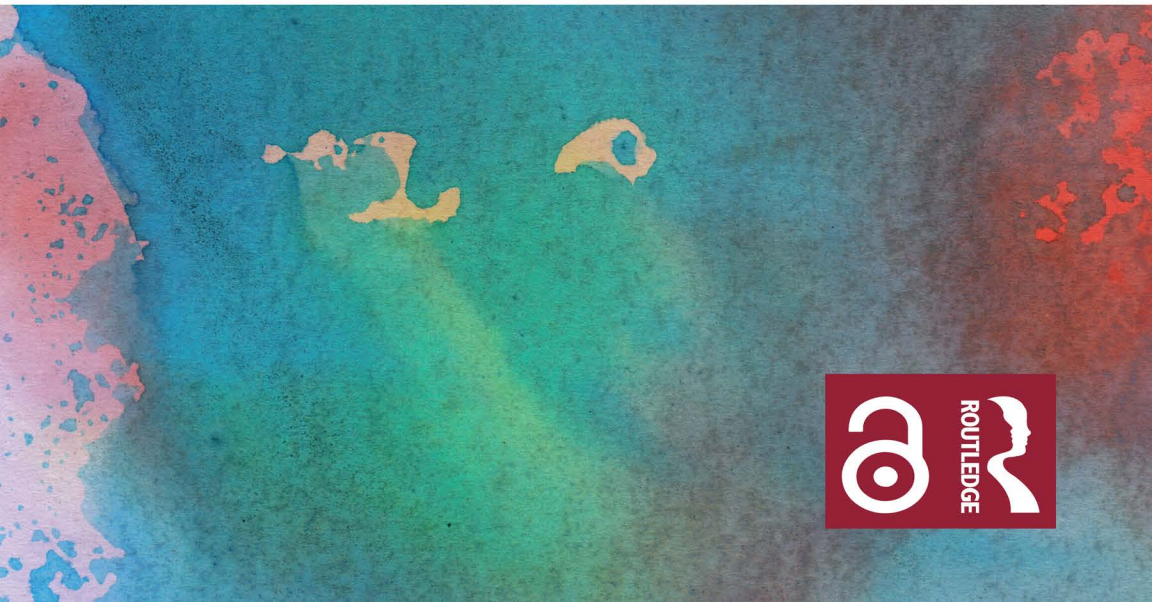
Routledge Advances in Management Learning and Education

SELF-ORGANISED SCHOOLS

EDUCATIONAL LEADERSHIP AND INNOVATIVE LEARNING ENVIRONMENTS

Alberto F. De Toni and Stefano De Marchi



Self-Organised Schools

Self-Organised Schools: Educational Leadership and Innovative Learning Environments describes the results of the research we carried out at 14 Italian schools that highlight how there is a positive correlation between the capabilities of school self-organization and the innovativeness of learning environments: in other words, the more self-organized schools are, the more innovative learning environments are.

The results of this work are part of the strand of research of bottom-up emergency and self-organization, an extremely fruitful trend as shown by Sugata Mitra, the founder of the Self-Organized Learning Environments, according to whom, "education is a self-organized system where learning is an emerging phenomenon". This book gives new insights into self-organization studies and, most of all, the idea that change – organizational and educational innovation – sparks from the bottom.

This book is aimed specifically at school principals of all levels, scholastic reformers, educational scholars and organization and management consultants who want to innovate learning and management of learning. These actors will benefit from the critical information drawn from more than 30 different learning environments worldwide, 14 schools that self-organize, and two frameworks – and two ready-to-use questionnaires – measuring the innovativeness of a learning environment and the capability of a school to self-organize. Self-organization is the most fascinating future of innovative principals.

Alberto F. De Toni is a full professor of management engineering and teaches management of complex systems at the University of Udine, Italy.

Stefano De Marchi is a principal and teacher of philosophy and history at the "Madonna del Grappa" Canossian Institute in Treviso, Italy.

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Self-Organised Schools

Educational Leadership and Innovative Learning Environments

Alberto F. De Toni and
Stefano De Marchi

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To the heroes of the school,

who have the courage

to create new learning environments

from the grassroots.

