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IO3 - Practical Guide for Schools. Quality Framework for Integrating ICT in the Teaching-Learning Process

O3/A4 - National Field Research. Italy

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The present report is part of the IO3 of the DECODE DEvelopCOmpetences in Digital Era. Expertise, best practices and teaching in the XXI century, an Erasmus+ KA2 - Strategic Partnerships in the field of Education.

The IO3 aims to elaborate "A Practical Guide for Schools - Quality Framework for Integrating ICT in the Teaching-Learning Process" and it is realized both on the bases of IO2 Italian National Report and on the I03 field research results. The IO3 includes the exploration of national education policy in terms of digital challenges, analysing through a qualitative approach based on document analysis and in-depth interviews with key actors, conducted on the bases of research tools prepared by IES partner to share methodology, tools and outputs.

It presents the Italian National Report realized for this phase and discussed during the 2nd Meeting and two skype conferences dedicated to the preparation of theoretical and methodological approach. This elaboration is preliminary to the preparation of the transnational report which will be elaborated by IES in a comparison perspective. In fact, National Reports aim to offer important information to define a proposal of Guidelines for Educational Institutions taking into account all emerging evidences identified by research leaded in country partners.

For this reason, according to shared planning, the Italian National report focuses on different level of analysis with the aim to understand legacies and opportunities at different levels.

1. INTRODUCTION

In coherence with project goals, the elaboration of the Italian National Report aims to offer important information to define a proposal of recommendation and attention points to inform the elaboration of Guidelines for Educational Institutions. Following methodological and operation instruction provided by IES, the Report aims to show the implementation process of digitalization in Italian schools, outlining the concrete and current needs and legacies as evidenced by key actors of this innovative process.

The report is articulated as follows:

- Opportunities and constraints at national level
- Opportunities for integrating ICT in the Curriculum
- Educational practices
- Exemplification of uses of relevant resources
- Recommendations for effective integration of ICT in teaching and learning processes
- Teaching training perspective.

In order to reach this goal, a qualitative research method has been used, based on documentary analysis and in-depth interviews. All the interviews[1] have been conducted between November and December 2017, involving eight persons, selected for their relevant role in educational institutions at different level (national, regional and local), in promoting digitalization in education system and practices. Interview excerpts are used to document and testify the evidences emerged; they are reported in quotation marks and numbered in progressive order of realization.

Date	Membershiporganization	Role
31.10.2017	Ministry of Education	Executive Director for Teachers Training Program
3.11.2017	Ministry of Education	School Leader, Minister's advisor, Executive director training teachers regional program
14.11.2017	Italian Association for Computer Science and Automatic Calculation	Teacher Training Project Manager

[1] We thank all the key actors interviewed for the availability and the valuable information contribution provided for the preparation of this Report, in alphabetical order: Agnese Addone (teacher innovator); Giovanni Biondi (President of INDIRE); Davide D'Amico (Executive Director); Salvatore Giuliano (School Leader); Gianfranco Marini (teacher innovator); Elisabetta Nanni (Researcher IPRASE Trento); EziaPalmeri (School Leader – MIUR); Carlo Tiberti (Teacher Training Project Manager).

07.11.2017	IPRASE - Trento	Researcher IPRASE Trento
13.11.2017 15.11.2017	Ministry of Education	N. 2 Teacher Innovators and digital trainers
06.12.2017	INDIRE (Innovation, Educative Research)	President
06.12.2017	Ministry of Education	School Leader

All interviewers have adopted the common instrument to ensure the comparison of all information at national and international level.

The Report is articulated in eight chapters.

The first one includes a brief synthesis of documentary analysis. In this chapter , 'Opportunities and constraints at national level regarding the ICT-based education', we explore briefly the current legal framework paying attention both to its coherence and relevance and to the assessment of the available national resources in terms of funding and support mechanisms. An analysis of the organisational structure (i.e. specific roles and responsibilities monitoring, assessment, planning, implementation) of actors at all levels concludes the chapter.

The second one, 'Further opportunities for integrating ICT in the Curriculum', presents the way in which digital technologies are integrated in the curriculum and how they are integrated in the educational practices with particular attention to best practices.

The third one summarizes further opportunities for integrating digital technologies in the Curriculum. It is oriented to present how digital resources can be integrated in the curriculum and what possibilities are there to enhance the ICT based education.

Chapter 4 focuses on best practices recognized at national level, such as: Genuine communication learning with ICT (language arts); Posing and Solving problems in the App-Era (Math); Virtual labs (Science & Technology); Digging far and beyond with several clicks (History, Geography, Literature and philosophy); Creating Minds, Creative Apps (Music, Visual Art, Performing Art etc); The Helping (Hand) connection (Counseling and Guidance) and so on. This recognition of good practices is shown particularly to support the promotion of a digital culture within the school, to promote positive contamination and to cultivate emerging communities of practice.

Chapter 5 offers an exemplification of uses of relevant resources for teaching and managerial purposes, indicating their value and how they are used.

Chapter 6 endeavours to extract useful recommendation and attention points to allow to IES the elaboration of 'Guidelines for effective integration of ICT in the teaching and learning processes' in comparative perspective on the bases of issue gathered through in-depth interviews, which focuses on:

- recommendation for national decision makers; school inspectors (county/regional level, school managers and leaders and teachers;
- initial and continuous teacher training system; a classification of the ICT profiles and skills of the educational staff;
- a recognition of official quality assurance and evaluation tools and procedures at national level.

Chapter seven focuses on teachers' training system for digital revolution also regarding ICT profiles and skills of educational staff; while chapter eight is dedicated to 'Official quality assurance and evaluation tools and procedures at national level'.

Brief conclusions (chapter nine) close the report summarising the main findings and setting for the integration of digital technologies in school.

Finally, the report provides an Annexes aimed to offer a Proposed National model for a School action plan, Tools for quality assurance and evaluation.

2. Opportunities and constraints at national level regarding the ICT-based education

2.1 A functional analysis of the current legal framework

It is particularly useful for purposes of this work, to provide a summary of the Italian regulatory and legal framework that constitute the background and context in which it is possible to understand the efforts made at national, regional and individual independent educational institutions to achieve an extension of the curriculum as a result of the introduction of ICTs.

The process is part of the more general digitalization process of the public administration, of which public schools are part, and is born of the requirements deriving from the European Digital Agenda of 19 May 2010, one of the initiatives of the Europe 2020 strategy to favour both innovation and a smart, sustainable, growth. The above initiative is followed by the launch (Art.47 Italian Decree-Law 5/2012 converted into Law 35/2012) of the Italian Digital Agenda, aimed at modernising relationships between the Public Administration, citizens and businesses.

In implementation of the above Agenda with Italian Decree Law 179/2012 converted into Law 221/2012, the national register of students was therefore introduced with regard to the school, with planned measures for eliminating digital divisions and for the dissemination of digital technologies at schools, also through the adoption of textbooks and digital school centres. From the MIUR (Italian Ministry of Education, University and Research) framework law 3/2013 and the Political Priority no. 8 *Modernisation of the school system*, various measures were implemented with the aim of fostering digital innovation in schools, to make the educational and training offer consistent with the digital evolution of other sectors of society.

With these investments and regulatory measures - designed to renew the organisation of the school system as a whole through the digitalisation of administrative and management processes - three further innovation drives were identified as strategicinvestimenti per : investments to fostering the connectivity of schools, to provide schools with appropriate technological tools (PCs, digital interactive whiteboards, tablets, ...) and to initiate a complex and extensive process of training staff to use modern teaching methods.

Regarding the first line of action, that of organisational innovation, we can trace a first phase in which the digitalisation of school secretariats has been encouraged, through the use of software for management activities (management of students, staff, financial and of assets) which exchanges data with SIDI / MIUR procedures and the creation of information flows in respect of MIUR or MEF or other bodies for the production of statistics (without interoperability or reciprocity of the information exchange). A second phase involved the use of tools for training, transmission and storage of administrative documentation (IT protocol, digital storage, digital signature, certified electronic mail).

The fundamental reference standard is the Italian Legislative Decree 82/2005 amended and supplemented by Italian Legislative Decree 235/2010 and then again by subsequent regulations, the last of which dates back to 11 December 2017[2], which constitutes the so-called Code of Digital Administration (CAD, from its Italian

[2]For the current text, it is useful to refer to the following link:

initials). With the above rule, the goal is to give a unitary and organic structure to the rights of citizens, legal institutions and duties of administration offices (therefore also of schools) in the field of digitalization. Furthermore, guidelines have been defined for the individual tools and legal institutions that characterise digitalization, allowing for training, transmission and storage of administrative documentation to be carried out electronically. In order to create a more citizen-friendly Public Administration (and therefore also schools), the government worked in order to promote the use of technologies due to effectiveness, efficiency and economy of administrative work, a greater internal efficiency and effectiveness of services rendered to users as well as to reorganise the management, administrative services and document flow on the four main axes of the information protocol, digital storage, digital signature, certified e-mail and, at the same time, the strategic lines related to the filing system, the employment system and related procedures have been defined.

The level of achievement of the goals set in the above measure is diversified nationally, but to a large extent satisfactory, judging by the results of the survey conducted by ANP and the Polytechnic of Milan (School of Management's Observatory and Government) whose outcomes were presented on 9 March 2017[3].

The drive for innovation in teaching methods is far more complex and belated. The role of technologies in teaching must be contextualised in relation to the current challenges of all educational systems: rethinking the quantity and the quality of the skills to be taught, rebalancing the relationship between theory and practice towards a didactics focused on skills, creating contexts and processes for personalized learning, taking into account the relationship between a cultural identity and universal nature of knowledge the globalisation process. Inevitably, this framework urgently requires to change the approaches to knowledge and the adoption of appropriate teaching methods.

Despite the commitments made so far (with particular regard to teacher training, which is the real strategic lever to trigger the change in teaching), the so-called "educational technologies" have not yet produced in Italian schools the innovative effect that they have exercised in other areas of social life and in other communicative contexts. To understand why it has spread patchily, it is important to reconstruct the historical stages that characterised training initiatives of Italian teachers with respect to the incorporation of ICT into teaching (see Table 1).

Table 1. Historical stages of training initiatives

Punto Edu 2001	Training of new hires (blended training, on-site and on-line)

http://www.normattiva.it/atto/caricaDettaglioAtto?atto.dataPubblicazioneGazzetta=2005-05-16&atto.codiceRedazionale=005G0104&queryString=%3FmeseProvvedimento%3D03%26formType%3Dricerca_semplice%26numeroArticolo%3D%26numeroProvvedimento%3D82%26testo%3D%26annoProvvedimento%3D2005%26giornoProvvedimento%3D07&currentPage=1)

[3]ttp://www.anp.it/filemanager/download/documenti/2017/2017marzo9_digitaleascuola/presentazione_polimi_processi_scolastici_def.pdf

ForTIC 2002 project	The first system training ▪ Route A - Basic skills (160,000 teachers involved) ▪ Route B - Figure of an advisor/lecturer (13,500 teachers involved) ▪ Route C - Professional figure for technological structures (4,500 teachers involved)
National Digital School Plan (PNSD, from its Italian initials) (2009-2010)	▪ Digital interactive whiteboard Project (LIM) - From the laboratory to the classroom ▪ Cl@ssi 2.0 Loans for hardware purchases ▪ Scuol@ 2.0 Funding for digitalization of a limited number of schools ▪ Digital Publishing
New National Digital School Plan (2015)	▪ Tools ▪ Access, Environments, Digital identities, Digital administration ▪ Teaching methodology for skills and creation of digital curricula ▪ Contents ▪ Training and mentoring ▪ Digital Team Leader, Digital Team (Action # 28) - System innovation

Important initiatives launched at the regional level have been added to the national initiatives, which define a real and true Digital Agenda of the Regions. The regional digital agendas currently available online are those of Ligury, Lombardy, Veneto, Tuscany Umbria, Emilia Romagna.

2.2 An assessment of the available national resources (funding/ support mechanisms)

Prior to the launch of the last National Digital School Plan, the situation of Italian schools was summarized by data of the MIUR 2015 Technological Observatory, according to which out of the 326,000 classrooms in the 33,000 schools, 70% were connected to the Internet through wired or wireless connections often sufficient for digital teaching; 41.9% of the classrooms were equipped with a digital interactive whiteboard, only 6.1% with an interactive projector; the number of laboratories was of 65,650, about 7.8 per institute, on average, 1 device was available for every 7.9 students. According to the 2015 MIUR findings, 99.3% of the schools have a website, 58.3% use online school-family means of communication, 69.2% use at least one type of electronic register, 73.6% % use the teacher's electronic register. The most alarming fact is that only 16.5% use forms of centralized LMS for teaching (Moodle, Edmodo, other ...).

A more detailed picture is given by the Indire research "Digital skills of students and teachers of the PON Regions" conducted in 2015, funded in the context of the ESF 2007-2013 "Skills for Development" Programme, involving 9,508 students and 7,732 teachers of academic institutes of every type and level of the Convergence Goal regions: Campania, Calabria, Puglia and Sicily. Collected data shows a high training need on the subject of digital skills: about 30% of the 173,000 teachers, of every type and level that trained under the PON, chose this area, within a very wide offer (Foreign languages 11%, Assessment 14%). The integration of digital tools and resources in daily practice is still partial: the highest percentages (about 65%) of frequent digital use in classrooms are connected to activities characterized by useful and informative nature, while lower percentages regard content creation activities (around 30%). Teachers who frequently use the potential of digital technology show a use mainly aimed at preparing lessons, scarce are the percentages (about 10%) of those who often perform activities that encourage students to use independent and conscious digital resources.

