's World*, David Attenborough's *Life on Earth* and Sagan's *Cosmos* all appeared on RTÉ. Then in 1985, the Irish Science and Technology Journalists' Association was founded. Their Mary Somerville Prize for the country's top science communicator remains one of the field's most prestigious awards.

For the next 20 years, science communication flourished in Ireland both in academic and policy circles. In 1996, the White Paper on Science and Technology (Rabitte, 1996) was published; the first science week was launched; and the first MSc in science communication was set up between Dublin City University and Queen's University Belfast. This was followed in 1998 by a joint-funded government, private sector, philanthropic scheme, the Programme for Research at Third Level Institutions (PRTLI). PRTLI was intended to generate inter-institutional collaboration, and it had funds specifically earmarked for education and outreach. Then in 2003, Science Foundation Ireland (SFI) was founded. It was designed to oversee science and technology policy and research, and its Discover Programme funds the majority of education and outreach programming.

Perhaps the most innovative institution, Science Gallery Dublin, was opened in 2008. "This was a departure for the representation of science in Ireland and arguably the first practical step [...] away from traditional deficit-model marketing. Here was an interstitial public space for the clash of ideas at the edges of science and the arts" (Murphy 2020, 428). The loss of Science Gallery Dublin in 2022 has left a hole, not only in the science communication efforts within Ireland, but also a physical one on Pearse Street.

WHAT NOW?

This piece has not touched in-depth upon the scientific developments or personalities that Ireland has produced throughout its history (e.g., Boyle, Walton, Burnell), nor has it given an in-depth examination of the political influences that scientists, science communication experts, and museums exert or are influenced by (the role of the National Museums in the independence movement and national identity construction are worth mentioning). Without that background, it is somewhat difficult to contemplate the contemporary and future landscapes.

Nonetheless, with the future of Science Gallery Dublin uncertain, the question does appear to be: what now? Shiele and Gascoigne (2020, 18) found that "The creation of a science centre is symbolic of the [...] importance of science and technology in a society." While Science Gallery was not a science centre as Shiele and Gascoigne define it, its loss highlights the gap in Irish science communication's ecosystem.

In 2006, plans were put in motion by the Irish Science Centres Awareness Network, to create a National Children's Science Centre in Dublin, but as of today construction is only set to begin sometime in 2024 and the doors to open in 2027. That represents over 30 years of planning and fundraising, and it demonstrates what Murphy (2020, 432) identified as "the fragility of Irish science culture."

Ireland's scientific research community has long benefited from a complimentary dedication to communication. Museums are a significant part of this, and it is notable not only the lack of a science centre, but also the distinctly analog taste of the museums that have persisted since their Victorian-era inception. The Natural History Museum for example, which is within the National Museum of Ireland network, has robust public programming but very little integration of digital engagement in person or online.

This appears to be despite digital communications and research happening elsewhere in Ireland, including innovative intersections of art and science through technology (e.g., Beta Festival; STEAM Learning Ecologies at the SFI centre, CÚRAM at NUIG). It appears as if museums charged with science communication in Ireland are not able to fully engage with this robust and cutting-edge technology and research that is being successfully integrated elsewhere. It is this lack of cohesion and innovative collaboration between technological and digital advancements and the museum sector that most calls upon Murphy's (2020) science-culture fragility. As museums, science communication initiatives, and digital innovation are all flourishing in Ireland there is reason to be positive about the future. It will require focused effort and a re-prioritisation of funding structures, but future collaborations have the potential to create more robust Irish museum culture, which can encompass and support digital mediums, and empower a broader public engagement with science

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PARADIGMS, MODELS, METHODOLOGIE

For a conscious approach to the digital transition

by Giuseppe D'Angelo and Anna Gunnarsson

Questions, creative idea and innovation concept. Credits: Dilok. Licence: AdobeStock_408559430

Any deep change in the contexts of human knowledge and human acting requires a changed point of view. This is true in the scientific, technological, educational, social, and cultural areas. The point of view is determined by what is called a paradigm. These changes are not always experienced consciously and are often under- or over-valued. This article aims to describe the conceptual and meta-conceptual principles that allow the identification of a "constructivist" definition of the concept of paradigm and its applications expressed through specific Models and appropriate operational Methodologies, with a specific focus on the changes brought about by the digital transition.

WHAT IS A PARADIGM?

There are multiple definitions of "**Paradigm**". The Encyclopedia Britannica give these two definitions: "*A paradigm is a model or schema for something that can be copied*" and "*A paradigm is a theory or group of ideas about how something should be done, accomplished, or thought out*". The Treccani Encyclopedia, Italia, has a more articulated definition: "*From late Latin "paradigma", Gr. παράδειγμα « example, model». In philosophical language it is sometimes used as the equivalent of "archetype", to designate ideal realities, conceived, e.g. in Plato, as eternal models of sensible, changing realities; in Aristotle the term is taken to indicate the argument, based on a known case, which is used to illustrate a less known or completely unknown one.*"

These definitions, from a practical point of view, see the paradigm as a synonym for a reference "model". Instead, we will see how there is a well-defined functional relationship between the concepts of *paradigm* and *model*.

To investigate this difference and arrive at a more structured definition of paradigm, we analyse the epistemological point of view.

In contemporary epistemology, the term Paradigm has been widely used in the sense attributed to it by Thomas S. Kuhn (epistemologist and theorist of science) who in 1962, in his most important work – "THE STRUCTURE OF SCIENTIFIC REVOLUTIONS" – addresses the problem of how scientists come to conceive and assume as coherent a general, essentially theoretical framework, which is in conflict with the commonly accepted framework or with the others that may also be considered reasonably acceptable. Kuhn calls this general theoretical framework a "*paradigm*" and gives the following definition of it: "*A paradigm is a set of practices, methodological rules, heuristic hypotheses, and explanatory models that guide scientific research in a given era". In this sense, the so-called* ***scientific revolutions*** *would be attributable to "****paradigm shifts****".*

A **paradigm shift**, according to Kuhn, means "**changing the point of view**." A changed point of view almost always derives from the emergence of anomalies that cannot be explained by universally accepted paradigms. These anomalies derive, in their turn, from the discovery, over a given time and context, of new visions, phenomena, processes and, in whole or in part, in contrast with those collectively shared and accepted by the communities of reference. These discoveries are essentially determined by a refinement of the technological, but not only, "tools" with which reality is observed.

The anomalies we are talking about are, therefore, the foundation of scientific revolutions.