Contents

About the Authors

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Foreword

First of all, I have to say: "Excellent idea". Alberto F. De Toni and Stefano De Marchi have thrown themselves headlong into innovation, into the true search for the new. The book is a bit of research on the feasibility of self-organization in schools. It is both a cultural and an empirical self-organization, given that numerous schools have been concretely examined in their effort to introduce a radicalness – such a decisive change self-organization is! It is no coincidence that the authors use words such as "heroes", "courage", "creating new learning environments from the bottom-up"; not by chance: aware as they were, and are even more so now after their research, that to introduce such a radical change in the organization of Italian schools, a good dose of courage is needed. It is not by chance that the protagonists are prefigured as real "heroes", that is, they challenge the static nature of the situation, regardless of the danger, and yet they are extremely confident of the need for a result. Excellent, then; excellent the idea, above all because it is one of the first times in which educational research, especially with respect to the function of schools, radically shifts onto learning.

The watchword of the forces of progress in this field is precisely that of the centrality of learning. The right watchword, correct, even if incomprehensible to most people. With it we want to grasp the sense of a *mission*, of a new path to venture down, focusing precisely on learning, making the whole school organization, and not just its function, rotate around learning. And with this we try to better understand what it is, what learning consists of, to overcome a biological vision that we have of it. It is in fact natural that every human being has a vocation for learning, inasmuch as the human being exists, precisely because it naturally grows, and not only that, indeed, it exists with its growth. Its existence is not only ontological, it is above all functional, or rather it is inseparably a function of growth itself, it also reveals itself through that function, which is precisely that of growing. Learning is growing.

Any human being, even later on in life, grows, he/she never ceases to grow, that is, he/she develops; and growth is not only a biological, physiological fact, it is also a strongly characterizing fact; and every human being is conditioned by education, that is by the fact that it is possible if it is accompanied by an investigation of that growth itself, by an analysis of the ways in which

one grows. Growing up means above all learning, growing intellectually. Even physical, biological, physiological growth is intimately linked to and conditioned by the impulse of an essential component: curiosity, with respect to knowledge, to a new knowledge, crossing that path of access essential to formation, to enrich oneself intellectually. So that growing, learning and developing end up converging.

In this book, there is an awareness that the centrality of learning is not just a new educational line, it is a real revolution. In the past, the school was always a transmission of knowledge, it has always focused on the teaching function and it has always dedicated all of the physical and temporal space of the school organization to teaching, to transmitting knowledge. Until the singular, perhaps grotesque, point that the student's studying does not take place at school. It takes place at home; his main cerebral effort is not to listen and to record the knowledge transmitted to him but to "study" in order to learn, that is to say to test himself on the acquisition of new knowledge through "learning", and unlike listening, this takes place alone, at home, outside the school and its organization. If we do not understand this difference, we cannot understand the reason for our opposition to the school as it is constructed, organized and therefore functional to transmission, that is, to teaching. In it, the central figure is not the student but the teacher; the student studies at home, studies alone, studies outside the school, out of the economic efforts that are produced for a school, out of its organizational efforts, out of its mechanisms. These efforts, on the contrary, in a school based on the centrality of learning, should be aimed mainly at learning, rather than transmitting.

The teacher's function should instead intertwine with that of the student by means of a radical leap, modifying the two actual functions, significantly reducing that of listening, which still remains the student's main function, instead increasing that of each person's first-person participation in the construction of their own path. The first change must come about within the school organized from high up, rigidly disciplined in rigorously planned procedures, with identical time arrangements, always, everywhere, with a discipline of school organization entirely top-down and all substantially authoritarian (not always in the negative sense of the term, but yet authoritarian). We want to contrast this type of school with another one, in which we want to use completely new and even "blasphemous" terms with respect to the past. The students are the main actors; they are in a sense "heroes", not common beings, and therefore the abnegation typical of the "hero" should be solicited in them, not the typical obedience of the bureaucratic and authoritarian relationship.

We therefore call attention to the fact, which is very important, that we are talking about *self-organization*. The school today is not self-organized at all, it is hetero-organized, it is regulated, governed from high, in procedures that refer to those in command. We do not start from the enhancement of diversity among the various students, and we should tend to avoid

homologation, starting from the fact that the differences among students are a wealth, a heritage, a resource; they are not at all an obstacle to be overcome through homologation. The logo-centric school is entirely founded on the *logos*, on the severity of reasoning, on the almost exclusive care of the mind in the classic and traditional sense of the term – which is a correct and necessary goal – and no care being given to the artistic-creative stimulus (which is equally necessary). Not the solicitation of creativity but merely the solicitation of diligence alone.