With Italian Ministerial Decree No. 851 of 27 October, 2015 the PNSD is adopted (http://www.istruzione.it/scuola_digitale/index.shtml) as envisaged by Italian Law 107/2015, which invests over € 1 billion over the 2015-2020 period for achieving the following goals:

- development of students' digital skills;
- strengthening of teaching and laboratory tools;
- adoption of organisational and technological tools to promote *governance*, transparency and data sharing;
- teacher training for educational innovation and digital culture development;
- training of administrative and technical staff for digital innovation in administration;
- strengthening of network infrastructures;
- enhancement of best national experiences;
- definition of the criteria for adopting educational texts in digital format and for disseminating educational materials produced by schools.

The implementation of the Plan is supported by various sources of funding: the funds allocated by law 107/2015, the funds provided by the 2014-2020 European PON programme "Per la scuola" ("Education") and other MIUR funds (see Fig. 1)

The implementation of the Plan, launched as early as autumn 2015, includes a set of 35 measures, many of which are managed through public funding notices for independent schools. This method, set up by the MIUR without a time schedule that was made known in advance to the recipients, has determined from the beginning management difficulties. Among the main issues reported are the excessive request to create more projects by schools, the lack of certainty of resources and consequent planning difficulties, the paralysing bureaucratic formalism (sometimes invasive of independence), the fragmented management of the resources to be invested, the high risk of poor efficacy.

Fig. 1. PNSD investment (Source PNSD MIUR)

	2015	2016	2017	2018	2019	2020	TOT
Buona Scuola Funds							
BuonaScuola Funds PNSD (National Digital School Plan)	90	30	30	30	30	30	**240**
Buona Scuola Funds –Training		10	10	10	10	10	**50**
Buona Scuola Funds –Changes (consequences)		10	10	10	10	10	**50**
PON "Per la Scuola" (Education) FESR 2014-2020							
Internalwiring (Wi-fi)	88.5 on the 2015-2017 three-yearperiod						**88,5**
Creative workshops for base skills	40 on the 2015-2017 three-year period						**40**
Digital laboratories for acquiring professional skills	140 on the 2015-2017 three-year period						**140**
Digital educationenvironments	140 on the 2015-2017 three-year period						**140**
On-line register (primary schools)	48 on the 2015-2017 three-year period						**48**
PON "Per la scuola" FESR 2014-2020							
Training		25	15	15	15	15	**85**
Skills		20	20	20	20	20	**100**
OTHER MIUR FUNDS							
Law 440/97	3	4	4	4	4	4	**23**
ICT Plan	15	15	15	15	15	15	**90**
TOT							**1094,5**

2.3 An analysis of the organisational structure of actors at all levels

The oversight of schools' digital innovation plan at a national level is entrusted to a special Management Unit for Digital Innovation, within the scope of the General Management for interventions in school buildings, for managing structural funds for education and digital innovation.. However, the management of the funding under the PON "Per la Scuola. Competenze e ambienti di apprendimento" (Education. Skills and learning environments) is instead headed by another Management Department of the General Management itself, that of the Planning and management of European and national Structural Funds for the development and social cohesion in the education sector. In addition to this, some lines of intervention, carried out within the more general 2016-2019 National Training Plan for teachers, required by Law 107/2015 and financed with an

investment of about 1.5 million Euro, are coordinated by the Management Unit for training school staff, training school managers and accrediting bodies under the General Management for school staff. The above complexity in respect of national governance does not favour the effectiveness and efficiency in the management of a Plan of broad and complex measures, which demands a system organised into independent educational institutions located in a wide territory and in diversified context conditions.

At the local level, at each Regional School Office, special offices have been set up for digital innovation and regional and provincial booths, based on locally identified models. Furthermore, in the individual schools a teacher was identified as a Digital Team Leader and a Digital Team composed of the Manager, the DSGA (the Head of General and Administrative Services), administrative and teaching staff, to support change processes (14 teachers for every school; it means more than 100.000 teachers engaged all over the country). Criticalities were highlighted during the first two years of implementation of the National Digital School Plan both with regard to the specific training envisaged for these roles at school level, and for the lack of incentives for the work that the responsibilities taken on entail. In general, furthermore, the lack of a serious monitoring plan of measures implemented and the lack of transparency on progressively achieved results, helped to weaken the various processes enabled. The only data currently available is that of a survey carried out between mid-July and late August 2017 by the MIUR's digital school Observatory which involved a total of 27,458 schools, of which 22,200 were of lower secondary schools and 5,258 of upper secondary schools. The above was a partial survey, which was not disseminated directly by the MIUR, but was made known only after a request for public access (required by national legislation) by the AGI press agency. The survey conveys the idea of schools in which digital skills progress extremely slowly despite national regulations and investments[4].

[4] Data can be traced to the following link:
https://www.agi.it/data-journalism/scuola_digitale_fedeli_piano_miur_foia-2313064/news/2017-11-02/

3. Further opportunities for integrating ICT in the Curriculum

In implementing the policies of the European Union, the integration of new technologies in schools as a key element of the Italian government agenda takes shape from the perspective of skills for digital citizenship. In this setting, measures tend to intervene in a systemic way, achieving full synergy with the Italian Digital Agenda that identifies the development of digital skills as one of the strategic axes of a policy for innovation for a "simple and transparent, sustainable, safe, aware and competitive country". The Agenda documents recall several times the importance acquired by skills and use of ICT in order to access services, participate in social, economic and political dynamics, exercise own rights and duties, have access to education paths, training and work. The observation that digital skills have become so decisive for all citizens to the point of determining a form of social exclusion as a result of the digital divide and to require a real extension of the concept of citizenship as "digital citizenship", obliges all EU countries to reinforce and redirect their actions. The Programme therefore highlights the need to intervene, among other, with regard to the adjustments required by the implementation of the PNSD, in strengthening students' key skills and in teacher's professional development. Digital skills and training needs of teachers, a vision that inspires the drive, are part of the goal of improving the capacity of the education and training system to guarantee quality services throughout the country.

The aim of the innovation - instrumental, educational, methodological - is combined with the basic principle of a school that is able to guarantee the full participation of all individuals in social processes, in the light of prevailing languages and the skills necessary to face the challenges of 21st century society. On the one hand, the need for "change", inspired by the need to adapt to the socio-cultural transformations taking place, on the other hand, attention to the actual characteristics of those born in a changing society, the so-called digital natives, accustomed to socialising with the environment through the new tools. The material content of institutions such as schools, families, markets and the State is different, in addition to the modelling role of activities and their daily practices. In fact, these provisions ensure, for example, that teachers choose to replace printouts with information and audiovisual technologies and that families encourage their children to use them. Given this transformation, in terms of social / communicative aspects and the production systems, our school system is required to rethink its aims, curricula and organisational, management and teaching methods. The motivations that have supported this global new reading by schools - both on its foundations and on its consolidated organisational and educational modalities - can be summarised in the points below:

- the pervasiveness of ICT in young people's everyday life ;
- the appeal that new technologies have for the younger generations;
- the contribution that schools are asked to make for overcoming the digital divide;
- new social and communication skills required in a society pervaded by ICT;
- new alphabets, languages, new skills.

ICTs also assume in the school an active part with regard to change as they allow to influence the academic setting, to transform the learning environment by redesigning space, reorganising time, modifying communications and socialisation processes. Skills and knowledge acquire new potential in terms of teaching and learning, in particular through the two concepts of "flexibility" and "networking", which open up to the new

possibilities of personalisation with respect to the different cognitive styles of learners and teachers, and to new relational and information opportunities through the network.

3.1 Digital skills in Italian school systems

In National Recommendations for Lower Secondary Schools (2012)

"Students, on completing lower secondary schools have good digital skills, use communication technologies to search and analyse data and information, to differentiate reliable information from that which needs to be reviewed, checked and verified and to interact with anyone worldwide".

In Guidelines of technical and vocational education (2008)

"Vocational technical schools are entrusted the task of making students acquire not only the skills necessary for the employment world and the professions, but also the ability to understand and apply the innovations that the development of science and technology continually produces. In order to become true "schools of innovation", technical institutes are called to make choices that are permanently oriented towards change and, at the same time, encourage attitudes towards self-learning, group work and continuous training.

In short, we need to appreciate the scientific method and technological knowledge, which accustom us to accuracy, intellectual honesty, freedom of thought, creativity and collaboration, as fundamental values for the construction of an open and democratic society. Values that, together with the inspiring principles of the Constitution, are the basis of a peaceful coexistence. In this context, aimed at achieving the skills required by the employment world and professions, the disciplines maintain their specificity and are aimed at making students acquire the learning outcomes indicated in the Regulations, but it is very important that teachers choose teaching methodologies which are consistent with the cultural approach of technical education that are capable of involving and motivating students to learn. Therefore, the use of inductive methods, participatory methodologies, and an extensive and widespread laboratory teaching, to be extended to the disciplines of the general education area with the use, in particular, of information and communications, of design activities and alternating school-work to develop the relationship with the region and its training resources within the company. The environment in which courses take place must increasingly take on the characteristics of a laboratory. It is a matter of promoting a laboratory teaching and learning methodology, under which the use of planned activities to be carried out in laboratories can be combined with greater benefits. For example, one can imagine a writing workshop in Italian, supported by the personal and / or collective use of digital technologies, in which one can also draw up reports on what has been explored in the sciences or technologies, as well as comments on their own readings; a laboratory for the introduction and application of mathematical concepts and procedures, through the solution of problems also inspired by the parallel study of science or technology."

In National Guidelines for Upper Secondary Schools (2008)

The Profile primarily calls into question *"the competition and the full assessment of all aspects of school work: the study of the disciplines from a systematic, historical and critical perspective; the practice of methods of*

investigation typical of the various disciplinary fields; the reading, analysis, translation of literary, philosophical, historical, scientific, essay texts and interpretation of works of art; the constant use of the laboratory for teaching scientific disciplines; the practice of argumentation and comparison; the care of a correct, relevant, effective and personal written and oral exposition method; the use of multimedia tools to support study and research".

The Profile also indicates the learning outcomes common to secondary school education, divided into the five methodological areas; logical-argument; linguistics and communication; historical-humanistic; scientific, mathematical and technological. With regard to the latter it is reiterated that upper secondary school students must be able to critically use IT and digital tools in study and research activities; understand the methodological value of information technology in the formalisation and modelling of complex processes and in the identification of decisive procedures. The acquisition of digital skills, as emphasised by the Profile, is certainly a topic that evolves during the first two years of each course within the Mathematics discipline. But it is, at the same time, the result of "field" work in all disciplines. The use of ICT, in fact, is instrumental to the improvement of work in the classroom and as a support to the study, verification, research, recovery and personal insights of students.

Stimuli in respect of which it would be useful to take measures to increase the use of technology in Schools

1. Improve the perception of self-efficacy by teachers with regard to their own professional and digital skills.
2. Use of technology for educational purposes. It might be useful to invest in training courses aimed at improving the specific technological skills of the teachers of the various school orders.
3. Compared to the technological equipment and connectivity of schools, it is not enough to invest in equipment. It is necessary to respond to real needs of the context and to accompany investments with training activities for teachers so as to take real advantage of the acquired equipment.
4. When it comes to using ICT, we need to distinguish between the simple use of digital content and the creative use of digital tools. Training and dissemination of good practices could be useful to increase a more active and creative use of ICT.
5. Compared to online educational activities of a social type, it is necessary to increase the use, both with regard to exchange with colleagues, as with regard to student's skills in working collaboratively in the network. The implementation of digital platforms within educational institutions could be a favourable element.
6. Expanding the development of collaborative networks with ICT (e-twinning, for example); national good practices indicate the effectiveness in the development of communication and technological skills both for teachers and for students.

4. How is ICT integrated in the educational practices

4.1 Introduction

The process of integrating ICT into Italian schools has been going on for decades, with gradual incorporations that have not led to effective and full incorporation. The only *structural* project for the digitalization of the school was the Digital School National Plan (PNSD) launched in 2015 as a fundamental pillar of Law 107, built on the idea that technologies alone are not sufficient for the educational innovation and the transformation of processes.

The Digital School National Plan promoted by the Italian government in 2015 had in fact among its objectives the systematization of an overall innovation strategy of the school and the proposal of "a new positioning of its educational system in the digital age"[5]. The PNSD refers to daily practices to support the development of citizenship skills and for the life of students, and to the figures of the Headmaster and the Administrative Director seen not as mere executors of administrative procedures but as protagonists of the "digital school". The protagonists are flanked by a new figure, the Digital Animator, whose role has been conceived and defined as enabling.

PNSD is one of the most significant and structured institutional initiatives regarding school innovation in Italy. Technology is hereby considered as an enabling environment, more than a determining force. The ministerial document refers to the aims of the educational system as a whole: “students’ competencies, learning and results, their impact as individuals, citizens and professionals in the society” (p. 8). One of the most important actions of PNSD in this regard is action #14, which is dedicated to the definition of a common framework for students’ digital competencies and media literacy (p. 71). The focus is on skills, therefore on the educational paths and pedagogical models: technology is correctly described as a learning environment “to support all dimensions of transversal skills (cognitive, operative, relational, metacognitive)” (p. 71).The social, economic and informative changes of recent years are recalled in order to underline the need of “digital citizenship” skills, essential for living present and future times. The efforts of the European Commission’s working groups on digital skills are recognized: the document mentions the DigComp European Framework, dedicated to the identification of key competences to be promoted, consolidated, validated and certified.