One of the most profound changes, due to its absolute impact on the "living flesh" of the human community, was the **birth of the "digital" representation of reality**, seen in its most explicit and dynamic manifestation: the processing of information and knowledge.

This extraordinary revolution, now known as Information Science or Computer Science, continues to introduce new and increasingly engaging and shocking worldviews and ways of being. It began in the modern era of first half of the 19th century, with the programmable computing machines – the *analytical machines* – by Charles Babbage and Ada Lovelace (we neglect the very long previous period that saw

the birth of "machines" to aid calculation starting from the twenty-first century B.C. with the abacus).
About "digital revolution"; we will talk about this "revolution" in depth in this article.
Obviously, the more complex the phenomenal reality we want to formalise, the more this reality is characterised by different paradigms that explain it from different points of view. Most scientific contexts are multi-paradigmatic by nature as well as transdisciplinary by nature. Two examples are *Pedagogy and Computer Science*. But we also have *Physics, Mathematics, Biology*.

BUILDING A PARADIGM

It is of particular significance for the understanding of the concept of paradigm to establish a "constructivist" approach to its definition. The importance of a constructive, i.e. meta-cognitive, definition of paradigm is also determined by an aspect that might seem beyond our reasoning; this is the "*pedagogical question*". Yet it cannot be overlooked that the introduction of a new "*point of view*" within science and of the related set of "practices, methodological rules, heuristic hypotheses and explanatory models" (what Kuhn, In the book we mentioned previously, associates with scientific research in a given context and in a given era), requires that the scientific community welcomes and accepts this new point of view. It must establish a complex set of visions, values, knowledge, symbolic and linguistic codes, cognitive approaches and strategies that will have to be learned by every new individual who wants to operate in that scientific context. Therefore, the identification of a "constructive" definition of paradigm also allows us to identify those sets of specialised knowledge, skills and abilities that the individual must acquire in order to act and create in the new paradigm context.
We'll explore this aspect at the end of this article. For the moment, let's start building step by step the concept of Paradigm to arrive at this "constructive" definition.
The first step is to raise the level of abstraction of our reasoning and introduce a new, more abstract definition:
A Paradigm is the means to operate a conceptual systematisation (interpretation/signification) in a specific area of phenomenal reality, to allow the individual to guide their thinking and to act in that reality at a given time
This definition tells us that:

- A Paradigm is a "tool" that serves to "interpret" the facts of an area of phenomenal reality in which the human being lives and evolves. Therefore, it serves to "signify" (i.e., "give meaning to") what is observed in that reality.
- A Paradigm serves to "orient" the thinking, decisions, and actions of individuals interested in that area of phenomenal reality (for those who observe and study it).
- A Paradigm has a temporal value, in the sense that when the knowledge of the observed reality changes (new phenomena, new knowledge, new facts, etc.) it can be transformed, evolve, and even "falsify", i.e. lose its significance.

This definition, in the case of scientific research, is transformed into Khun's.

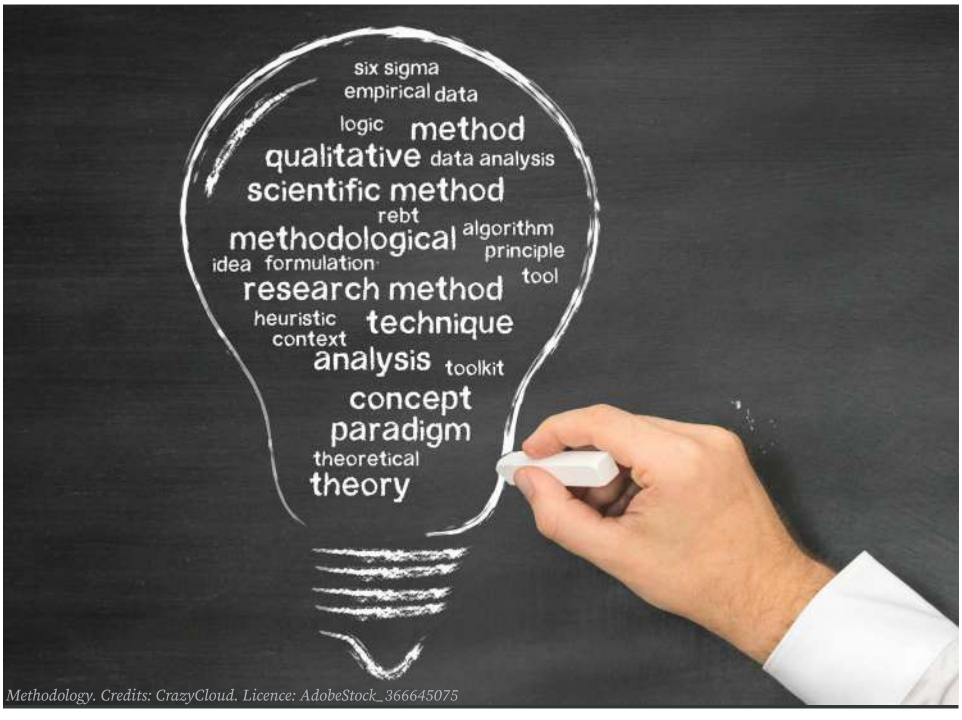
The second step is to establish that a **systematic and conceptual definition** of a paradigm starts from a synthetic and self-consistent definition. It must contain, in an absolutely general way, the elements that characterize this reality – in particular the objects of interest – and the methods of action within it.

The third step is to introduce a more structured definition of Paradigm that modifies the previous one:
A Paradigm in a specific area of phenomenal reality, appropriately described through the Scope of action and the Objects treated in such reality, is the set of Knowledge, Processes and Strategies to allow the individual to guide his thought and to act in this reality at a given time, as well as an adequate Language to represent and communicate this – and in this – reality.
This can also be expressed, briefly, by writing that: **Paradigm** $\equiv$ **{K, P, S, L}**.
Knowledge *consists of the elements that characterise the phenomenal reality that we want to interpret. This knowledge includes not only the conceptual aspects of reality, but also all the means that allow us to operate in it.*
The following are Knowledge: data, information, definitions, rules, theorems, principles, axioms, instruments, wherewithal, contexts, ... And so on

Processes *are the set of codified actions – conceptual and operational – that allow us to advance and progress in the phenomenal reality that we are interpreting in order to achieve the objectives we have set ourselves, formulate judgments, give solutions, etc.*
The following are Processes: algorithms, regulations, procedures, guidelines, how to use, operational disciplines, development criteria ... And so on.
Strategies *allow us, in the phenomenal reality that we are interpreting, to find and plan actions to act in this reality to achieve goals, answer questions, solve problems, build new knowledge, etc.*
The following are Strategies: theories, methods, techniques, dynamics, praxis, tactics, conducted, gimmicks, arts; ... And so on.
Language *is the complexity of terms, expressions, definitions that are introduced into a paradigm to simplify the ways of expressing it, in particular, Processes and Strategies, starting from Knowledge.* These linguistic codes, which lead to the creation of neologisms and acronyms, make it possible to synthetically represent concepts or facts that would otherwise require complex "periphrases". Sometimes these new linguistic codes are called "jargons" when they do not enter the common language but are confined to the specialized context in which they are born. Examples of paradigm languages are: mathematical language; the language of music; computer language ... and so on.