The revolution – precisely – that is necessary today must focus on self-organization, even on the stimulation that derives from the analysis and correction of the errors that are encountered in the school activity itself. This is the great novelty of the objectives and also of the intuition, of the severe elaboration, even in the details, which is at the base of this book: self-organization. Mind you: we are not speaking of self-management but more properly of self-regulation, because this is simpler, it is more radical, it can also exist in a school which is in other senses authoritarian. Self-organization is much more because it means that autonomy, which is the basis of this process, maximizes even in its etymology, the term that consists not only of *auton*, referring to the subject, but also of *nomos*, and that is "rule". Autonomy not only self-organizes its own methods, its own discipline, but it produces its own rules (*nomos*), maximizes the term, its true conceptual content.

In the past, the school has always experienced autonomy reluctantly, due to a widespread mood among the teaching staff, and today it seeks somehow to navigate through the thrust of the State, which tends to remove oxygen from autonomy, to suffocate it, and the thrust of a part of the teachers, who tend toward the defense of hyper-disciplinarity, especially in secondary schools. Here the need prevails to cultivate the individual subjects, each one on its own, and thus to preserve the fragmentation of knowledge in different disciplines, rather than making an effort to re-consolidate knowledge, as should be necessary.

This dialectical point of contrast against autonomy has not allowed the full affirmation of autonomy, the acceptance of an extraordinary revolution of the idea of school, inherent in the invention of school autonomy, in having introduced it with such energy into the school system and now in having pushed further efforts for it to take its first steps. The real revolution is autonomy: the whole which is *autos* and *nomos*. The real revolution is that every single school must give itself a proper form of organization: therefore, self-organization as a necessary premise and temperament of the risk of the single autonomies remaining isolated and alone – an effort to give value to the network and to forms of solidarity among autonomies, to produce effective results. All this must be based on what is called the "capabilities", the professional quality and the construction of the new, both in the teaching staff and in the students' willingness to compete with themselves. It is an answer,

perhaps it is the only answer, to what today is emerging on the one hand with an increasing attention to the network, but on the other especially to the risk of what is called *homeschooling*, that is to the idea that the orientation among individual schools and single families to organize a home school, home-made, set up to satisfy peculiarities and differences, both organizational and even social, of the different families. A solution that could seriously threaten to accentuate the social inequities that are within our society.

On the contrary, the response of self-organization is a strong response, forward-looking, with respect to the defects of the traditionally bureaucratic structure – an answer that could meet real needs and that is feasible. We must therefore convince ourselves that this path is possible; we must treasure the novelty of the Epilogue on the circus elephant tied to a rope, which despite being substantially free fears that it is not so and therefore is afraid of trying to move freely. So, even the school elephant must feel free, and it can only do so on condition that the extraordinary novelty represented by self-organization is discovered, especially if this means development of learning environments, as stated in the message of Sugata Mitra and the great intellectuals who have understood the meaning of all this: discovering, encouraging one's own soul in school, one's dream of building something new in society – and that is self-determination, which is then the true substance of freedom.

At this point I want to add a consideration on a theme that is perhaps less developed in this book: the enrichment of the curriculum, the disciplinary horizon, the extension of knowledge; the cognitive aspect is not the only factor of intellectual growth. It is also necessary to deal with the enrichment of the experiences that everyone has to live during their own lives and that are also part of learning. It is precisely for this purpose that that part of the brain, of intellectual potential, which is also a component of the natural propensity of the human being, is to be solicited: to engage with art, and especially with music. In other words, to feel, to be intellectual not only by producing *logos*, developing reason, but also by producing art, living artistic experiences.

And here it is quite urgent to modify the school structure that has existed even since before the birth of the unitary State, in the 19th century, and confirmed so far in the Italian school system (one of the great blasphemies of our history): art and music are not culture. This is an unworthy blasphemy, which has sacrificed generations and generations of young people, depriving them of an essential part of their education, the artistic one. A measure which is not only intellectually stupid but also socially backward: that is, making it impossible for the individual student to engage in his own creativity and become a permanent subject of innovation and individual and social growth, through what the stimuli of artistic production represent in the growth of a human being. Correcting this insane direction and instead giving full educational dignity to the artistic experience is necessarily part

of the structural modification of the system, and therefore also of self-organization – of a hope, that is, that the "heroes" of the school can create an education that is totally different from the current one.