The application of the Plan has been characterized by strong problems from the beginning. The training was articulated on a regional scale and sometimes in radically different ways. In some regions the leader schools (the ones responsible for the training) have followed a strictly disciplinary approach, built on single modules related to the many areas of PNSD[6] (coding, broadband, security and ICT, Byod, etc.); in other regions, the leader schools have promoted an approach oriented to the development of meta-competences and soft skills necessary for the new system figures identified by the Plan. In some regions, the initial training for AD (“AnimatoreDigitale”) has been coordinated by a single leader school, in other regions the leading schools

[5] Cfr. http://bit.ly/2eJ14sK
[6] Cfr. http://schoolkit.istruzione.it/materiali-e-pnsd/

were more than one. Depending on the place and the choices made, the results obtained have been very different both in terms of satisfaction of the subjects involved and in terms of impact on the educational and organizational practices of the schools.

In Italy, there are about 42 thousand schools (or complex: many times there are more schools in the same complex) organized in a non-simple system: about 8300 institutions divided between I and II cycle. In the first cycle there are "comprehensive schools" (which include at least three schools from those of infancy to middle school, and often many more, under the management of a single manager). The second cycle corresponds to the "higher institutes" (usually with a manager for each school, but following the unification of the last few years, there are also institutions where more than one school is run by a single manager). The 5500 comprehensive schools bring together the entire compulsory school path while the higher ones are around 2700.

Following the request for data access through the Freedom of Information Act (FOIA), in the fall of 2017 official data on the monitoring of the National Digital School Plan were released by MIUR (through the Digital School Observatory). This is interesting information and yet without the fundamental data: even where the equipped areas and facilities are listed, there are no indications on actual uses and tested applications.

However, some useful information emerges from the released data. In Italy there are more than 8,000 Digital Animators (AD). The PNSD (2015) provided that each school receive 1000 euros a year to support the commitment of digital animators: in October 2017 the money has not yet reached the schools (the first tranche, which was to arrive in March 2016, was sent in payment between October and November 2017). Digital animators have operated without additional resources available. There is no official data on the real work of digital animators and their actions in schools.

Not all schools are connected to the Internet. Broadband comes only in a few thousand complexes across the peninsula. The data show that optic fiber reaches an average of 13% of the plexuses, with the prevalence of high schools over those of the first cycle, and with very marked regional differences (for example, Emilia Romagna with 35% of the plexuses). Most schools are connected with ADSL, with very different speeds but with a prevalence of connections below 10Mbps. The connection fee is inhomogeneous, with most schools paying around 3,000 euros a year and some schools paying 10,000 a year. In many cases the school is connected but Internet does not reach the classrooms because there is no money to stipulate a contract and make the last step.

The data shows that most schools seem to have a connectivity dedicated to digital didactics, with very marked regional differences, but there are no data on the actual availability of equipped digital classrooms and on the internal connectivity (LAN, WLAN) of educational spaces. Confirmations to the digital divide that characterizes large portions of the territory are also present in the “Ultra Wide Band Italian Strategy” Report.[7]

[7] Consiglio dei Ministri, 2015: http://www.governo.it/sites/governo.it/files/strategia_banda_ultralarga.pdf

About half of the institutes have at least one connected laboratory, but the data show that high schools are the most lacking in terms of structures. In the regions of Southern Italy, several didactic experimentation paths were activated through BYOD (probably due to the scarce investments in digital instrumentation) and activities related to the development of computational thinking.

According to data from MIUR, about half of the institutes have activated the electronic register of the online teacher (introduced in 2012), a public document and an instrument with which the school communicates to the outside world, in particular with students' families. More than 60% of schools still communicate with paper based media and around 18% use social media for communications. There is no data on how these channels are used[8].

4.2 Innovation pathways

The research team used two main sources in order to analyze relevant didactic resources and innovative projects for ICT integration in schools.

The first one is the first Didacta Italia Fair, during which innovative projects and experiences in digital field were presented. The second one is the official website of INDIRE, the National Institute for Documentation, Innovation and Educational Research.

In September 2017, the first edition of Didacta Italia Fair[9] took place in Florence: it was one of the most important exhibition on the world of the school. Didacta International has been organized in Germany for over 50 years. The Fair was founded with the aim to encourage the debate on the world of education among institutions, associations and entrepreneurs, to create a meeting place between schools and companies in the sector of New Technologies and their role and use in learning and education processes.

Didacta Italia Fiera was developed on two levels: an exhibition activity, which involved the long chain of companies working in the world of education and training, and an activity dedicated to events, such as conferences and seminars - ranging from the technological area to the scientific and humanistic -, to the learning space.

INDIRE is the Italian Ministry of Education's oldest research organisation. Since its foundation in 1925, the Institute has worked closely with the Italian school system, investing in training and innovation while supporting improvement processes in schools. For the research, the work of the Innovation Research Area is particularly interesting. It concentrates specifically on analysing "structural" innovations in the educational model that are affecting educational systems worldwide.

In this paragraph, recent most interesting innovative projects are presented.

[8] For a more detailed analysis of the technological equipment of the schools, please refer to Capogna 2014.
[9] Link to the website: http://fieradidacta.indire.it/

a. Genuine communication learning with ICT (Language Arts)

COMPITA. Le competenze linguistiche in italiano / Linguisticcompetences in Italian

Compìta is a pilot project, aimed at promoting the teaching innovation of Italian language and literature in the second two-year period and in the last year of high school. It is supported by a protocol of MIUR, General Directorate for School Ordinances, with the University of Bari as leader, who involved in a three-year experimentation ten other universities and forty-five high schools (high schools, technical institutes and professional institutes), selected throughout the national territory.

Compìta has proposed a language and - above all - an Italian literature teaching model, which looks at the didactic competence-based approach as a necessity, also in the field of humanistic disciplines and which therefore aims to develop competences in Italian - hence the title of the project: Comp-Ita, or the competences of Italian.

To encourage students to the reappropriation of the text - thanks to a process of understanding, analysis, interpretation of the literary work -, cooperation between teacher and student becomes a strategic factor in the linguistic-literary teaching-learning process; a laboratory teaching and an action-research approach require this cooperation. It is also a primary objective of an adequate training of literature teachers.

It is possible to download several didactic supporting material for teachers, papers; events, meeting and conferences are organised to promote the project and there is a specific blog.

The project continues to be implemented and experimented by disseminating results and proposals in all Italian schools that wish to join.

Link to the project website: http://www.compita.it/

b. Posing and Solving problems in the App-Era (Math)

The computer based laboratory - **Real Time Technologies Laboratory (RTL) or MBL Microcomputer Based Laboratory** is among the most significant applications of the didactic uses of New Technologies. Calculator is used as a powerful measuring device, able to collect and analyze experimental data.

The components of MBL are: an hardware (computer, interface and sensors), a software (management programs) and a courseware (teacher guide, student didactic cards).

Measurements are acquired in real time, without significant delay with respect to the implementation of the experiment; they are called “briefly online” and are the result of the interaction between the sensor and experimental environment, data acquisition and organization (interface, computer), according to the scheme:

DATA COLLECTION / TRANSDUCTION ⇒ PROCESSING ⇒ REPRESENTATION

The MBL offers a connection and integration tool between two traditional moments in the teaching of physics: the first one, which is based on lessons and exercises, aimed at conceptualization, formalization, to the

schematization of different and more or less complex phenomena; the second one, which is based on laboratory activities, typically aimed at bridging the gap between theory and experiment and at encourage attitudes of exploration and discovery.

The potential educational uses of these tools are in the possibility to change the learning environment, which is realizes in class moving the center of the educational action from education to the direct construction of knowledge by student.

The role of the teacher is modified: the control of formulated by the student hypotheses can be done by the student himself and by the class, through the analysis of experimental data concerning the analysed phenomenon.

The MBL (Microcomputer Based Laboratory) experiments can significantly enrich the activities of the science laboratory.

c. Virtual labs (Science & Technology)

In accord with how much underlined in report EURIDYCE 2011 "Science Education in Europe"[10], the decline of interest of the young people in the sciences, particularly in the Physics, it is partly due to the representation of the disciplines as a series of facts decontextualized distant from the experience of daily life.

USA in IT-aly

Digital resource for didactic about science and virtual laboratory with the approach of David Perkins and Howard Gardner with the Harvard group of "Project Zero": "Learning is to consequence of thinking" is an opportunity for Italian school as the "Didacta Italia" fair proposed to a large public (over 4000 teachers) in 2017. It search and it explores the human potential and particularly the nature of the thought, the creativeness, the intelligence and the learning. To learn needs to practice the thought in all of his/her declinations: critical, creative, problem-solver, reflexive and decisional. But as it is possible to stimulate and to valorize the thought in the boys, so that from "consumers of contents" becomes solvers of problems and producers of information and knowledge? The Thinking Routines, resulted of an approach experimented with the "Project Zero", they help to encourage in class a culture of the exploration and the construction of the thought and introduces him as you orchestrate didactic very simple, practical to use in class and transversals to all the disciplines, proper for to make the students able to employ their knowledges and competences in different circles to face complex problem list and to find innovative and creative solutions.

Also from USA (University of Colorado): the PhET Interactive Simulationa platform with a database of math and science virtual experiment founded in 2002 by the Nobel Prize Carl Wieman. The platform is in Italian and can be used free.

[10] http://eacea.ec.europa.eu/education/eurydice/documents/thematic_reports/133EN_HI.pdf

IT-aly project: free platform

We can mention the national project **LSOSAlab** developed by UniRoma3 Department of Sciencemake a support for traditional laboratory activity with a pack of ready to play experiment in many branches of science with application of P&PBL (Project & Problem-based Learning) methodology. Student are driven to develop observation and interpretation skill, experimental experience (very rare in Italian high school) and also learn and being skilled to use of applet also for virtual laboratory with an interdisciplinary point of view.

Another project of IT applicated to learning is the platform developed by University of Turin for the Ministry of Education: **PPS platform**. Learning result more efficient if obtained by learning by doing: **PP&S** (Problem Posing & Solving) enhance developing of competencies and is promoted by the Office for the Scholastic Autonomy (DirezioneGenerale per gliOrdinamentiScolastici e per l'AutonomiaScolastica) for the innovation of didactic of Mathematics and IT : e-learning platform, distance learning, the goal is improve the learning community of teachers and students.

Some useful APP for personal study are:

Fisica a Scuola - LITE (Physics at school): Better for tablet but useful for personal and classroom study this App run many animation to explain physics law and practical example:

https://play.google.com/store/apps/details?id=air.cz.moravia.vascak.physicsatschool&hl=it

Skyorb (Astronomical geography) a virtual observatory useful for study of astronomical geography: https://play.google.com/store/apps/details?id=com.realtechvr.skyorb

d. Digging far and beyond with several clicks (History, Geography, literature, philosophy)

As it regards the historical and geographical studies, a crowd of sites and app that can give a support in the study exists, how much in the didactics. The subjects in matter well they are lent for the frequent use of maps and chronologies. Here a brief list:

A resource for distant learning. Here a free list of video lesson and exercise for high school and university totally in *Creative Commons 2.5*: http://www.oilproject.org/

One useful APP for personal study of history: **DEA - SSF Storia**

And for geography: AtlanteMondiale (**Mondial Atlas**):

In respect to the "*Wikipedia generation*" we have also included the official **App**: Wikipedia Mobile.

e. Creating Minds – Creative Apps (Music, Visual Art, Performing Arts)

The projects of the National Committee for practical learning of music[11]

In 2006, the National Committee for practical learning of music was established by the Minister of Education, with the task of drafting new guidelines for the practical learning of music by all Italian students, in line with the guidance provided by European Union.

Immediately, it has been engaged in solicitations and proposals for the great goal of musical practice for all. An unprecedented goal in the school and in Italian culture.

It has been busy because practiced art could enter in the school, so that everyone could learn to play and sing and so understand and enjoy music, the most natural expression of every human being.

Some of the national projects, promoted and coordinated by the Committee, are:

- **"Music is school"**: a research and activity project for the dissemination of the practical learning of music at school (http://www.musicaescuola.it/);
- **"Music at school"**: a project set to promote, select, organise and introduce the best practices in the didactic of music in the first and in the second cycle of education, through a web platform and an integrated electronic archive. The project is addressed to teachers at all levels of education, who have the possibility to insert contents, participate in the discussions and compare their work with colleagues. It involves the development of 3 general areas: documentation of best practices related to the didactics of music; community and contents delivery by the Ministry of Education, University and Research and Indire (http://www.indire.it/progetto/musica-a-scuola/).

In 2017, the **National Archaeological Museum of Naples - MANN** Museo Archeologico Nazionale di Napoli - have launched a video-game, which has been a great international success.

"Father and Son" is the first videogame entirely produced by Mann and it can be downloaded for free on smartphones and tablets, both iOS and Android.

It is a graphic adventure, a story to crossroads to play, to discover the National Archaeological Museum of Naples.

The contents of the videogame are developed by the Association “Tuo Museo” (Your Museum) and agreed with the director of the MANN Paolo Giulierini, from an idea of Prof. Ludovico Solima.