FROM THE PARADIGM TO THE MODELS

A paradigm takes on different characteristics when applied to different fields of reality. In some way, the application of a paradigm to a given context determines a "**projection**" of the three classes that characterise it (Knowledge, Processes and Strategies) to the specific area. This area can be determined by new



Methodology. Credits: CrazyCloud. Licence: AdobeStock_366645075


Change of direction, change of point of view. Credits: hmzphotostory. Licence: AdobeStock_460608014

criteria of use, by specific application methods, by renewed means and tools, by new techniques. In essence, we have a Model of a Paradigm whenever the modalities and criteria of its application change, **leaving the synthetic and self-consistent description and the general knowledge, processes and strategies unchanged**.

As we saw in the opening paragraph, the terms "paradigm" and "model" are sometimes used synonymously, but from a conceptual point of view, the two terms represent two different formalisation levels of the phenomenal reality we want to represent. The first is the "ideal" reference, the one, to be clearer, that defines the context of reference.

For science, it is the scope of research and the objects covered in it as well as the methods and approaches used.

For example, we can introduce the following synthetic and self-consistent definition of Mathematical Science:

"Mathematical Science is the body of knowledge that studies (field of research) the structures that allow to manipulate (treated objects) quantities, spatial extensions and related figures, the movements of bodies, through (methods and approaches used) a rigorous use of abstraction, formalization and axiomatization, proof, logic and, in particular, reasoning hypothetical-deductive based on inference, induction, deduction, abduction up to reasoning by absurdity".

Starting from this definition, we can observe that in *Mathematical Science*, seen as a paradigm, the specialisation of the objects of study and/or methods leads to more specialised paradigms: *Arithmetic* (which studies the processes of numerical calculation, in particular the calculus of natural numbers), *Algebra* (which studies structures consisting of numbers and other non-numerical expressions, structures that are defined as "algebraic"), *Geometry* (which studies the shapes that can be represented in the plane and in space), *Analysis* (which studies the so-called "infinitesimal" calculation processes).

Each "projection" of a Paradigm is a formal representation (ontology) that allows to conceptualise the domain of interest by specialising its knowledge, processes and strategies and, consequently, the reference language. For this reason, we can give the following definition of a Model of a Paradigm:

"The Model of a Paradigm (or, simply, Model) is the ontological specialisation of Knowledge, Processes and Strategies to a given Reference Context and the related Reference Language".

To contextualise a Paradigm and build a Model, we must define the following seven characteristics that make the paradigm itself "usable": Purposes, Constraints, Wherewithal, Aids, Strategies, Processes, Knowledge.

Let's exemplify these seven characteristics by taking the case of **Communication Science**, that in its general definition is a multi-paradigmatic scientific field, of which we give the following concise and self-consistent definition:

"Communication Science is the body of knowledge that studies (field of research) human communication understood (objects treated) as a process of relationship or interactive exchange, in a given environment, between two or more participants, based (methods and approaches used) on mutual intentionality and on a certain level of awareness capable of making participants share a certain meaning through linguistic codes, symbolic and conventional systems of signification and signaling shared over time and in the culture of reference".

Based on this definition, let's see how the seven characteristics in the case of Communication Science are exemplified.

- The **purposes** of communication are different if I want to "communicate to transmit data", "communicate to inform", "communicate to explain", "communicate to educate", "communicate to instruct", "communicate to train".
- The **terms** and **conditions** of the aspects of communication, which we can also call **Constraints**, are different if I have to communicate "in person" or "remotely". More differences appear in communication of "one-to-one" or "one-to-many", if I have to communicate "synchronously" or "asynchronously", if I have to communicate "at the table with the family", "in a bar", "in a class", "in a university lecture hall", "in a theatre", "on the radio", "on television", "in a blog" or "in a community".
- The **means** of communication are different if I have to communicate "by voice", "by text", "by images", and if the means of communication is "analogue" or "digital" (or even if I have to use a combination of these).
- **Assistive devices** for communicating are different if the communication is based only on "the use of a main medium" or if it presupposes "the use, with the main medium, Additional Aids" too; for example, in didactic communication it is different if "I explain only verbally" or "I explain verbally with the aid of a blackboard" or "I explain verbally with the aid of slides" or "I explain with the aid of of multimedia tools".
- The **strategies** used for communication are different depending on whether I plan to apply the principles and rules of "pedagogy" or "psychology" or "rhetoric" or "prosodic" or "proxemics" or "mimicry" or "music", and, again, whether I have to use "mother tongue", "a foreign language", "a jargon", "a Song".
- A **communication process** is different depending on the field of application in which this communication takes place: in schools, universities, vocational training, publishing, journalism, public administration, politics, sport, science, cinema, television, radio.
- The **knowledge** that must be possessed to achieve the purpose – or purposes – of communication in the conditions and with the modalities offered by the context and with the means, aids and strategies required!

The last aspect that must be considered in the construction of a Model of a Paradigm is its "Internal Coherence" with respect to the constraints imposed. To this end, we can say that:

The coherence of a Paradigm Model is its applicability for the purposes for which it is developed, in compliance with the principles and constraints set.

THE IT PARADIGM AND DIGITAL TRANSITION MODELS

What has been illustrated so far can be effectively exemplified in the case of **Digital** Innovation (or Transition) **processes**.

Computer Science is also a multi-paradigmatic field but, from a general point of view, we can give the following synthetic and self-consistent definition:

Computer Science is the scientific context that deals with (field of research) the theoretical foundations and computational manipulation of "information" – understood (objects treated) as any data, news, knowledge that can be represented in a quantitative form and appropriately qualified through its categorisation – through (methods and approaches used)) strict formal procedures, called "programs", which can be implemented, together with the information, in automated electronic systems, called "computers".