We must realize it: school today does not need reforms, which I fear will be of little use. The school needs a real revolution, a scholastic revolution that puts learning at the center, and that therefore supports learning itself in a different manner, and which supports it both in a logical and artistic context and presents the students with what society will be like right from the time in which they begin to study. I allude to the culture of work. To the great educational value of the idea of work, of the culture of work, in which the human being deals with himself, in the crucial moment in which he is expected to become a social being, to place himself in this new dimension. All these elements, largely missing in the current structure of the school, must instead be found along the path of autonomy. In other words, we propose another kind of school, not the one managed so far by the apparatus in Viale Trastevere (the seat of the Italian Ministry of Education): a truly autonomous, self-organized school, the true school of autonomy, which is able to understand and value the contribution of artistic experience, creativity, work culture, their full formative nature for the cultural and social formation of the citizen, in a truly democratic country.

by Luigi Berlinguer
Minister of Education from 1996 to 2000

Acknowledgments

The writing of this book is the result of a long journey over several years, during which we met many people who gave us a significant contribution. The time has come to thank them for coming with us on this journey through self-organization in schools and innovative learning environments.

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University of Cagliari; Corrado Petrucco, associate professor of experimental pedagogy at the University of Padua; Maurizio Gentile, assistant professor of special education and pedagogy at the University of Verona; Franco Azzali, president of "Studio Pegaso", professor of general pedagogy at the IUSVE.

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We are grateful to Maria Grazia Carnazzola, principal of the "Piazzi Lena Perpenti" school in Sondrio, for showing us how to best use the resources present on the territory and for having strengthened the creativity of teachers and students in the face of a shortage of teaching equipment.

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We thank Anna Morrone, former principal of the "Randi" school in Ravenna, for showing us what it means to develop and carry on a shared culture needed to face the daily educational challenges, to believe in teachers and to enhance experimental teaching methodologies, to be able to cope with problems by investing in education. We thank her for her willing help during the sultry days of August inside an empty school.

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by Alberto F. De Toni & Stefano De Marchi

Introduction

The OECD countries are undergoing a major transformation as they are moving from a society based on an industrial economy to a society based on a knowledge economy. The rapid development of information and communication technologies (ICTs) is shifting the boundaries of educational possibilities, in particular enhancing the role of informal learning, in any place and at any time. We are facing a growing importance of online learning, the spread of *homeschooling* experiences and Self-Organized Learning Environments (SOLE) of great educational effectiveness.

These phenomena give the school system new unprecedented challenges. Traditional educational approaches are not equipped to efficiently address the scenarios mentioned here. Studies on the evolution of school systems highlight how the future of the school is based, on the one hand, on its responsible autonomy and on its consequent ability to interact with neighboring and distant communities and, on the other hand, on the individualization of learning. The digital revolution, which allows cognitive distance learning, does not seem to question the role of the school as a physical place for the acquisition of transversal non-cognitive skills. In any case, the successful changes in the school system emerge from the grassroots: all the successful international experiences prove this.

This work aims at studying and empirically verifying how to foster the development of an innovative learning environment, how it is implemented and what its level of innovation is compared to traditional methods. In particular, the authors investigate the organizational variables of learning environments, the factors that make it innovative and the extent to which they do.

In particular, they have investigated whether the introduction of the learning environment is favored as an alternative by

- *top-down* approaches, that is, whether the change should start from the top of the school system, with institutional policies that define the conditions of the context: educational policies, governance models, the role of leadership, the recruitment system, the career perspectives and so on.

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- *bottom-up* approaches, that is, whether the change should start from the grassroots, focusing on the organizational and educational innovation of the single school.

From what we have observed by visiting various Italian schools, innovations generally start from single schools and teachers, from networks of schools and networks of teachers, from parents and sometimes also from students: The perspective of self-organization – in the context of school autonomy – seems to be an effective interpretative key to the development of innovative learning environments.

Our research, therefore, focused on the organizational capabilities that are developed inside a school to guarantee the realization of innovative learning environments.