The video-game is available in several languages (including Chinese, Russian and, soon, the Neapolitan); it tells the vicissitudes of Michael, a young man who flies to Naples to solve the mystery of a letter left to him by his father, archaeologist at Mann.

[11] http://archivio.pubblica.istruzione.it/comitato_musica_new/index.shtml

The graphic is all horizontal scrolling and it was hand drawn by the artist Sean Wenham, who has rebuilt about three kilometers of Neapolitan roads, on the bases of hundreds of photos taken in historic streets and buildings. This is also for the rooms of the ex PalazzodegliStudi, where Giulierini appears among the several characters.

The plot dynamics leads the player to identity with more historical periods: within the present, the ancient Rome and Egypt, the 79 after Christ (year of the eruption of Vesuvius, which destroyed Pompeii and Herculaneum) and the Bourbon kingdom.

Exploring streets of Naples and the halls of the museum, the player meets ten different characters and runs into stories that cross different ages, but which present constant references to current life. In 2018, the release of a second chapter is expected.

Link to the website: http://www.fatherandsongame.com/

f. The Helping (Hand) / connection (Counseling and Guidance)

IO SCELGO STUDIO - Il portaledell'orientamento al secondo grado e al post diploma (i choose study - The guidance portal for the high school and the post-diploma) is a Ministry of Education guidance platform in which the different choice possibilities after diploma are presented. It describes in detail the various pathways: licei, the technical high schools, the professional and vocational training institutes and the IeFPIstruzione e FormazioneProfessionale / Education and Vocational Training. A lots of cards presents the different single study addresses.

The portal has been promoted with the aim of providing students with the necessary information to consciously choose, and with the help of their family, the school and the type of study address closest to their potential, ambitions and expectations.

Link to the portal: http://www.orientamentoistruzione.it/

PLAN YOUR FUTURE. It is a school guidance project, which aims at helping guys and girls to face up to choices of high school and of post-diploma and teachers and experts to give answers on guidances themes.

The projects involves four Italian Provinces, Verona, Belluno, Vicenza and Lodi; different partners are promoters, they came from the public, economic and association sectors. More than 12000 boys and girls and more than 80 schools are enrolled, more than 600 classroom meetings have taken place.

In the platform, several supporting material is published: more than 110 video-interviews to persons who have travelled for work and there is the possibility to directly communicate with them; more than 40 informative infographics on different themes, like to decide university, to better understand the world of work, to find a job and to go abroad. 9 didactic cards for teachers are presented; they are downloadable and useful for guidance classroom activities. Finally, 20 good practices are described.

Link to the platform: http://www.planyourfuture.eu/

NEXT is an information interface for those looking for guidance answers, both in school and in professional field; it is available according to different access keys: by target (student, unemployed, parent), type of service or Municipality of the Mantuan territory in which to identify the service.

It is a digital platform, created to collect and summarize contents and guidance actions mapped by the Mantuan territorial actors, who have joined the "Territorial Action Plan for the Lifelong Guidance".

The initiative involves several promoters and partners: Mantua Province, Lombardy Region, Provincial Employment Centers, Commerce Chamber, Territorial Scholastic Office, University of Mantua, Provincial Adult Education Center of Mantua and other different associations.

Students or citizens, who are looking for guidance answers, can find on the NEXT portal a mapping of the guidance services, organised by:

- FIRST INFORMATION: information space, guidance events organization, guided tours and first guidance interview;
- CONSULTANCY: personal and professional career planning, bilan des compétences, support in the active research of a job and in the training path choice, individual and group counseling activities;
- ACCOMPANYING AND TUTORING - Accompaniment in the passages between training courses, in the passages between training courses and the world of work or in the shift between different work experiences, accompaniment in the phase of job loss, intermediation for job placement, connection with the volunteers for social activities, stage.

The platform includes a special EVENTS section, in which the user can access to be aware of educational and professional guidance initiatives in the Mantua area.

Link to the platform: http://next.formazionemantova.it/

MyOurJob is an Italian portal for professional guidance[12]. It was created with the aim of providing young students (but not only) with an information system for guidance and the choice of professions and careers; it is constantly updated on the bases of needs and on trends of enterprises and the world of work.

The initiative is promoted by an Employment Agency, OrientaSpA: it intends to contribute to heal the technical, educational and practical rift, which still split young people from the world of work, offering them a guidance towards professions and crafts which offer concrete opportunities of employment.

The platform offers a big data base of videos, which presents different vocational figures. It presents all the different 26 Italian economic sectors and their professions. For each of these last ones textual cards are presented, and they describe contents, education and training iter, technical and transversal competences

[12] The service costs 20 Euros per year.

requested. Two propaedeutic tests are included: they concern the discovery of the interest of the young for some aspects of the world of work and the real interest towards it and the different typologies of professions.

Link to the platform: www.myourjob.it

4.3 Beyond a disciplinary approach

The adoption of new educational technologies, new devices, new communication tools allows to go beyond a disciplinary didactic approach. It promotes new opportunities to work together with a multidisciplinary approach. This is possible thanks to the use of different applications, simple softwares and web environments.

There are several national projects which promote researches and, at the same time offer digital quality environments and resources, trying to develop a research and a collaborative approach among teachers.

FIDENIA https://www.fidenia.com/

SOCIAL CLASSROOM http://www.socialclassroom.it/

E-learning and collaborative environments in the Cloud

Increasingly, teachers and students give life to lessons with a workshop approach, using cloud environments, where everyone becomes the main character of content creation, working in sharing, in collaboration and cooperation, communicating and organizing contents. For example, Google Drive is a set of web tools more and more often used from teachers and students.

Didactical platform for e-learning

Numerous bases exist, also in Italian language, for what concerns the distance learning and the virtual classroom. On top of the priorities elaborated by some of them there is an immediate relationship between parents and teachers through the base, and then didactical tools. For example the italian platform ***Fidenia*** has the possibility to create in free way a virtual environment for the teacher and the members of his/her class and a guided procedure for: test, ebook, sharing resource (audio file, photo, pdf) in a folder of singular class. **Teacher** licence is *free*, without other functionality, but exist a *Premium* version for **school**: virtual classroom, message board for teachers and parents, archive, calendar, advanced version of test and ebook editor, access to tools of Centro Studi Erickson for diagnosis of dislexia and for compilation of plan for special need in education (Pei and PDP).

Similar to Fidenia is ***Social Classroom***, another italian social learning environment based on flipped classroom technology. Also for Social Classroom there is a free licence for teacher and a premium one for school (about 10 Euro for student) or a *sponserized*licence (now only in some provinces of North Italy). Social Classroom also provide for video lessons and wiki for collaborative projects of students and teachers.

Virtual and augmented reality, immersive environments to enhance learning

The new "immersive" technologies - those that fade the boundary between physical reality and virtual reality - are more and more often used also in the educational field, with the perspective of giving life to learning experiences that until today were unimaginable. Recently, the use of some digital environments has been developed, to test their teaching potentials and their possible application in the scholastic context. For example, with TES TEACH (https://www.tes.com/lessons) it is possible to create lessons in few minutes.

From the "Maker movement" to Maker@Scuola. A project of INDIRE

Maker@School[13] is an INDIRE research project launched in 2014. The project monitors, also beyond national borders, the most interesting educational activities related to the "Maker movement". The "Makers" are "Digital artisans", that is, creators, authors and artists that design and self-produce out of passion mechanical appliances, electronic equipment and open source software, in their laboratories called "Maker spaces" and "FabLabs".

The project Maker@School analyses the specific characteristics of the educational model proposed by the "Maker movement" and its application in teaching laboratories. The research aims to investigate the possible interactions between the working methods of the "2.0 artisans" and students' current learning schemes. The aim is to verify if the innovative tools and the new educational methods, applied in the class, can help transcend the traditional lecture-based educational model, and foster the creation of modern teaching tools that can encourage students to use a more participative approach.

Including "Maker activities" in the educational curriculum can enhance logical-mathematical, scientific and linguistic competencies, and especially meta-competencies and soft skills. This working method can encourage in the students a more participative and engaging approach.

In 2016, the first research activities carried out in the framework of the project "Maker@school", "Building toys with 3D printers" and "3DPrimary school" were concluded. The results were collected in the publication "Maker@school- 3D printers at infant school" complying the work of some of the infant school teachers who included this innovative activity in the educational curriculum.

The online environment 3D Indire was created as part of the research. It includes a variety of tools for the modelling and optimisation of the printing process and an area to share models and experiences. In this online environment there are useful tools for the configuration and use of 3D printing programmes in the class, such as In3Dire, a dedicated server and SugarCAD, a free software for 3D modelling optimised for schools.

In 2017, a new project started: "The hydroponic greenhouse at school – a new way to observe and study a natural phenomenon". The project aims to support scientific educational pathways at infant and primary school through observation, experimentation and modelling of the phenomenon which has been observed. The method was inspired by the famous Bifocal Model of Stanford University, with which Indire collaborates.

[13] http://www.indire.it/en/progetto/maker-at-school/

During the school year 2017/18, the research on the use of 3D printers will continue, involving more schools: the schools will become more than one hundred, including primary and infants' schools.

Robotics at school

The research project **"Coding@School"** is promoted by INDIRE. It investigates whether and how Coding can support teaching methods in which students play a leading role in creating knowledge, and if, and to what extent, there could be room for Coding even within non-scientific subjects. Coding is not a discipline in itself, which can be inserted sporadically throughout the school year, detached from the various curricula, but a set of methods that can be used along with different subjects (and in different types of schools).

The research project is based on Computational Thinking, which represents its soundest and most fruitful academic reference and is part of a field of studies, ranging from theoretical informatics to pedagogy. Coding@School will be investigating two aspects in particular: the use of formalised languages and anything belonging to "algorithmic thinking" and the problem solving approach. Computational thinking is defined as a structured form of thought to resolve problems. The analysis and structuring of a problem are fundamental logical steps, before formalising the procedures that any performer (whether machine or human) must follow to resolve a problem.

Another sphere of interest, apart from the purely scholastic one, is that of operators in the field, such as training agencies outside schools that offer youngsters the chance to try out coding as well as getting to know the basics of computational thinking. These agencies allow youngsters a freedom of learning that is difficult to find in schools.

ImparaDigitale (LearnDigital): competence-based design with Curriculum Mapping

The Study CenterImparaDigitale is an association founded in March 2012 to promote the development of an innovative teaching method, which allows the Italian and European schools to benefit significantly from the potential offered by the introduction of digital technology.

ImparaDigitale offers a "Curriculum Mapping" platform, or mapping of study courses, as an essential tool to facilitate sharing of programs between teachers of the same discipline and between schools of the same educational network; their supervision by didactic coordinators; an orderly and integrated use of digital didactic contents by students. Mapping the curriculum means making the scholastic curriculum and its components intelligible, shareable and transparent. With the curriculum mapping it is possible to see in a synoptic way the fundamental educational values of the school, the reference skills, their application in different cultural axes and levels or degrees school, the annual planning for each year and school cycle and the structure of the units training programs. The idea is that by planning the curriculum on a single platform rather than in different and non-mappable ways, some very important aims are achieved in education for the 21st century. They can be: sharing objectives and programs between teachers from the same school or groups of schools; make digital teaching content accessible to teachers and students; monitor, update and adapt the disciplinary planning in real time; allow supervision of the curriculum by the teaching coordinators.

DigCompOrg (European Framework for Digitally Competent Educational Organisations). SELFIE in Italy

In Italy, the Istituto per le TecnologieDidattiche of CNR of Genoa coordinates the locationing and the experimentation of the online tool SELFIE, in the framework of DIGCOMPORG, in collaboration with INDIRE and the European Commission - Joint Research Centre.

The European Reference Framework of Digitally Competent Educational Organisation (DigCompOrg) is an initiative of the European Commission, Directorate General for Education and Culture (DG EAC). Research, design and piloting of the Framework is carried out by the European Commission's Joint Research Centre Directorate B: Innovation & Growth, Human Capital and Employment Unit (JRC Seville).

DigCompOrg aims to support integration and effective use of digital technologies in education settings. So far, DigCompOrg is a generic framework for all educational organisations, from primary schools up to higher education institutions. In order to move from a theoretical framework for all sectors to an evidence-based framework relevant to schools, DigCompOrg school pilots' initiatives have recently been launched by the JRC Seville in four Member States (Denmark, Estonia, Italy and Spain). DigCompOrg School Pilot in Italy aims to provide meaningful adaptations to the Italian educational context of DigCompOrg. The ultimate goal is to contribute to develop a consolidated DigCompOrg standardised question set (SELFIE) that schools can use to self-reflect as organisations.

The method to translate and adapt the generic DigCompOrg conceptual framework to the Italian education context will involve a three-stage approach focusing on general language (step 1); key concepts and terminology (step 2); and on clarity, coherence, contextual relevance, and ease of use (step 3). The translation and localisation process will involve high-profile Italian experts, as well as a sample group of school practitioners (school leaders, teachers and students). Through a User Consultation Survey (DigCompOrg UCS), users' inputs on the DigCompOrg framework descriptors will be collected to ensure they make sense for school leaders, teachers and students of primary, secondary and IVET schools in Italy. The pilot project in Italy will also contribute towards adaptation of the DigCompOrg SELFIE (i.e. a self-assessment tools for schools) to the Italian context, allowing schools to self-reflect as organizations, track their progress in integrating technologies for learning over time, compare themselves with others, identify strong points and areas for improvement, and finally, raise their digital maturity level.