We will also define the **Information Science Paradigm** with the more succinct expression of **ICT Paradigm.**

Starting from this we can easily identify the set {K, P, S}. For reasons of space, please refer to the article that will be published in the next issue of the journal, dedicated to the SciCo+ Model for an articulated description of Knowledge, Processes and Strategies of Information Science[1].

[1]These two links provide a glossary respectively in Italian and English of the main terms of the ICT Paradigm Language:

- http://www.labinfca.unipr.it/glossario/gloss.htm#glossario
- https://en.wikipedia.org/wiki/Glossary_of_computer_science

[2]https://it.wikipedia.org/wiki/Digital_transformation

ICT PARADIGM MODELS AS CRITERIA FOR THE DIGITAL TRANSITION

Digital Transition (or **Transformation**) is the process through which in a given context of the life of a community is introduced by means and tools of Computer Science. We found the following definition taken from Wikipedia to be well articulated and interesting for our purposes[2]:

Digital Transition is a set of predominantly technological, cultural, organizational, social, creative, and managerial changes, associated with the applications of digital technology, in all aspects of human society.

The expression "digital technology" assumes a central value in the definition but, as we know, the ICT Paradigm, like all paradigms, has a specific historical-temporal connotation, therefore technological evolution has determined, over time, different Models of digital transition because technologies have evolved to represent and communicate knowledge. And these models have also assumed, over time, a different linguistic identification.

Let's look at this comparison panel:

Years	'90	'00	'10
Notation	**Tele-**	**e-**	**Smart- (or "+")**
Technologies	- Asynchronous communication,Audio communication - Digital Data and Document Transmission Personal Computing - Specialized application packages, texts, images, animations, hypertexts	- Synchronous communication, Textual communication - Video Communication (Video Conferencing) Networks - Representation, preservation and use of knowledge (e-Book, e-Library, graphic content, audio, etc.) - Advanced Personal Computing, Digital Graphics - Hypermedia	- Advanced communication (integration of electronic forms of communication) - Mobile Computing - Augmented reality - Virtual reality - Holography - 3D Printing - Internet of Things - Artificial intelligence

The prefixes "*Tele-*", "*e-*", "*Smart-*" and the suffix *"+"* have become as ways to define phenomenological contexts in which a Digital Transition process has intervened.

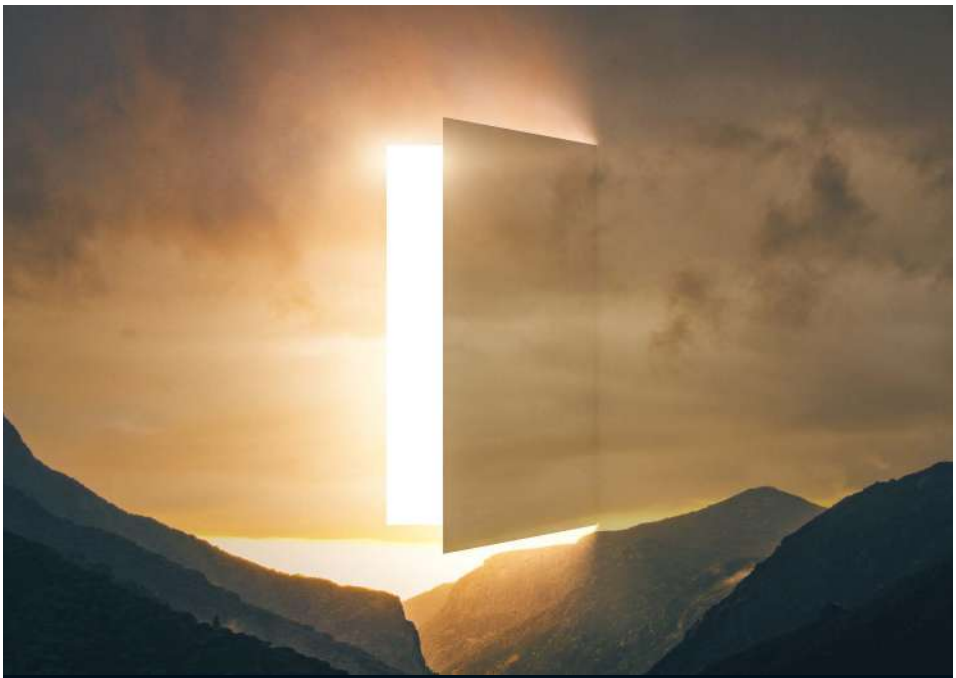
AN EXAMPLE: DIGITAL TRANSITION MODELS IN THE "WORK" CONTEXT

The world of work was, of course, deeply affected by innovation and the introduction of the first computers in production processes starting from the '50s. But this innovation, around the end of the 1980s, affected directly the "way of working", that is, it affected the "**process of production of work performanc**e" (shown in the figure) and introduced the theme of the "**de-localisation**" of the worker and the "**de-structuring**" of work time, which we can also define, respectively: "<u>spatial de-localisation</u>" and "<u>temporal de-localisation</u>".

The general process of providing a work service.

From what has been said, it is clear that the possibility of de-localising a work performance derives from the possibility of de-locating, in whole or in part, the materials for production, the means of production/supply and the products of the service. This possibility is fully guaranteed (in the sense that a total delocalisation of the work practice is possible) only when the *production materials, the products of the work performance and the means of production operate on and with the "information" and its elaboration and management processes.*

Over the last forty years or so, "unlocalised and un-temporised work" has taken on three different names, all of which are also well known to the general public: **Teleworking, e-Work, Smart-Working.**


Open door on creative mountain background. Credits: Who is Danny. Licence: AdobeStock_374841343

Let's take a look at its general features:

Tele-Work (1990s)
This model of digital transition of work was based on the transposition of work activities more closely related to communication ("asynchronous") and the digital transmission of data and documents, as well as the introduction of IT environments (applications) capable of automating – and making "remote" – some work and/or organisational processes.

e-Work ('00s)
e-Working brings the processes of work production to a more advanced level in which the communication skills between workers are amplified, introducing "synchronous" communication (Chat, Videoconferencing, Internet Calling, Virtual Rooms and Classrooms, etc.) and, at the same time, the forms of representation, preservation and use of knowledge (e-Books, e-Libraries, graphic content, audio, etc.) and the IT environments of production (advanced personal computing) are expanded, as well as computer systems for the virtualisation of work environments.
This Model presupposes, in general, a very wide recourse to the total distance between the producers of the work performance and the users of the same.