The structure of the book is described here. In Chapter 1 we examine the nature of learning and the learning classes, the factors of the effectiveness of learning, the concepts of the learning environment and self-directed, emerging and self-organized learning.

In Chapter 2 we proceed with the analysis of the literature on innovative learning environments. Fifteen significant contributions were identified, and five international case studies were analyzed as examples of *best practice*. The fundamental variables and the common principles articulated in the areas of organization, management and evaluation of learning environments were then identified. At the end of the chapter, we provide the definition of a framework for measuring the innovativeness of a learning environment.

In Chapter 3 the future school perspectives are examined first of all, illustrating a series of studies that identify possible scenarios. The first identifies six and the second four; the third investigates the impact of new digital technologies; the fourth explores the conditions of scholastic change in the current socioeconomic and cultural contexts. Answers are given to questions such as: Will the existing bureaucratic model be extended? Will schools continue to do as they have always done, according to *top-down* models? Or will the state withdraw from the management of the school, creating the conditions for a school immersed in the market model, innovative and dynamic, but exclusionary and unequal? Or will the school strengthen its role in close collaboration with the social community, focusing on learning, experimentation and innovation? Or, again, will we have the disappearance of schools, replaced by learning networks of students, parents or professionals?

The school is then analyzed as a complex system, contextualizing the study within the research fields known as *School Effectiveness* and *School Improvement*. Finally, the regulatory context of school autonomy is briefly described, within which the processes of change from the bottom-up can be activated, which gives rise to self-organization.

In Chapter 4 we focus on the perspective of self-organization as a key lever in the processes of change; the relevant experiences are analyzed, first that of self-leadership in the Jesuit order and then the self-activation in the Toyota

experience; finally, we focus on the organizational capabilities that enable self-organization: interconnection, redundancy, sharing and restructuring. A final question is whether hierarchy is inevitable, whether self-organization can be designed and whether hierarchy and self-organization can coexist.

Chapter 5 opens with a review of the literature on the subject of scholastic self-organization. Among the topics dealt with are weak ties, distributed control, distributed leadership, communities of practice and collaborative management. We then focus on the articulation of the capabilities of self-organization in order to build a framework for measuring them in the school environment. Finally, attention is placed on who the actors of self-organization are and what the styles of leadership in self-organized schools are.

Chapter 6 presents the results of the research carried out in 14 educational institutions, seven of which were high schools, five comprehensive schools, one junior high school, one primary and nursery school. Two associations are also described – along with their related projects – which work to reintegrate the students who have left school and which represent particularly innovative learning environments in the sense indicated by us.

The Concluding Remarks highlight the results of the scientific research and the suggestions that arise for *policymakers*. The key conclusion of the work is that the self-organized school's capabilities are connected with the level of innovation of the learning environments, that is, the more self-organized the schools are, the more innovative the learning environments are.

The results of this work are part of the strand of research of bottom-up emergency, understood as a process, and of self-organization, understood as a result of the emergency itself. This is an extremely fruitful trend for those interested in learning and in school systems, as shown by the experience gained on various continents by Sugata Mitra, a well-known scholar of the so-called *Self-Organized Learning Environments*. As reported in the text, according to the author, "education is a self-organized system where learning is an emerging phenomenon".

Part One

Learning Environments

1 The Nature of Learning and the Categories of Learning

1.1 The Nature of Learning

According to an international study conducted by the Center for Research and Educational Innovation (CERI) of the OECD on the nature of learning (OECD, 2010a), traditional educational approaches are not able to cope with the transformations experienced by the OECD countries, which have gone from a society based on an industrial economy to a society based on a knowledge economy. The great attention that has been placed on the quantity and quality of learning and on the measurement of results in recent decades – an example is the Program for International Student Assessment (PISA) – has led the CERI to go beyond the diagnosis and limits of these surveys and to study the ways in which we learn more in-depth and more effectively (OECD, 2010a).