The pilot project in Italy will involve 21 Italian schools (equally representing primary level, lower and upper secondary level, and initial vocational education), engaging about 1,470 students, 420 teachers and 17 school leaders. Schools involved in the pilot will be selected from three regions: Emilia Romagna (North), Tuscany (Centre) and Puglia (South).

Expected results are: translated and adapted version of DigCompOrg framework (UCS) and self-assessment tool (SELFIE) to the Italian context and language; UCS and SELFIE DigCompOrg pilots in 21 Italian schools in compulsory education; exploratory findings from four case studies in selected schools in Italy; a final report synthesizing main findings from SELFIE DigCompOrg pilots in Italy.

SELFIE[14] is developed by the JRC in collaboration with the Directorate General for Education, Youth, Sport and Culture (DG EAC). SELFIE is the self-assessment tool for digitally capable schools. It is a sound, reliable and validated self-assessment tool to help schools' progress towards digital age learning.

It is based on the Digitally-Competent Educational Organisations (DigCompOrg) conceptual framework that offers a fine-grained description of what it takes to educational organisations of any kind to be digitally competent.

SELFIE supports European schools who want to reflect on their take up of digital technologies for better learning outcomes. It will be piloted in a number of European countries. The idea is that, every year, schools reflect on their current take up of digital technologies for innovative and effective learning by taking a snapshot of where they stand and then reflect and decide how they want to improve for the next year.

SELFIE is going to be an evidence-based tool, bringing together theory and practice.

SELFIE team has developed the prototype SELFIE tool in English, based on DigCompOrg conceptual model and a user consultation survey, where more than 5000 school leaders, teachers and students from 5 EU countries provided their input about the tool. The prototype tool has been developed in English and translated/adapted in 11 more languages. The pilot implementation was in 2017. The consolidated SELFIE tool for schools is expected to be ready early 2018.

Innovative Design of School Educational Processes

The project "Innovative Design of School Educational Processes" ispromoted by ANP - Associazione Nazionale Dirigenti e Alte Professionalità della Scuola and FTI - Fondazione Telecom Italia. It aims to respond to an urgent training demand, which is currently expressed by the teaching staff, related to methodological and didactic innovation; necessary training to increase the effectiveness of teaching and learning processes, to promote the high skills development of students, to enhance individual talents and encourage training success, using technologies. To propose an answer to this demand, a collaborative environment was created for all Italian teachers, in which creating a peer-based approach for teaching and learning, thanks to a shared and visible pathway in each phase. The interesting idea of the project is to work like in a “see-through kitchen”: through the platform it will be possible to observe all the design and implementation phases of new teaching models and new didactic supporting material; it will be also possible to participate to the development of new ways for information and knowledge sharing.

http://www.innovazioneinclasse.it/

4.4 Final consideration

In Italy there are many interesting innovative projects, but not in a homogeneously spread throughout the whole national territory.

[14] https://ec.europa.eu/jrc/en/digcomporg/selfie-tool

This characteristic of our context do not permit to create an integrated system. A lot of good practices and useful innovative tools or platforms are available, but they are often hidden on the web.

The availability of numerous apps and virtual platform certifies that there is a cultural movement - even in Italy - that affects both companies that offer services and innovative teachers and schools, but these realities exist and work without being able to create shared standards.

This suggests it would be crucial to create, for example, a public database of relevant and reusable resources. Projects could be voted by users - teachers and students - to become best practices; this process could offer a sort of validation tool that combines top-down and bottom-up approaches. The first approach can be offered by a validation proposed by a group of experts.

A reflection which emerges from the analysis of so different projects is that the use of ICT can help overcome boundaries among disciplines. Indeed, one of the limits of learning in a complex society seems to be precisely the rigid division of knowledge into separate disciplines, which characterized the pre-industrial and industrial age of the nineteenth and twentieth centuries. Digital technologies and network environments can promote the dialogue between disciplinary knowledge and educational pathways that can address the problems in their entirety.

The main characteristics of projects tell us how different competences are required to develop or use digital tools, and how often transversal skills are solicited, as highlighted by the DigCompEdu working group[15].

From 2013, the development of the National Assessment System has been very important to offer a crucial contribution to the improvement of the education system. It is aimed at improving the educational and training outcomes of schools, but assessment plays a fundamental role in knowing and transforming teaching and learning processes and in promoting innovation. In this perspective, it is essential to know and interpret the data emerging from monitoring on Improvement Plans developed by schools during next years. From these, useful information will emerge also for digital innovation.

5.Exemplification of uses of relevant resources

During last three years, the Italian Government has worked to concentrate economic resources for education on a great strategic objective: to lead definitively Italian education into the digital age.

It is possible by promoting a harmonization of the aims and creating synergies between the different funding sources. They are mainly three: the funds allocated by the law “La BuonaScuola” ("The Good School") (Law

[15]https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/european-framework-digital-competence-educators-digcompedu

107/2015), those provided for by the European programming, through the PON "Per la Scuola" 2014-2020, and other MIUR funds[16].

The Law 107/2015 recognizes a structural character to the in-service training, investing significant financial resources. Itguarantees a found of:

- 240 millions for the PNSD, from 2015 to 2020;
- 50 millions for recurrent training for teachers, from 2016 to 2020.

It introduces an annual bonus for them - the so called CARD - of Euro 500,00, which can be used for taking care of own learning and training. From the interviews, it emerges that many Italian schools use particularly devices and applications for three activities:

- to use tablets to handle notebooks, to take notes;
- to produce and share didactic supporting material, as video-lessons or ebooks;
- and to prepare tools for learning assessments.

In schools, there is usually a group of teachers, who is involved in testing various applications, then it suggests the use of those that can be better used. These activities feed a repository of didactic supporting material, which is shared in class or at school level, but also published on the web.

A virtuous process of creation and sharing of contents has been begun.

The MIUR National Operational Program (PON), entitled "For the School - Competences and environments for learning" is a plan of actions aimed at creating a high quality education and training system. It is financed by the European Structural Funds and has a seven-year duration, from 2014 to 2020. The total budget of the Program is € 3.019.300.000.

The other MIUR funds are:

- the Law 440/97: 23 millions from 2015 to 2020;
- the ICT Plan: 90 millions from 2015 to 2020.

The Italian Ministry of Education invest important resources in developing innovation projects through the *National Institute for Documentation, Innovation and Educational Research* (INDIRE). The Innovation Research Area concentrates specifically on analysing “structural” innovations in the educational model that are affecting educational systems worldwide. The Area’s sphere of research is international and the issues it focuses on are those concerning the on going transformation of the “Tayloristic approach” made possible also thanks to the opportunities offered by ICT and digital languages. These are structural changes that concern both time and space of teaching. Governments, local authorities, teachers, managers, companies and publishers are also committed towards “the school of the future”. Consequently, this area analyses on going

[16] Source: Piano Nazionale Scuola Digitale http://www.istruzione.it/scuola_digitale/allegati/Materiali/pnsd-layout-30.10-WEB.pdf

innovation experiences in Italian and foreign schools. It develops proposals to systematise them in order to find the most effective tools, languages and formats to document and disseminate the best educational practices. The Institute promotes some very important national projects, which involves hundreds of schools, teachers and students.

Il progetto Piccole scuole / Small Schools Grow[17]

Another project referring to the Innovation Research area is Small Schools Grow, which analyses and promotes experiences of distance learning, building up a national network, using ICT in geographically isolated schools hindered by dwindling student numbers.

The Projectsets out to analyse and promote a national network of *small schools* using distance-learning models in geographically isolated schools hindered by dwindling student numbers. This issue concerns around 300 thousand students from about 200 schools on the islands and 3.500 mountain municipalities. In these contexts, the potential offered by digital technology, which can overcome spatial and temporal limits, along with the construction of school networks, can offer solutions to keep the school population on the territory by facilitating the continuation of study and lifelong learning. Setting up a distance school means transforming isolation, due to geographical location, into a learning opportunity for both students and teachers.

The National Operational Programmes on Education – and the *repositories* NOP Teachersand NOP SOS Students – constitute, through a wide range of digital teaching resources, effective tools to foster new educational approaches and prepare the young for the demands of the third millennium (as well as documenting good practices and experiences thanks to the potential of the Web).

Other initiatives include: New formats for documenting innovation experiences carried out by schools, a project that aims to investigate how audio-visual language can effectively document innovation processes in schools and disseminate them by grasping and transmitting their peculiarities; Teaching Workshops in Technical-Professional Centres, a project designed to breathe new life into Institutes of technical and vocational education and training, identifying and trying out appropriate solutions for innovative teaching methods. Special attention is given to workshop activities regarding core competencies developed through widespread application of digital tools;*Making Learning and Thinking Visible in Italian Secondary Schools (MLTV)*, which is born out of the collaboration between Harvard School of Education and Indire with the aim of stimulating creativity and critical thinking at school. The project analyses how visual representation of thinking processes can benefit studying and knowledge acquisition.

5.1 Some website and platforms for public administration and school digital innovation

AGID - Agenzia per l'Italia digitale (Presidenza del Consiglio dei Ministri)

http://www.agid.gov.it/

[17]http://www.indire.it/progetto/piccole-scuole/

System actions for the digitalisation of public administration:

AGENDA DIGITALE / DIGITAL AGENDA: https://www.agendadigitale.eu/scuola-digitale/

TEAM PER LA TRASFORMAZIONE DIGITALE / TEAM FOR THE DIGITAL TRANSFORMATION: https://teamdigitale.governo.it/

The Digital Transformation Team was born to build the "operating system" in Italy, a series of fundamental components on top of which we can build simpler and more efficient services for the citizens, the Public Administration and businesses, through innovative digital products. The team of the Commissioner has been created on September 2016 and will last until September 2018.

AIDR - ITALIAN DIGITAL REVOLUTION

http://www.aidr.it/

It is a social promotion association made up of lawyers, managers and public officials, university professors, doctors and professionals, which promotes digital culture and focus to create network between actors and systems.

MIUR - MINISTRY OF EDUCATION, UNIVERSITY AND RESEARCH

SCHOOLKIT

http://schoolkit.istruzione.it

They are instructions models to accompany schools in the implementation of the National Digital School Plan. They answer a clear question and help solve a problem or develop an innovative practice.

S.O.F.I.A.

http://www.istruzione.it/pdgf/

The platform for teacher training.

AVANGUARDIE EDUCATIVE / Educational Avant-garde[18]

http://www.indire.it/area-di-ricerca/innovazione/

Educational Avant-garde is a movement open to all Italian schools engaged daily in transforming the traditional lecture-based model, aimed at creating a network by singling out and supporting bottom up experiences of innovation that can help overcome didactic, structural and organisational teaching limits.

The project arose from the collaboration with a group of schools that were trying out innovative, sustainable and transferable teaching solutions to overcome the lecture-based model. A Movement was created, inspired

[18] http://avanguardieeducative.indire.it/

by a Manifesto for Innovation, containing the principles for change. The first 12 Ideas of Educational Avant-garde were produced observing and analysing innovation processes in a group of schools. Each idea helps to overcome didactic, structural and organisational teaching limits. The project aims to create a network of schools, supporting one or more ideas, to trigger a knock-on effect on school innovation.

MediaLibraryOnLine

https://www.medialibrary.it/home/cover.aspx

It is the first Italian network of public libraries for digital loans.

OILPROJECT

http://www.oilproject.org/

The project is promoted by an independent company, but recognized and supported from MIUR. The platform is one of the most massive cultural dissemination initiatives in Italy; it promotes a more interactive, collaborative and digital school. The team involves more than 50 professors, researchers and experts, from chemistry to philosophy.

THE INNOVATION GROUP

https://www.theinnovationgroup.it/events/digital-italy-summit-2017/?lang=it

The Innovation Group is an independent market research and advisory enterprise, specializing in growing segments of digital technologies that accelerate change and innovation processes in companies and organizations. It realizes integrated services, solutions and programs as platforms, for different stakeholders for the demand and supply of the digital industry development.

Institute for didactic technologies

http://www.itd.cnr.it/

The **Istituto per le TecnologieDidattiche (ITD)** is one of the research institutes of the Italian National Research Council. The institute is devoted to the study of educational innovation brought about through the use of Information and Communication Technologies (ICT). The researchundertakenfocuses on:

- the integration of ICT in various educational settings (school, university, business);
- issues related to different disciplines and themes (humanities, sciences, environmental education, etc.);
- learning issues of particular social significance (disability, learning difficulties, social disadvantage, intercultural issues, etc.);
- the study of technological innovation as a learning resource.

The main areas of reference for the Institute's research work are the cognitive sciences, computer science and the pedagogy of the various disciplines.

6. Recommendations for effective integration of ICT in the teaching and learning processes

In relation to what emerges from the document analysis about the innovation policies and the good practices so far disseminated in Italy, some contextual constraints emerge. For the realization of any effective integration of digital resources in teaching and learning processes in the school system we need to face them. These restrictions belong to three distinct levels: infrastructural; systemic and cultural.