Smart-Working (from '10s)
Smart-Working overcomes this last constraint (the total distance). It introduces, in the world of work, solutions aimed at "amplifying" the production criteria of work performance and their effectiveness and at "virtualising" the means of production of work without sacrificing =relationships between workers and with their work environments, and at the same time making the transition between in-person work and remote work more dynamic depending on circumstances and needs. This is because the processing capabilities of mobile platforms are expanded and, therefore, there is a shift from "remote work" to "mobile work".

FROM THE MODEL TO THE METHODOLOGIES

At the beginning of the article, we observed that a new Paradigm or a new Model requires particular attention to the pedagogical aspects in the community of its users. A new way of operating, a new point of view with which to act, determines the need to formalise the complex of visions, values, knowledge, symbolic and linguistic codes, cognitive approaches, strategies to allow them to be learned by each new individual who wants to operate in that context.
This process of "formalisation" of the innovations introduced by a new Model, in any area of human action (work, social, cultural), is substantiated in one or more (operational) **methodologies**.
A Methodology can be defined as follows:
An (operational) Methodology – or, simply, Methodology – of a Model of a Paradigm is the set of Knowledge, Skills and Abilities that make one or more components of the Model itself applicable and that it is necessary to transfer to those who want to operate within the scope of application of the Model itself.
In general, each new methodology introduced to make a Model applicable in a specific paradigmatic field, involves a fairly wide set of knowledge and skills that lead, generally, to the identification of a new specialised professional profile capable of applying this methodology.
This should be quite clear to the reader. Let's think, for example, of all the new professions that the processes of technological innovation over time have created. Some of these new professions are specialisations of existing professions, others represent real new professional figures in the panorama of technological innovation.
We will talk about the topic of methodologies in depth in the article dedicated to the SciCo+ Model we talked about earlier.

CONCLUSIONS - TOWARDS A CONSCIOUS APPROACH TO THE DIGITAL TRANSITION

As we have seen, we interpret a paradigm as something that have the *means to operate a conceptual systematisation (interpretation), in a certain time, of a specific area of phenomenal reality, to allow the individual to guide his or her own thinking and to act in it*. This is an interpretation suitable to our time, especially when it comes to the digital world. A rapid change has been taking place, as we know, during the last years when it comes to digital tools, digital mindset and practical digital skills. There are so many things that are carried out in a digital way that we practically take them for granted; the systems we use, the devices we operate regularly and the "applications" (software) available to us (just to mention some aspects of this transition). Where we are now as far as the digital development, we will most likely not be tomorrow.. Things are happening so fast that most of us have a hard time keeping up. New influences, technical findings and new things to learn are at full speed ahead. During the pandemic, many adults and young people were forced into learning new digital systems and new ways of communication in a digital manner just because we could not meet in person. All of the above has brought about a new condition, which is affecting us and will continue to affect us in many ways. There is a chance/risk that things we learn right now will have to be re-learned very soon.

Mindset

The pandemic has showed us that rapid change when it comes to digital skills is possible for many. We, as humans, have the ability to adjust, learn about new systems, operate new tools and see change not only as something annoying or bad. It is now a "normal" situation for many to work from a distance, using new tools parallel to each other (Zoom, Teams....) and to collaborate in real-time on digital platforms with shared content online. The rapid changes that we are a part of, the pandemic being one example, makes us realise that we do not have to know everything about everything to be an 'okay' or even a quite skilled user.We are aware that, most likely, there will always be another update coming, a new technology, which will make us rethink how to act. Time is always short in the digital world, making it smart to quickly learn exactly what we need and be ready to quickly learn what comes next that we'll need. But the attitude of "digital change" is not the only thing required.

Knowledge - Technical skills

There are a number of technical skills that are nowadays more or less mandatory to digitally handle specific types of information: video, photo, sound, music, digital communication (meetings, bank-services, the handling of money, booking, care systems...) and more. Most of these areas can be controlled from our mobile devices that we carry with us most hours of the day and stubbornly still call "phones" (only when we are aware of the paradigm shift do we call them "Smartphones"); nowadays they are much more. They are "all-rounder devices" based on constantly changing technology. Today it is considered normal to be a "multiuser" of digital tools without being an expert or having to depend on experts. We use our previous knowledge about digital tools and systems and apply it to new situations and challenges – quite successfully. It's also true that individuals slowly get used to a new technology (those who use a Windows PC and its two-button mouse, have difficulty switching to a Mac PC and its single-button mouse. About forty years ago, when most users were using the word processor environment, Wordstar had a hard time switching to visual environments such as MS-Word. This resistance to technological change has a name; It's called "digital laziness" and it's the resistance to changing a technology that we dominate. This difficulty is becoming less and less of an obstacle because we have reached a good level of "digital elasticity" (this is demonstrated by the aforementioned case of the transition to digital of a few billion individuals during the pandemic).

Risks

When a big change is going on there are risks on many levels to consider. And the digital development is of course no exception. We will be using digital platforms and tools before having the complete knowledge of them; we can even ask ourselves if we will ever know everything. When making risk assessments with different levels of digital knowledge, we will come up with different results that will have an effect on decisions made. In a digital context we will have users that do not have great digital skills. How do we plan for them? How do we make sure that they get appropriate services and environments for use, do not feel stupid and are not left behind? The digital change in science centers and museums is in many ways a change with high costs attached – how do we collaborate in order to make the digital tools available for many, without limiting the possibilities for smaller places?

The digital transition has to be looked at for what it is – a huge challenge with so many possibilities that it is practically limitless. How do we take on this challenge having fun and with open eyes? The answer is "just being together"; sharing experiences, mistakes, resources, findings and more. Where are we headed? No one knows.

And what about Science Communication in Science Centres and Science Museums?

What we have illustrated so far also fully applies to the theme of the "digital transition of the Science Communication sector". In an article that will appear in the next issue of the magazine dedicated to the SciCo+ Model, we will describe this topic in great depth. Here we just want to anticipate some reflections. The shift to digital has, of course, a significant impact on people working in science centres and museums. The roles of the people working there, as well as necessary skills, knowledge and necessary abilities, collaboration and development of new materials are changing. What do we need to take this on?

Employees at science centres and museums meet a diverse audience every day. From the general public to school classes and teachers, community groups and many more. Some of these users are not completely comfortable with digital change. In this situation, the "digital mindset" means not only to think and act for yourself, as workers, but also to use digital solutions effectively in the development of new content in exhibitions, both practically in exhibitions for visitors to use and in online only activities, in order to facilitate the best experience for our visitors.. This requires many different skills from those who work in the sector.