The rapid development of ICTs and the growing availability and importance that these technologies have in the lives of young people are shifting the boundaries of educational possibilities by enhancing the role of informal learning. More and more young people, in fact, have access to digital media, and this is changing the way people socialize, play, learn, acquire and process knowledge, an increasingly social kind of knowledge, that is co-constructed, shared and less and less often transmitted passively. These methods make learning possible in any place and at any time, even outside those places and times historically and institutionally devoted to this purpose: "Technology puts students in a position to become actors of their knowledge and to build their own learning environment" (ibid: 25), or environments that go beyond the confines of the classroom and the school, at least as they have been conceived of so far. As Collins and Halverson (2010, 19) claim, although the students are in school, part of their schooling comes from out-of-school. Moreover, ICTs allow access at a low cost, for sharing texts and products, as well as for interacting and networking (Williams *et al.*, 2011, 54).

The OECD report on the nature of learning mentioned here (OECD, 2010a) concludes that, to be effective, or to achieve the skills of the 21st century, learning environments must:

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1. put students at the center, activate their involvement and make them aware of their activity as learners (self-regulation);
2. be based on the social nature of learning, therefore on group work and cooperative learning;
3. have "professionals" who are experts in learning, who are in tune with the motivations of the students, conscious of the role of their emotions for achieving scholastic success;
4. be sensitive to individual differences, taking into account innate knowledge;
5. be based on demanding and stimulating programs for all, avoiding work overloads;
6. operate on clear expectations, evaluated in a consistent manner; formative feedback has a great role in learning;
7. favor horizontal integration with the other cognitive areas and subjects, with the community and with the world.

To ensure effectiveness, therefore, these environments must, in some way, include all seven principles, although they can be applied flexibly in different cases. These environments are called *innovative learning environments* (ILEs), and they have been the subject of an international research project on 40 case studies that lasted three years and ended in 2013 (OECD, 2013).

Effective, in a different sense compared to the OECD criteria, were also those Self-Organized Learning Environments (SOLE) experimented with by Sugata Mitra starting from 1999 (Mitra, 2005; Mitra and Dangwal, 2010) for children of various depressed areas of the world where education is absent or of a low quality, which exploit the availability of personal computers, a connection to the network and other learners to learn without the need for a teacher or a school, or through the use of a non-professional mediator (*Self-Organized Mediation Environment* – SOME), and with results equal or superior to those of students at state or private schools. The results of this research show that, given certain minimum conditions – a computer, a high-speed connection, companions – education is "a self-organizing system where learning is an emerging phenomenon" and that the school is an obsolete system.

The work of Williams *et al.* (2011) in the English context of learning through web 2.0 networks goes along this same direction. Their work regarded whether this emerging type of learning, which arises from the self-organized interaction between people and resources, in which learners determine both the processes and the objectives of their learning, can be integrated with the prescribed scholastic environment.

1.2 The Concept of a Learning Environment

The concept of "learning environment" dates back at least to the beginning of the 1990s in the context of constructivist epistemology, but its historical roots can be found at least in the early 20th-century thoughts of J. Dewey.

It is a very widespread term today in the lexicon of educational sciences because in the psycho-pedagogical field, the passage from the paradigm of teaching to that of learning has been recorded and, therefore, we have moved on to a perspective centered on the subject, on its processes and on the construction of the context to encourage learning (Loiero, 2008; Istance, 2010; Marconato, 2013). There is plentiful literature (e.g., De Kock, 2004) on the different types of environments classified according to the three aspects that most influence learning:

a. the learning objectives,
b. the distinction between the role of the teacher and that of the learner,
c. the roles of the learners in relation to each other.

According to Perkins (1991), a learning environment is a place where learners can determine their own learning goals, choose activities, access information resources and tools, work with support and guidance. The learner engages in different activities for different objectives, where the teacher plays the role of coach and facilitator. In an interview on the occasion of the *At school with Love* International Gala of Education (February 16, 2013) organized by *Mindgroup* – International Community for Cooperation in Education – Perkins states that a learning environment must be flexible, it must exploit the local community as an extracurricular learning environment, it must make use of *peer tutoring*, teaching to and among students of different ages, and there must be the possibility to decorate the walls of classrooms with the work students have produced.

According to Wilson (1996), a learning environment is a place made up of a subject that acts, uses tools, collects and interprets information and interacts with other people: a place where one can work and help each other to use a variety of tools in the common pursuit of learning and *problem-solving* goals – a place where learning is not controlled nor directed but stimulated and supported.

According to Jonassen *et al.* (1999), knowledge is not transmitted but built through an activity, anchored to a context that gives it meaning; the construction of the meaning of the activity stems from a problem, a question, a confused thought, a disagreement and is shared with others through conversation; the meaning that is constructed must be articulated, expressed and represented, but the activity is manifold inasmuch as the perspectives on reality are multiple.