Infrastructural dimension:

Access to ultra-wideband through enabling conditions for switching to optical fiber, connectivity and internal cabling in each school. "*Among the constraints of the context one must remember the lack of coverage of the ultra wide band in large portions of the territory*" (int 6, Monitoraggio BUL) the need to promote:

- "Facilities aimed at lowering the cost barriers to implementation, simplifying and reducing administrative burdens;
- Coordination in the management of the subsoil through the establishment of a cadastre of the under and above ground that ensures monitoring of the interventions and the best use of existing infrastructures;
- The adjustment to the other European countries of the limits on electromagnetism;
- Tax incentives, low-interest loans and non-repayable loans;
- The direct realization of public infrastructures in areas not covered by the market "(Strategia BUL).

System dimension:

Definition of the boundaries of competence. "The implementation of the interventions envisaged in relation to the Europe 2020 objectives clash at the local level with the hyper-bureaucratization and fragmentation of skills that characterize our central and peripheral administrative system" (Int 6), often producing high levels of conflict, delays and failure to assume responsibility in the absence of a clear identification of the competent bodies and responsibilities.

It is also considered appropriate to clarify the levels of delegation and/or simplification regarding the role of the single educational institution in relation to the school digitalization processes (supplies and services) that are obviously linked to the complex administrative structure of the PA, in relation for example to:

1) the rules that establish the transparent Administration;

2) the Digital Administration Code which in *Art. 17 - Structures for organization, innovation and technologies*, establishes the minimum ICT security measures to which the PA must refer;

3) the PA Public Procurement Code. All legitimate tasks that are not often reflected in streamlined and flat of the school.

6.1 Funding

Regarding funding, even if the PNSD has made a significant step forward, to continue on the road to improvement, we must remember that:

- "The incentives are not sufficient. The revolution is not exclusively technological because it invests models of business, organization, service, education and relationship" (int 2);
- it is necessary to favor the speeding up of the process that underlies the allocation of financial resources, overcoming "the logic of the tender to favor that of the financing considered with an incentive towards those who promote winning ideas" (Int 1);
- the financial resources for digital innovation are many and for the most part they are outside the spectrum of competence of the MIUR, such as those related to the infrastructural gap (IO2). For this reason it is necessary to foster synergy of intents and integrated policies capable of operating change in a multidimensional, multi-actor, multi-district logic;
- it is necessary to promote the logic of co-planning, co-financing, public-private participation, center-periphery to activate virtuous processes and inter-systemic networks.

6.2 National decision makers

Field research has revealed the complexity of the digital innovation framework characterized by a complex system of governance in which operate:

At the central level: Presidency of the Council of Ministers; Infratel, AGID and MISE for the development of ultra-wide bandwidth and connectivity; MIUR regarding the digital innovation policies in the school. At this level, the *National Institute for the evaluation of the educational system of education and training* (INVALSI) and the *National Institute for Educational Documentation and Research* (INDIRE), which contribute through guidelines, experiments and projects that animate the schools and acts, albeit indirectly.

At regional level: the individual Regions and related Regional Offices that show different levels of liveliness and strategic government of the territory in relation to the policies of digital innovation, both in terms of infrastructure and services/assistance offered to schools;

At the local level: the single educational institution or the training centers responsible for driving innovation/enhancement of digital in educational environments. "Not only in everyday teaching but in all, therefore, the document management, the communication / information / involvement processes of the local school community ... this is the intelligent use of digital, not to be confused with the electrified school". (int 2).

Among the points of attention aimed at policy makers stress the importance of:

- to favor integrative processes based on long-term strategies and policies;
- rethinking some administrative-bureaucratic processes within the PA, of which the education system is an integral part, to guide them towards "digitalization, interoperability and transparency, at the service of simplification" (Int 2).

6.3 School inspectors (country/regional level)

The PNSD has provided, at the regional level, the presence of schools polo with the task of taking care of the training of all the schools in its field: "in general, 27/28 million euro we give to schools. We divide the schools into 319 schools, each area is formed by about fifty schools, so we give money to the lead school that must take care for the formation of all other schools partner" (int 2).

At regional and local level it is necessary to activate ever stronger synergies between the public body and private companies, between the school and the labor market, between the world of education and that of research, to activate trust relations and a community educating 'that represent the true driving force of the educational success'.

It was not possible to foresee an evaluation of the results in this start-up phase, but only a monitoring of the activities through the detection of: "courses provided; hours of attendance of participants; certificates of participation issued "(MIUR Note No. 0009825.26-07-2016, Final activities for the training of" Digital Animators "and teachers of the" Team for Innovation ").

As highlighted, the outcomes of this training have been very diversified in the absence of common and shared guidelines and an action strategy.

In the nascent National Assessment System that establishes the visit, at a sample of nationally drawn schools, of an External Evaluation Unit, attention is paid to the use of digital within the section *2.2 Learning Environment*, through the following points of attention aimed at verifying:

1. Extension of the training offer both in curricular time and in extra-curricular time
2. Recovery and reinforcement activities both in curricular time and extracurricular hours
3. Presence of managers for the management of laboratory spaces
4. Planning of access to the laboratories
5. Use of laboratory spaces continuously
6. Takes care of the presence of teaching aids in the classes (class library, materials for scientific activities, etc.)
7. Takes care of the presence of digital supports in the classes (computer, tablet, LIM, internet connection, etc.)
8. Other (specify - max 200 characters)

In the same way, in the analysis of learning outcomes only one specific question is asked in the Italian Teacher Questionnaire 2014/15 and in the 2014/15 Mathematics Teaching Questionnaire[19].

However, there are focuses of analysis and evaluation with respect to the use of digital in teaching, built on a core of schools that have started a system transformation and that are very interesting. In the events in which the use of digital in the classroom is observed, through appropriate methodologies by the teacher, its impact on the Italian and mathematics tests are very positive. "We did a test; we took a dozen schools, where digital

[19] INVALSI Teaching Survey 2014-2015. Question D6: "How much did you use the following media in class with your class students in the last school year?.

is all-encompassing, where they always work on computers and with all subjects. We have checked the results of the Invalsi tests and we have seen that they are all above the benchmarks of reference, not only, but there are some interesting elements. In one of these high schools, they have reached abandonment 0, the absences of the students diminish, etc. (Int 6).

"In our school there are also training initiatives aimed at students for the conscious use of digital technology and to present the potential offered by technological tools for the improvement of their learning path. Digital tools are being used by everyone in a massive and when we did, we recorded some very positive results, the curve rose suddenly up because you have created a standard. I take notes with a certain application, even you take them with that, our notes will be interchangeable, this favors the sharing of resources "(Int. 2).

6.4 School managers/leaders

All the interviewees during the field research emphasized the central role of Head Masters (HM) in the school's innovation process. It is considered essential to devote special attention, by the administrative structure, to this category in terms of recruitment, training, entry into the role, assessment and continuous empowerment.

All respondents agree with the belief that there can be no innovation at school in the absence of a HM that promotes and witnesses. The HM is a "bridge" to ensure dialogue between the administrative and educational sectors and to put any innovative practice in the system. He must be the first to value the work and commitment of the most open professors to the incorporation of learning and knowledge technologies in the teaching-learning process. "The role [of the head master] is to protect and encourage the innovation pioneers that are in every school, often these 4/5 teachers present in every school that they almost have to hide because they are misunderstood. This is a big problem. If the head teacher really wants to promote change, he must set the example, he must be the first to mark the path ... so it becomes credible " (int 2).

The HM must be able to foster an innovative school vision to be presented both inside and outside the school to stimulate teacher approach change and address family investment preferences. A concrete example is the introduction of digital e-books produced by the school, with sustainable costs for families and a concrete advantage for students, in terms of transport and use of the text. "Our project is a Book in progress, i.e. the creation of digital books self-produced on the web (this year we have produced 160 thousand copies). They cost families no more than € 5 each, so instead of spending € 350/400 they spend € 50. We set minimum standards so that everyone has the same type of resource. I usually summon families of the first classes in June or July, I tell them what is the price that I managed to get on the market ... if they agree they take that, or they go somewhere else; and all the families get equipped with a technological device with a cost saving, so innovation is sustainable "(int 2).

7. Teacher training for ICT

Probably, the National Digital School Plan (2015) was the first important moment of reflection about digital didactical practices at school in the institutional world. It constituted the first moment of reflection on the educational processes, but also on the type of organization, school environment, spaces, training of teachers and real connection between schools and the world of work. However, like all reforms, it has clashed with an organizational and educational context, often not ready to absorb and welcome the changes, resulting in "a series of problems that clash, both with a very cumbersome and demanding organization of the ministry and, with the organization of schools" (Int.4), hindering the pervasive relapse of initiatives that remain occasional experiences, difficult to capitalize.

Among the most innovative actions of the recent PNSD, we point out, as part of the continuous training of teachers, the establishment of the figure of the digital animator, responsible for supporting colleagues in the process of incorporation of ICT in teaching; an opportunity for each institute to set up the guidelines for ministerial guidelines. But this figure suffers from some "system" limits, among which the most relevant is the lack of integration with the entire teaching body, linked to forms of disregarded recognition of retributive nature and role. "The Digital Animator is abandoned by the rest of the teaching staff who does not give him great support, he does not have his own budget. The school takes € 1000 a year but not him. So, the digital animator has a big workload, conceptually important, but it is not supported by a strong mandate "(Int.6). A mandate able to honour the additional workload and the costs of self-training, self-updating and maintenance of personal digital equipment.

Furthermore, we have seen that the training of teachers in Italy is not subject to evaluation and monitoring actions in progress and ex post. "In other countries teachers must go to training courses, the training courses will end with exams, if the exams are not passed the teacher has negative evaluations that affect his work, his salary, his shots of career. In Italy is not like that. Apart from generic comparison, verification and customer satisfaction tables ... there is no a real system for checking the quality of training" (Int 6).

The verification of the impact of teacher training is only formal and not substantial, it has an administrative and reporting nature. An attempt to overcome is the platform S.o.f.i.a of MIUR, where individual teachers who benefit from training, have the opportunity to give an assessment to their training, involving thousands of teachers can be a significant first step in giving value to training.

This new portal also aims to harmonize rules, processes and technologies for the implementation of a single training system for the professional updating of teachers. "Today it is not possible to have immediate knowledge of the interventions carried out on the territory by the bodies and associations that provide training, nor know in real time the number of teachers who participated in a national or territorial training initiative in implementation of funding allocated by MIUR" (int 1).

With the introduction of this new system, we therefore hope for the concrete realization of the provisions of the 2016-2019 Teacher Training Plan (D.M. 797/2016) which includes:

- the implementation of monitoring systems that allow the construction of targeted public policies;

- the introduction of the teacher's portfolio centered on professional development in order to bring together incoming and in-service training in a single process, intercepting the teacher's training needs throughout his professional career;
- simplification of the administrative and accounting management of training, so as to guarantee adequate timing; adequate liquidity to educational institutions for the payment of expenses incurred and prevention of corruption in all those areas that have potential risks such as the issue of certifications and accreditations.

"We need to design new management and operational processes, and bring together in a single platform the activities connected with the life cycle of training, in particular:

- the analysis of the needs and the segmented demand for the various recipients;
- the organization of the Plan;
- the implementation and management of training interventions;
- administrative and accounting management (distribution of funds and reporting);
- the monitoring (output - outcome) of the training initiatives;
- accreditation of training institutions and recognition of training paths" (int 1).

7.1 Initial and continuous teacher training system

From the evidence gathered throughout the field research, with respect to the initial and in-service teacher training system, the following recommendations can be drawn:

<u>At the central system level</u>

- **Investing more on involvement and training at different levels:**
  - overcome the project approach and direct a system approach aimed at guiding change through the establishment of a properly trained task force that can train school leaders and accompany them in the innovation process;
  - rain the Head Masters to their role as e-leader in the school;
  - promote support and bsck up activities by the central and local administration to the Head Masters and to the 'polo' schools;
  - to enhance the activity of the digital animator through an economic and role recognition, which may include, for example, a partial exemption from teaching to devote himself to this system activity;
  - offer a "conscious", targeted and homogeneous training to the teaching staff through the recognition of minimum and recognized certification paths and the relevance of continuing education for the profession and career;
  - apply a method of evaluation aimed at the work of individual teachers and their availability and commitment in the continuous training of their professionalism.

- **Rethinking recruitment and career paths**
  - to give continuity to the insertion into service through clear recruitment policies, able to guarantee quality of training and clarity of procedures;
  - to combat precariousness and disinvestment in continuing education;
  - accompany career paths, at different levels, with professional empowerment systems.

- **Giving time and gradualness to the reforms.** The last twenty years the public administration, and the school in particular, have been the subject of numerous reforms, producing an overload and regulatory stratification "that there is no time to assimilate, with the risk that in the end everything is resolved in a soap bubble, it bursts and nothing happens (int.5). We need to adopt incremental reform processes, guided through longer times, capable of enhancing bottom-up initiatives and proceeding in a logic of empowerment of peripheral institutions and communities. The collateral risk to this way of proceeding is that of crashing, under the rhetoric of simplification, in only apparent delegations, characterized by an effective lack of normative and/or cognitive tools, and by the lack of adequate resources, by those who should implement.
- **Promote the planning of individual institutions, shortening the evaluation times of projects presented by schools.**
- **Ensure monitoring of actions that are financed through public funds in itinere and ex post, in order to evaluate and then redesign or redirect the shot.**

At the level of meso-implementation

- **Govern the processes of territorial implementation through:**
  - the implementation of a synergistic governance action among all the various actors involved in the process of digital technological and cultural innovation;
  - the promotion, in a logic of system, of processes of network construction and renewed forms of inter-organizational relationship, in order to make the territorial actors dialogue and support the establishment of a network capable of setting common objectives and optimizing resources by virtue of common interests;
  - the identification of goods, services and forms of assistance (digital) to be managed, even on the network, at a local level to rationalize processes, levels of institutional competence and standardize results: example, management of security systems, management of technical assistance system, adoption of interoperable systems, service delivery, innovation and development support, open data management and related analytics, etc.