We would like to add that the growth of digital skills on the part of potential users of science centres and science museums also leads to an increase in the expectations of these users on the quality of the digital products offered. This means that the operators in the sector, managers and technicians, must have the technical skills to produce and present relevant digital content to their audiences and to be able to collaborate with the right experts in doing so. The technical skills needed span from producing digital materials in combination with more traditional hands-on activities on the floor of a museum/science center and digital materials for online-only use.

The number of different techniques and methods to inform, teach and fascinate the audiences in science centres and museums have always been many in the museum/science centre world. So far, many very creative ways have been used to give the public results with, so to speak, "good value for money". When it comes to digital possibilities, this is more difficult. The use of new technologies such as virtual reality, augmented reality, AI, mixed reality, digital tables for interaction, digital escape rooms, digital planetariums and such give new possibilities, but also new challenges including high costs and the need for external consultancy just to be able to produce qualitative content. The search for new methods and techniques that can at the same time excite the public and not succumb to cost problems is necessary. But how can we make the right choices to get solutions that are used effectively by the public? What do we know so far- and what do we still need to find out from, for example, the behaviours of our audiences?

Giuseppe D'Angelo is an expert in training and innovation. He holds the role of Advisor in the SCI-CO+ Project

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THE SCICO+ MODEL

by Giuseppe D'Angelo

A CONCEPTUAL APPROACH TO THE DIGITAL TRANSITION IN SCIENCE COMMUNICATION

This article presents the activities carried out and the conceptual reference framework defined by the SCI-CO+ Project, developed to aid the construction of the SciCo+ Model.. In dealing with these issues, extensive reference is made to the article "PARADIGMS, MODELS, METHODOLOGIES - For a conscious approach to digital transition" published in the same issue of this magazine.

In the NEWS FROM SCI-CO+ section of the previous issue, we gave an overview of the SCI-CO+ Project and the results it aims to achieve. From this issue, we will start describing the work done and the results achieved. To support the contents of this column we will publish, in each issue, an in-depth article dealing with theoretical topics and general themes on tools, methods, and knowledge on which the project work and the realisation of results is based. There are three main results the project has worked on in this first year:
- the SCI-CO+ System
- the SciCo+ Model
- The Model's Application Methodologies

We dedicate this article to the **SciCo+ Model** by inviting the reader who has not already done so to read the article *"PARADIGMS, MODELS, METHODOLOGIES - For a conscious approach to the digital transition"*, published in this issue of the magazine, both to contextualise what we will illustrate below and to share a glossary of reference. We will cite this article in several places.

Giuseppe D'Angelo is an expert in training and innovation. He holds the role of Advisor in the SCI-CO+ Project

WHY BUILD A MODEL FOR ADVANCED SCIENCE COMMUNICATION?

The object of interest of the SCI-CO+ Project is the **process of digital transition in the field of Science Communication** and for this purpose it has set as its basis one of the main horizontal priorities that the Erasmus+ Programme has set as of 2020: "*addressing the digital transformation through the development of digital readiness, resilience and capacity*".
As is well known, the Programme has two main founding reference points: the cultural, economic and social cohesion of the citizens of the European Union, and their education and training to enable them to move and act consciously in European society and in a competent way in an ever-changing, increasingly globalised and dynamic world of work and professions.
The debate on digital transformation (or transition) is - among the social, economic and cultural issues tackled today - one of the most wide-ranging and profound; an issue that involves societies all over the world because of the need it brings about to look at reality, in which individuals move and act, with '*new points of view*'. And so it is reasonable to think that in order to train and orient the human beings of our communities to be '*ready*' and '*resilient*' people in a '*digital world*' or '*increasingly digitised*', as the aforementioned horizontal priority of the Erasmus+ Programme calls for, it is necessary to equip ourselves with conceptual tools that help us to classify and categorise the changes in our point of view in a comprehensive and rigorous manner.
These conceptual tools are the **paradigms** and **models** with which we represent the scientific and technological fields of reference. And it is for this reason that the SCI-CO+ Project has developed and implemented initial research aimed at identifying and describing the 'advanced' communication of science as a **model of** a specific paradigmatic field of reference. This field is determined by the overlapping area of the domain of '*Communication Science*' and that of '*Information Science*'. A model we have named **SciCo+,** where the suffix '+' has the same function as the better known prefix 'smart' and thus indicates a very advanced type of digital transition .

COMMUNICATION AND INFORMATION SCIENCE

When we speak of paradigms, models, methodologies, we move, in general, within that vast and complex context that we call '**science**'. Obviously we should not associate this challenging term only with those areas of knowledge that are traditionally 'scientific' - mathematics, physics, chemistry, astronomy, etc. - but we must think of 'science' as synonymous with 'method' and thus also consider all those areas of knowledge where 'method' becomes essential. So we can think of 'science' when we speak of sociology, pedagogy, education, politics, psychology, history, linguistics, economics, i.e. all those disciplines that are known, collectively, either as social *sciences* or as *humanities*.
Referring back to the article cited at the beginning, we see that every science is characterised, fundamentally, by a system consisting of: a *field of research*, a set of *objects handled and manipulated in it*, and the set of *methods and approaches* used to carry out the research activity. Using this system, we have introduced the paradigmatic definitions of the two sciences useful for our purposes: *Communication Science and Information Science*.

*"**Communication Science** is the body of knowledge, processes and strategies for the study (field of research) of human communication understood (treated objects) as a process of interactive relationship or exchange, in a given environment, between two or more participants, based (methods and approaches used) on mutual intentionality and a certain level of awareness capable of making the participants share a given meaning through linguistic codes, symbolic and conventional systems of signification and signalling shared over time and in the reference culture."*

*"**Information Science** is the body of knowledge, processes and strategies for the study (scope of research) of the theoretical foundations and computational manipulation of 'information' - understood (treated objects) as any data, news, knowledge that can be represented in quantitative form and appropriately qualified by its categorisation - through (methods and approaches used) rigorous formal procedures, referred to as 'programmes', which can be implemented, together with information, in automated electronic systems, referred to as 'processors'."*

By Laufer - Licence AdobeStock_267644983 -

PARADIGMS AND MODELS OF SCIENCE COMMUNICATION AND DIGITAL TRANSITION

Starting from the experiences and competences of the individual Project Partners and the results of the documentary and field research carried out with the previous project tasks, the following shared definitions of **Science Communication** and **Digital Transition** were elaborated:

*"The **Communication of Science** is the application of Communication Science for the dissemination of scientific culture and the results of scientific and technological research in order to contribute to the construction of scientific and democratic citizenship (ethics of science communication)."*

*"**Digital Transformation** (or **Transition**) is the application of Information Technology to one or more contexts of human society, to ensure that people and organisations are provided with innovative solutions for communicating and sharing knowledge, work, activities through technological, cultural, organisational, social, creative changes that are resilient, inclusive, accessible, sustainable (ethics of innovation) as well as effective and efficient."*

In both, as we can see, specific properties have been introduced that substantiate the particular and advanced 'point of view' assumed by the Partnership. In the first is *the ethics of science communication*, a characteristic that translates into the fundamental *mission of the* Communication of Science to contribute to the construction of a s*cientific and democratic citizenship*. Scientific citizenship indicates the value that science must assume in the life of the members of a community in cultural, educational, social terms; the second - *democratic citizenship* - represents the demand that the communication of science operates, obviously together with other areas of knowledge, as a tool to consolidate the 'democratic' vision of access to scientific knowledge. The definition of *Digital Transition*, on the other hand, highlights two aspects that must characterise, in our view, every process of IT transformation: *transversality* in terms of scope, not only work and study, but also other activities carried out by individuals and organisations within their communities, and *ethicality*, in the sense of ensuring that the tools and knowledge required for the broad and correct use of innovation are inclusive, accessible, and sustainable.

These two important definitions of 'communication of science' and 'digital transition' have allowed us to construct the following respective paradigms:

*"A **Science Communication Paradigm** is the set of Knowledge, Processes and Strategies and appropriate specialised Language needed to implement Science Communication initiatives in a given time."*

*"A **Digital Transition Paradigm** is the set of Knowledge, Processes and Strategies and appropriate specialised Language needed to realise Digital Transition initiatives in a given time."*

For both paradigms, the SCI-CO+ Project obviously did not limit itself to introducing their definitions, but carried out precise classification work, constructing the relevant (general) ontologies of the *knowledge*, *processes* and *strategies* mentioned and thus arriving at a complete, structured and homogeneous reference context, which is fundamental for the subsequent phase of constructing specific models, since, as we illustrated in the aforementioned article *"PARADIGMS, MODELS, METHODOLOGIES - For a conscious approach to digital transition"*, several models descend from one paradigm (which in some cases may themselves be seen as paradigms, but let us not complicate life!).

In our case, we have the following definitions for the two aforementioned paradigms:

__Models of Science Communication__ are defined in relation to the media and modes of communication used and the areas of science covered. The main areas include:
- *Science Centre*
- *Science Museums*
- *Science festivals*
- *Popular science publishing*
- *Scientific Movie*
- *Television Science Communication*
- *Radio Science Communication*

__Digital Transition Models__ are defined in relation to the means and modes of knowledge and information management. Among the main models we have those identified by the prefixes "Tele-", "e-" and "Smart-" (the latter also indicated with the suffix "+") that allow us to distinguish three distinct processes of Digital Transition that we could define:
- *Tele-Digital Transition*
- *e-Digital Transition*
- *Smart-Digital Transition (or Digital Transition+)*

THE SCICO+ MODEL

With regards to the three Digital Transition Models identified by the prefixes *tele, e- and smart*, we have discussed them in detail in the oft-quoted article in this issue to which we refer you for a more detailed discussion.

As far as the Models of Science Communication are concerned, however, the Project limited its work to the areas of Science Centres and Science Museums, as these are the contexts in which science communication is realised in its broadest and most complete articulation.

Therefore, the definition of SciCo+ that we have taken as a reference is as follows:

*"**The SciCo+ Model** is the set of knowledge, processes and strategies and appropriate specialised language needed to implement Science Communication initiatives in Science Centres and Science Museums based on the application of the smart-digital transition."*

Obviously, even in this case, this definition is only the starting point. What we have subsequently done is to identify the (general) set of knowledge, processes and strategies that characterise the SciCo+ Model and the specialist language of reference.

In the next issue of the magazine, we will detail this work.

Communication Science

Communication Science is the body of knowledge that studies (field of research) human communication understood (objects treated) as a process of relationship or interactive exchange, in a given environment, between two or more participants, based (methods and approaches used) on mutual intentionality and on a certain level of awareness capable of making participants share a certain meaning through linguistic codes, symbolic and conventional systems of signification and signaling shared over time and in the culture of reference.

Science Communication Paradigm

A Science Communication Paradigm is the set of Knowledge, Processes and Strategies and appropriate specialised Language needed to implement Science Communication initiatives in a given time.

Communication of Science

The Communication of Science is the application of Communication Science for the dissemination of scientific culture and the results of scientific and technological research in order to contribute to the construction of scientific and democratic citizenship (ethics of science communication).

Science Communication Paradigm

A Science Communication Paradigm is the set of Knowledge, Processes and Strategies and appropriate specialised Language needed to implement Science Communication initiatives in a given time.

Models of Science Communication

Models of Science Communication are defined in relation to the media and modes of communication used and the areas of science covered. The main areas include:

- *Science Centre*
- *Science Museums*
- *Science festivals*
- *Popular science publishing*
- *Scientific Movie*
- *Television Communication of Science*
- *Radio Communication of Science*

Information Science

Computer Science is the scientific context that deals with (field of research) the theoretical foundations and computational manipulation of "information" – understood (objects treated) as any data, news, knowledge that can be represented in a quantitative form and appropriately qualified through its categorisation – through (methods and approaches used)) strict formal procedures, called "programs", which can be implemented, together with the information, in automated electronic systems, called "computers".

Paradigma dell'Informatica

Un Paradigma Informatico è il complesso di Conoscenze, Processi e Strategie e un adeguato Linguaggio di contesto necessari per guidare il pensiero e agire nell'ambito della Scienza dell'Informazione in un dato tempo.

Digital Transition

Digital Transformation (or Transition) is the application of Information Technology to one or more contexts of human society, to ensure that people and organisations are provided with innovative solutions for communicating and sharing knowledge, work, activities through technological, cultural, organisational, social, creative changes that are resilient, inclusive, accessible, sustainable (ethics of innovation) as well as effective and efficient.

Digital Transition Paradigm

A Digital Transition Paradigm is the set of Knowledge, Processes and Strategies and appropriate specialised Language needed to realise Digital Transition initiatives in a given time.