- **Open data management**
  - interoperable, that is, they must implement systems that, even if not homogeneous, can interact and communicate with each other, exchange or reuse information;
  - that can be integrated, that is to be fully usable with existing devices;
  - multiplatform, therefore working on multiple operating systems and in particular on operating platforms.

At the organizationallevel:

- **Share a school vision appropriate to the digital challenge**
  - Design and share the change towards the new school model, identifying the phases of transition, roles and responsibilities in guiding the process, as well as monitoring systems and self-assessment of the process.
  - Ensure the wiring of the school, an essential prerequisite that requires continuous assistance to ensure access to the overall user base of students, internal staff (teachers and technical-administrative), families and any external partners.

- To plan the dematerialization path both from an administrative and an educational point of view, guaranteeing adequate training to all the subjects involved, according to their competences and responsibilities.
- Organize and ensure adequate internal training and continuity in the accompanying process because the journey towards change is long and fraught with obstacles and requires gradualness and pervasiveness of innovation in practice. For this reason, "there is a group of continuing education for teachers with classroom activities and classroom activities at least once a month; it is a process of continuous training of teachers and slowly they are all adapted to this way of doing school, because we have not scared anyone, even those who were more worried. We have led them to understand that they could do it, there is a continuous path updating and training" (int 2).
- Digitizing the teaching through the preparation in all classrooms of light, diffuse and invisible technologies, thus overcoming the logic of large investments in laboratories.
- To encourage the practice of sharing, at all levels (teachers, students, school networks, training centers) through the use of digital teaching resources and the creation and/or access to digital educational environments (eg. digital libraries: medialibrary.com).
- Support teachers and students in the adoption of digital teaching devices in place of traditional (and much more expensive) paper supports and accompany the progressive integration, replacement, enhancement in all phases and processes of learning and knowledge building.
- Redesign the setting of the classroom no longer understood as a closed and confined place in time, space and disciplinary scanning, but designing physical-virtual educational environments able to respond to multiple functions depending on the activity to be performed.
- Pursue the path of transparency through a wide and correct integration of functions (use of the integrated badge to the electronic booklet for the management of absences in place of the absence booklet) and of external communication to stakeholders: families, suppliers, partners, institutions, educating community etc.
- Ensure adequate paths to strengthen soft skills "because the potential in digital technology is endless, and they are by their nature interdisciplinary, transversal and pervasive. The challenge is not technical, but concerns how to use digital, how to use them in the social context. For this reason, the soft skills that touch the digital sphere are central; and teachers can transfer them to the students through their testimony and approach to the use of digital both in learning and in everyday relationships"(Int 6). Because, studentslearn more and more by modelingapproach.

7.2 Classification of the ICT profiles and skills of the educational staff

As noted introduces the theme of the teacher profile in the digital age and the expertise to carry out this profession in an innovative way. Although there is no clear definition of the minimum professional profiles and competences necessary to guarantee the school an adequate transition to the new model, reference can be made to the Guidelines for the quality of digital skills in ICT professionalism developed by AGID (2016). This document offers an overall reference framework for the public procurement of ICT services by administrations.

"The activity of our country on the cataloging of professional ICT profiles has been at the forefront since 2013 when, after having implemented the CEN e-Competence Framework (e-CF) model, it has elaborated it to the e-CF 3.0 version obtaining recognition as a technical standard (UNI 11506: 2013) by all European countries. This allowed to classify the 40 competences of the framework in 5 areas of ICT activities related to the European Qualifications Framework (EQF). In this way it has been possible to identify the specialized digital

skills of the individual subjects, cataloging them in a univocal way. Also in the European context, 6 first-generation families were identified, which then followed 23 second-generation ICT profiles, however envisaging subsequent profiles - defined as third-generation - to cover all possible specializations (Annex, Fig. 1, Agid, SkyLine ICT GuideLine). Even if the document does not specifically address the school world, it can offer useful food for thought to design an imagining process of digital innovation in an educational system perspective. For example, the need to ensure the security of systems in its various forms (ICT Security Manager), management, updating, standard protection of hardware and software technologies (System Administrator and Technical Specialist); and the continuous updating of the various resources involved (ICT Trainer) to provide the knowledge and skills necessary to ensure that the subjects are effectively able to carry out their tasks and are also able to transfer this knowledge to others, represent profiles and skills that the single school can not dispose of. And without which a true process of contamination and renewal can not start. The merit of this document is to highlight the complexity of the system and the need to provide a different management of services without thinking of being able to delegate all these functions to the single school. While at school it is undoubtedly to develop models of competence specifically aimed at outlining: new e-leadership profiles for the DS; new profiles able to outline innovators, trainers, animators-facilitators who make up the digital team; and the emerging centres of expertise that interest those dedicated to teaching.

On the basis of the analysis carried out, one can try to highlight the characteristics of these profiles in light of the responsibilities / competences required by the digital government in the educational system.

1. **The Headmaster as an e-leader:**

- to promote a new vision of school, redefining each person's boundaries and skills in a logic of leadership empowerment;
- designing and managing a new system / model of internal, external and educational communication based on the paradigm of participation, sharing, construction according to a logic that restores centrality and power to each of the subjects involved in every way and in order to the principles of 'transparent communication' ;
- to cultivate communities of practices to facilitate the transferability of experiences and create paths in which to form the new professional habitus: "teachers, do not know how to work with each other, confront networking projects and discussing online. This is something that often happens in school, it is never discussed again, there is no reflexive approach. Teacher training on this could be studied, because teaching teachers how to do this is not strictly trivial and in any case favours cultural development "(int 5);
- favouring**the transition from a disciplinary approach to a reflexive, situational, experimental and transversal approach to the disciplines**: "The teacher must be trained to abandon the comfort of the discipline in order to confront a system that disregards predefined rules once and for all" (int . 2);
- **take care of the improvement of the teacher's life skills** in the face of a widespread "resistance of the adults who work in the school world to update for the development of skills and methods of approach to innovative teaching, unfortunately still not widely practiced" (int. 5).

2. **Articulation of the digital team**

The centrality of the digital team is supported by the fact that "the elementary capacity of use of the computer is not enough, it serves an aptitude for change, accompanied by the awareness of the transformations produced by the digital" (int 2). In the educational field this means to worry about the continuous, experimentation, reflection, adaptation of the methodologies and essential training of the new soft skills that any job requires today. The digital animator works in this sense, within his community, an action of: internal

training; involvement of the school community and creation of innovative solutions (Annex 2 Digital Animator Profile) it is evident therefore that one person can not perform all these functions alone but identify three areas of intervention, closely integrated with each other, but with responsibilities and competences different. Skills for which there is no certification path. One of the first initiatives aimed at training digital skills for teachers is the FoR.TIC project, which provided for three levels of skills:

- Basic skills on the use of computers appropriately combined with knowledge aimed at supporting the integration of technologies in teaching and extra-teaching activities of teachers. This level should be owned by all teachers.
- Advanced knowledge / skills on the intertwining of teaching and technologies, ie related to the teaching resources present in the network and to the impact of ICT on the disciplines, on the learning processes, on the processes of collaboration and learning on the web, on the evaluation processes of the learning and teaching. Finally, the knowledge of the new possibilities for integrating disabled people offered by the spread of ICT should not be neglected. Each educational institution should have at least one person with such abilities within it. *Ministry of Education, University and Research National Training Plan for Teachers on Information and Communication Technologies.*
- Advanced computer skills aimed at guaranteeing, within each single educational institution, an adequate capacity for design, development, profitable use and governance of the technological infrastructure.

AICA ("Italian Association for Automatic Calculation") established the first PNSD Training Course by elaborating the OFFICIAL LIST OF AICA TRAINERS FOR PNSD divided by Region.

3. Teachers

With regard to teaching skills, the analysis of the literature makes it possible to identify the following four emerging groups that are anything but strictly technical:

- socio-emotional skills: interpersonal communication, educational leadership, problem solving, problem setting, conflict management, decision making, emotional intelligence(Capogna,Nirchi, 2016; Capogna, 2017[20]);
- methodology competences: need analysis, process management plan; assessment and evaluation for learning, process and system;
- communicative skills: communicative competences (effective communication (Grice, 1975[21]), assertive communication and non-violent (Rosenberg, 1998[22]), media literacy, digital literacy, media competences;
- self-directed learning (Goleman, Boyatzis, McKee, 2004[23]).

[20]Capogna S. &Nirchi S. (a cura di), (2016), *Tra educazione e società nell'era delle ICT Luci e ombre del processo di innovazione digitale in ambito educativo*, Roma: Anicia; Capogna S. (2017), *Le sfide della scuola nell'era digitale. Una ricerca sociologica sulle competenze digitali dei docenti*,Roma: Eurilink.

[21] Grice H. P. (1975). Logic and conversation. In P. Cole, & J. Morgan (Eds.), Syntax and semantics (pp. 41-58). New York: Academic Press.

[22]Rosenberg M.B. (1998), Le parole sono finestre [oppure muri], Reggio Emilia:Esserci.

[23] Goleman, D., Boyatzis, R., & McKee, A., (2002). Primal leadership: Learning to lead with emotional intelligence. Boston, MA: Harvard Business School Press.

8. Official quality assurance and evaluation tools and procedures at national level

At national level, there are still no clear guidelines and procedures that accompany the education system to integrate digital innovations in educational processes and practices. In 2016, the Ministry created the School Single Data Portal for free access to data about: schools, students, school staff, school buildings, national assessment system and national operational program (PON).

In the same way, there are still no public monitoring and evaluation results regarding the efforts made through the PNSD. While it is possible to reconstruct some important stages of about a working progress process. In 2016 an exploratory research was carried out aimed at detecting teachers' needs, uses, practices and digital skills (Capogna, Cocozza, Cianfriglia, 2016) with the aim of taking a picture of the digitalization process in teaching at time when the PNSD he took his first steps.

AGID takes care of a collection of Quality Handbooks for ICTs, acting as a point of reference for those who work in the PA.

The evaluation actions related to the PNSD investments have so far focused on the accounts aspects. However, in note no. AOODGEFID0012810 of 10.15.2015 the Minister illustrates the National Operational Plan 2014-2020 for the school, clarifying the financed actions, included in Axis II, named *Infrastructures for Education ERDF*, and which defines a series of sub-actions related to multimedia environments.

Source: no. AOODGEFID0012810 of 10.15.2015

This document defines in detail:

- Called actions, objectives and financial coverage;
- Characteristics of the interventions;
- How to participate;
- Beneficiaries' obligations
- Reference legislation
- Concluding provisions

- Technical attachments

Monitoring

In line with community regulations, the projects monitoring starting from the formulation of proposals, up to the educational and administrative management of authorized interventions, and their assessment. All this activities are managed in an automated manner by the Information System composed of two distinct platforms:

- "Management of the Interventions", which intend to accommodate all the physical and procedural data relevant for the project; and therefore, in particular, it is destined to accept the candidacy data related to this financing action;
- "Financial Management" aimed to gather all financial data.

These platforms are powered by educational institutions that benefit from community funding. The data present in these platforms are transferred to the General Accounting State Office - General Inspectorate for Financial Relations with the European Union (I.G.R.U.E.) and, through it, to the European Commission.

At the same time, educational institutions benefiting from such funding are required to provide and update the data requested by the Technological Observatory, managed by the Ministry of Education, Universities and Research.

Moreover, at the conclusion of each project, the beneficiary school institution must fill in the self-assessment form about the intervention. Form that will be transmitted by the Managing Authority.

Evaluation

The PON "For the school", like all community programs, is subordinate to ongoing and ex post evaluation. During the programming period, in order to allow the evaluation of the effectiveness, efficiency and impact of the financed interventions, the Managing Authority may envisage field investigations, involving the beneficiary Scholastic Institutions.

The ex post evaluation, which can be completed by December 31, 2023, and will be carried out by the European Commission in agreement with the Member State. In the event of an audit, the beneficiary schools must make themselves available for investigations and actively cooperate in carrying out all evaluation activities.

Controls

The initiatives financed under the Structural Funds are subject to a system of checks aimed at verifying that the interventions are carried out in full compliance with European and national legislation.

The Managing Authority of the National Operational Program, pursuant to art. 125 of the Community Regulation (EC) n. 1303/2013, is required to ensure the correct financial management of the Operational Program. In accordance with paragraph 4, letter a) of the aforementioned article, the Managing Authority must verify "that the products and services co-financed have been provided, that the beneficiaries have paid the

declared expenses, and that the latter comply with the applicable law, the operational program and the conditions for the operation support".

The checks provided by the Community Regulations are divided into first level checks and second level checks.

The first-level controls, realized under the responsibility of the Managing Authority, are intended to verify the administrative and technical correctness of the expenses incurred by the beneficiaries. The second level controls, within the competence of the Audit Authority, are aimed at verifying the effective functioning of the management and control systems put in place in the implementation of the Program. These are spot checks carried out by the Audit Authority - Ministry of Economy and Finance - General State Accounting - General Inspectorate for Relations with the European Union (IGRUE).

Further checks, in preparation for reimbursement requests by the European Commission, are implemented by the Certification Authority.

9. Conclusions

School autonomy has encouraged the development of digital skills in institutions which welcomed the PNSD. But, at the same time, it has strengthened disparities between schools, dispersing the effort in studying and designing leaded bu the central authority. This prevented the implementation of unified monitoring and evaluation processes. The implementation phase has clashed "*with a myriad of initiatives released from each other where each school offers what it wants, vaguely inspired by certain actions of the National Plan ...*" (Int. 6). This led us to impossibility to have an overall picture.

To date, there are numerous negotiating tables; the risk is the fragmentation and difficulty in consultation and systemisation for what has been achieved.

From the survey carried out, some essential issues emerge. We can consider them such a prerequisite for achieving an integral digital policy, able to look at school, innovation and work at the same time.

First of all, the need to proceed, rapidly, at the country level, towards broadband coverage to recover areas and territories that are still not served.

Secondly, the need to imagine a system policy able to harmonize the many efforts made so far by enhancing the territorial expressions without abdicating a directorial role aimed at nurturing innovation and guiding the changes taking place.

From the reconnaissance work about projects and good practices some common and transversal elements emerge. It would be useful to valorise them in order to proceed towards an advancement of the difficult process of modernization undertaken.

1. The change of school from 'physical space', rigidly determined by its boundaries inspired by the logic of total institution (Goffman), to 'learning environment'. A learningenvironmentthatchanges in:

a) physical and spatial organization through:

- the redesign of the spaces;
- the overcoming of the asymmetry determined by the class setting which establishes a top-down 'communication framework' in favor of communication models, between teachers and learners based on bottom-up or star and network patterns;
- the consequent need to develop new models of relationships and different communication skills by which teachers and learners can recognize each other;
- overcoming the rigid boundaries of class and discipline, typical of a traditional and transmissive model.

b) The creation of new educational environments such as, for example, the digital library, which pushes towards the overcoming of the text and the linear and alphabetic tradition, in favor of the creation of accessible, free and quality digital databases and learning resources.

2. The dissemination of educational relationship systems and teaching models students' oriented and aimed at bringing out:

- formal, non-formal and informal learning, and competence teaching;
- enhancement of the laboratory, experiential and playful dimension;
- enhancement of the cooperative dimension and sharing;
- growing attention to the consequences that social net-working processes activate with respect to subjectivity and socialization paths, so important at this stage of life. A sensibility that brings again these other two school missions (which are beyond the mere transmission of knowledge) to the center.

3. The change of teachers' role which measure themselves, and let themselves be more and more involved in paths of:

- innovation,
- community of practice,
- peer learning,
- learning by doing,
- experimentation and discovering approach,
- reflective approaches in relation to level and type of school,
- experimenting with new programs (such as coding)
- and so on.

Increasing attention to communication role as both a documentary responsibility and a commitment to dissemination. An effort in which emerges the growing awareness of the centrality of this function regarding the concepts of sense making, sharing, community, etc., in according to the change paradigm that increasingly sees communication as a social and relational space and not merely as a transmission of information and contents.

4. We can therefore highlight five pillars that represents some essential action lines in driving schools towards the construction of a holistic and ecological digital culture with the aim of humanizing and rebalancing the force relationships between work, school, system and subject.

- A new governance model able to make a virtuous dialogue between the center and the territories, also in the light of a review of the responsibilities that, given the complexity of the system, cannot all be at the head of the single school.
- Enabling infrastructures within a clear assignment of responsibility and competence in a simplified governance framework.
- Pay attention to the definition of a digital innovation strategy for the PA and schools oriented to the principles of open resources and open data management responsibility, which must be accompanied by the definition of minimum standards, to avoid that the peripheral administrations, as well as schools, are victims of a wild digital market.
- Promotion of a digital culture for citizenship and work, which goes beyond the rhetoric of digital citizenship and the skills necessary for ICT professionals. At school, as in any other sector, it is necessary to promote the formation of a widespread digital culture in order to three essential macro areas of competence: the critical and conscious use of social networks and media; the development of computational thinking; and the production and ties to the world of work.
- Redefinition of the processes through which to build and accompany the constitution of the new professional habitus of School Leaders, professors and digital support staff figures, in the panorama of the dashed changes. In this regard, it is central to rethink: the initial training paths for the entry into the role; the on-

going training in a logic of personal growth; the definition of specialized training courses aimed at identifying certificates and digital profiles for the school;

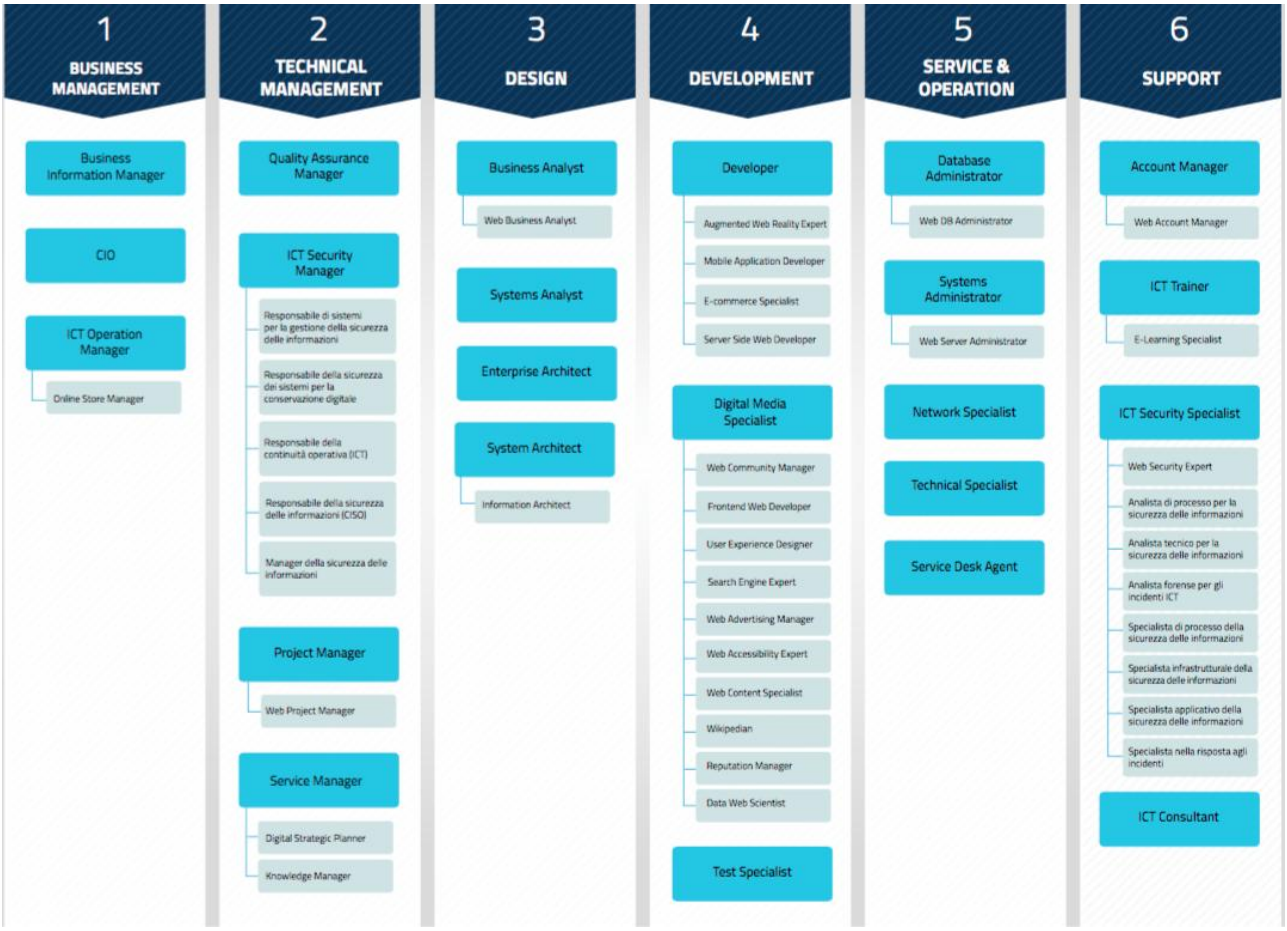
- Pay attention to training and the continuous accompaniment of School Leaders, staff support and teachers in a logic of professional and organizational empowerment.
- Identification, scientific validation and transfer of best practices through a logic of valorisation and synergy between the center and the peripheries.

Summarizing we can say, the testimonies gathered, highlight that "*guidelines would serve to governments before teachers; to the regional school offices, to those who manage processes. The first recommendation to offer for this purpose is to have an overall vision. If we are not able to offer a vision of change and a digital policy across all sectors of transformation and innovation in the country we will not be able to make big changes* "(Int 6).

Annexes

(Proposed National model for a School action plan, Tools for quality assurance and evaluation)

Annex 1. Guidelines for the quality of digital skills in the professions ICT - AgID



Annex 2. Animator Profile – Action #28 - PNSD

INTERNAL TRAINING: stimulate internal school training in the areas of the PNSD, through the organization of training workshops (without necessarily being a trainer), encouraging the animation and participation of the whole school community in training activities, such as organized ones through the training hubs.

INVOLVEMENT OF THE SCHOOL COMMUNITY: encourage participation and stimulate the students' role in organizing workshops and other activities, including structured ones, on PNSD issues, also through training sessions open to families and other local actors, for the realization of a shared digital culture.

CREATION OF INNOVATIVE SOLUTIONS: identify sustainable methodological and technological solutions to be disseminated within the school environment (e.i. use of special teaching tools that the school has equipped with, the practice of a common methodology, information on existing innovations in other schools, a coding workshop for all students), consistent with the analysis of the needs of the school itself, also in synergy with technical assistance activities conducted by other figures.

DESIGN AREA (INSTRUMENTS)	The digital animator must be a promoter of the following actions in the context of his / her own scholastic institution or in connection with other schools: ▪ learning environments for integrated digital education ▪ realization / expansion of the network, connectivity, accesses ▪ laboratories for creativity and entrepreneurship ▪ school libraries as media environments ▪ coordination with the system figures and with the technical operators ▪ modernization of the school website, also by highlighting the priorities of the PNSD; ▪ electronic registers and cloud archives ▪ purchases and fundraising ▪ data security and privacy ▪ experimentation of new digital hardware and software solutions
SKILLS AND CONTENT AREA	The digital animator must be a promoter of the following actions in the context of his / her own scholastic institution or in connection with other schools: ▪ orientation for digital careers ▪ promotion of courses on digital economy ▪ digital citizenship ▪ education to the media and social networks ▪ e-Safety ▪ quality of information, copyright and privacy ▪ actions to bridge the female digital divide ▪ construction of digital and digital curricula ▪ development of computational thinking

	○ introduction to coding ○ unplugged coding ○ educational robotics ▪ update the technology curriculum ○ coding ○ educational robotics ○ making, creativity and dexterity ▪ open educational resources (OER) and construction of digital content ▪ collaboration and online communication: from digital school platforms to virtual communities of practice and research ▪ research, selection, organization of information ▪ coordination of digital initiatives for inclusion ▪ alternating school work for the digital business
TRAINING AND ACCOMPANYING AREA	The digital animator must be a promoter of the following actions in the context of his / her own scholastic institution or in connection with other schools: ▪ educational scenarios and processes for mobile integration, digital environments and the use of individual devices at school (BYOD) ▪ experimentation and dissemination of methodologies and processes of active and collaborative teaching ▪ technical assistance models ▪ models of team work and community involvement (families, associations, etc.) ▪ creation of networks and consortia on the territory, nationally and internationally ▪ participation in national, European and international calls ▪ documentation and gallery of the PNSD ▪ implementation of digital training programs for students, teachers, families and communities ▪ use of data (also invaded, evaluation, construction of questionnaires) and social reporting (monitoring)

Annex 3. Guidelines for the dissemination of ICT in schools. Final document of the project

*Guidelines for the dissemination of ICT in schools. Finaldocument of the project*elaboratedbyI.S.I.S. “Arturo Malignani” - Udine; I.S.I.S. “Raimondo D'Aronco” - Gemona del Friuli; Istituto Salesiano “G. Bearzi” - Udine.

The **infrastructures** constitute the set of physical supports for connecting the school to the Internet, functional to the support of "broadband connection" (amount data can be sent and received in the unit of time) necessary for the use of services. The network infrastructure is essential for the whole system to work. If it does not exist or is lacking, the real innovation of classroom teaching with ICT does not happen. The service system not only becomes neither more efficient nor more effective, but it is perceived as further complicated, the tools, the services. Therefore, the adaptation of structures is preliminary to every innovation process in the educational field.

The **tools** are applied in the classroom activities and in the relationship between the various components of the school such as: the electronic register, applications for teaching and support for Special Educational Needs, e-learning platforms, open source, etc.

The **services** refer to all technological support actions that outline, configure and make possible the activation of the teaching tools. The service, in this sense, intervenes in solid in all issues related to management; sensitive and personal data; privacy regulations and so on. Therefore, it is configured as a physical and system infrastructure, managed by the institution or, when necessary, partially outsourced. In this the service can be traced to the following areas: administrative services, digital administration, maintenance of classroom equipment, school network, security, educational servers, web server and private area, wi-fi, e-mail.