Digital Transition Models

Digital Transition Models are defined in relation to the means and modes of knowledge and information management. Among the main models we have those identified by the prefixes "Tele-", "e-" and "Smart-" (the latter also inidicated with the suffix "+") that allow us to distinguish three distinct processes of Digital Transition that we could define:

- *Tele-Digital Transition*
- *e-Digital Transition*
- *Smart-Digital Transition (or Digital Transition+)*

SciCo+ Model

The SciCo+ Model is the set of knowledge, processes and strategies and appropriate specialised language needed to implement Science Communication initiatives in Science Centres and Science Museums based on the application of the smart-digital transition.

SciCo+ model - Concept map

16 JANUARY 2024
GÖTEBORG - SVEZIA
AI IN THE PUBLIC DOMAIN

Lindholmen Science Park

www.lindholmen.se/sv/event/ai-i-offentlig-sektor

JANUARY 27-28, 2024 FEBRUARY 3-4, 2024
NAPLES - ITALY
HEALTH WEEKENDS AT THE MUSEUM

in collaboration with SORESA spa

In collaboration with Regione Campania SORESA spa, an instrumental company set up by the Campania Region to implement strategic actions aimed at rationalising regional healthcare spending, the City of Science (Cittá della Scienza) in Naples is planning two special weekends dedicated to health, with the details outlined below:

JANUARY 27-28, 2024
"STROLLING" THROUGH THE HUMAN BODY.
EXPLORING THE SECRETS OF AN ALMOST PERFECT MACHINE!

"Welcome aboard" our science centre. Are you ready to begin an extraordinary journey of discovery of the human body? It will be a fascinating adventure through the mysteries, wonders and curiosities that lie within our complex organism. Don't miss the opportunity to discover the anatomy and functions of the systems and apparatus that enable us to live, move and experience the world around us. Through engaging workshops, science demonstrations and fun activities, we will discover together the secrets kept under our skin and those to keep us healthy! We will do this thanks to the Citizen's Health Portal (Salute del Cittadino), the tool that allows us to access online services made available by the Regional Health System (SSR), as part of the larger Campania Region project called Sinfonia.

FEBRUARY 3-4, 2024
TOGETHER FOR LIFE.
BETWEEN ECOSYSTEMS AND BIODIVERSITY!

On the occasion of the Day for Life, Feb. 2, Science City (Cittá della Scienza) opens its doors to the public to celebrate the importance of preserving the diversity of life on Earth. A series of engaging workshops designed to deepen your understanding of ecosystems and biodiversity in a fun and interactive way await you. A weekend together to discover the incredible web of connections that sustains life itself and promote awareness and responsibility for the life forms around us. But that's not all! You will have the opportunity to retrace the most important historical milestones that have contributed to improved and increased life expectancy: from the first vaccinations, to the emergence of antibiotics, to the development of community-based counseling

https://www.cittadellacienza.it

2 FEBRUARY 2024
BOROAS - SWEDEN
MEETUP: AI FOR INCREASED CUSTOMER USE – SPRINT #2

How AI can be used for better customer relationships and tech development. How can Tech Arena Borås help with this development?

FEBRUARY 22-23, 2024
STOCKHOLM - SWEDEN
TECHARENA SWEDEN

Bringing together business leaders, entrepreneurs, investors and decision makers

www.techarena.se

TECH ARENAN

MARCH 12-13, 2024
BRUSSEL - BELGIO
THE INTERNATIONAL SCIENCE COUNCIL (ISC)

The International Science Council (ISC) works globally to catalyse and bring together scientific expertise, advice and influence on issues of great interest to both science and society.

Unlocking the power of science communication in research and policy conference

https://council.science/it/events/high-level-conference-on-science-communication/

International Science Council

MARCH 11 AND 14, 2024
TURIN - ITALY
WINTER SCHOOL OF SCIENTIFIC COMMUNICATION 2024

Between March 11 and 14, 2024, Gran Paradiso National Park together with MUSE in Trento is organising a residential winter school on Science Research Communication in Valsavarenche for researchers, students, employees and collaborators of protected areas, museums and research centres.

SCUOLA INVERNALE DI COMUNICAZIONE DELLA RICERCA SCIENTIFICA

https://www.pngp.it/scuola-invernale-di-comunicazione-scientifica-2024

30 MARCH-14 APRIL 2024
EDINBURG - SCOTLAND
SCIENCE COMMUNICATORS

Time Machines is not just an exhibition, but offers a series of educational workshops , for preschools, elementary school and families to explore and discover together the wonders of the Cosmos. All educational and inclusive activities in the exhibition are carried out in collaboration with OAE - Italy.

https://macchinedeltempo.inaf.it/index.php/homepage/

EDINBURGH SCIENCE FESTIVAL

https://www.sciencefestival.co.uk/job-details/science-communicators-edinburgh-science-festival-2024

MAY - NOVEMBER 2024

NAPLES -CITTA' DELLA SCIENZA

CALL FOR PROPOSAL XXXVIII EDITION OF FUTURO REMOTO CO-SCIENZE

The XXXVIII edition of Futuro Remoto is entitled CO-SCIENCE.

True and false... Order and disorder... Right and wrong... Responsibility, awareness and activism need knowledge, ethics, consciousness, not of one, not of many, but of all. In recent years, Futuro Remoto has contributed significantly to bringing generations of students, young professionals and ordinary people closer to science and technological innovation. It started in Bagnoli in 1987 to involve Naples, Campania, neighboring regions and all of Italy. With its XXXVIII edition, Futuro Remoto wants to consolidate even more its relationship with the territory and communities and does so with a major event that will go on throughout 2024 and involve Campania with stops in Naples, Salerno, Benevento, Avellino and Caserta. The event will be inaugurated in October, in Città della Scienza, and will conclude in December with events throughout the region realized with the contribution and support of all the event's co-organizers and partners. Participate in the call for proposals to help build the program to be held at Science City from October 18-20!

DEADLINE: May 24, 2024

Below are the details of the calls:

- Call for Institutions, Research Organizations and Associations, IN PRESENCE

- Call for Institutions, Research Organizations and Associations, ONLINE

- Call for Educational Institutions, IN PRESENCE

The call will be open from February to mid-April. During this time it will be possible to submit the proposal via online form that will be posted on the Idis-City of Science Foundation website

www.cittadellascienza.it

THE COVER OF THE NEXT ISSUE

> However certain the facts of science may be, and however correct the ideas we have formed of such facts may be, we can only convey wrong impressions to others if we lack the words with which to express those ideas properly.

Antoine-Laurent de Lavoisier

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