In a broader sense, the learning environment can be understood as a physical or virtual place, a mental and cultural, organizational and emotional/affective space altogether (Loiero, 2008). It is a dynamic, open system in which a true, rich and redundant "learning experience" is lived, in which the objectives are more the direction than the goal to be reached, in which the contents are not pre-packaged but constitute a flexible resource on which to draw as needed: this means that, at least at the beginning, the

environment is not already defined, but times and spaces are left partly free (Marconato, 2013).

At the beginning of the OECD project – Innovative Learning Environments – Istance (2010) defined any learning environment, innovative or not, as a set of activities carried out by a class of students over time through the interaction

a. of the students themselves,
b. of learning professionals,
c. of the resources and equipment,
d. of the contents.

It is expressed through different pedagogies, groupings of students, sequences of activities, the use of different resources and technologies, *feedback* and guidance in formal and non-formal environments, and informal if deliberate environments (adapted from Istance, 2010, 3). The OECD at the end of the project (OECD, 2013, 22–23) proposes a more organic and holistic definition that includes both learning and "background design" (the *setting*): that is "a learning ecosystem that includes the activity and the learning outcomes" and recognizes the context (the students with their social profiles, experiences, knowledge, expectations and family values) as essential and integral to the protagonists and to the variables of the learning environment – a perspective that admits a mix of didactic approaches, experiences and *settings* more in the logic of the age of *et et* than that of *either–or*.

From the conceptualizations just outlined, it emerges that a "learning environment" is a virtual or material place, but also mental and cultural, organizational and emotional/affective altogether, in which a subject constructs his own learning in a learning experience of interaction with other subjects, determining their own learning objectives, choosing activities, resources (books, web, video, etc.) and the rich and redundant tools (word processors, emails, search engines, etc.) with which to reach them, through the guidance, support and feedback of a coach, a facilitator, prompted by the context in which he/she is inserted, posing a problem, a question, a confused thought, a disagreement from which to start. A learning environment is an open and dynamic environment, in the sense that the objectives are a direction rather than a point of arrival, the contents a flexible resource on which to draw, times and spaces can be defined in itinere. It can be based on different pedagogies; it can make use of different groupings of students, sequences of activities and didactic approaches; and it can take place in formal, non-formal and informal environments. It must recognize both the context, in the sense of the place where the learning takes place, and the starting context of the students or their social profiles, experiences, knowledge, expectations and family values.

1.3 Self-Directed, Emerging, Self-Organized Learning

In a task for the National Consultative Commission on Creative and Cultural Education of the United Kingdom (the *Robinson Report*), it was hoped that, in order to teach one to be creative, the development of the self-directed student, the *self-directed learner* could be developed, who gradually develops his own autonomy, establishes goals, plans and manages him/herself, evaluates him/herself while self-monitoring, especially during that evolutionary phase in which there is more need for independence and there is more digital competence, that is during secondary school (Robinson, 1999, 106).

Semetsky (2005, 31) defines learning as an "emergent property of interactions among teachers, students and subjects, even in the absence of direct instruction and teaching".

Sugata Mitra, in his various experiments since 1999 (e.g., Mitra, 2005; Mitra and Dangwal, 2010), argues that learning is an "emerging phenomenon", proposing *Self-Organized Learning Environments* (SOLE), "self-organized" meaning a system in which there is no explicit intervention from outside the system. Such environments are as effective as the institutional public systems of the villages; however – as without supervision – they have limits and do not reach the results of the city schools: here then, a minimal intervention of an external mediator was used to reach the same levels successfully. Mitra hypothesizes that the approach could be one of support to reinforce traditional schools and complete part of the program in an autonomous and semi-autonomous way.

Williams *et al.* (2011) define as "emerging" that kind of learning that takes place in the interaction among people and resources where the students organize themselves independently and determine both the processes and, to a certain extent, the goals to be achieved. The interaction is self-organized, frequent and free, but within specific constraints; it is dynamic in the sense that the self-organizing agents and the system co-evolve. It can include virtual or physical networks, or both. It is open and flexible, therefore sensitive to the context and quick to adapt. The authors argue that emerging learning is not a panacea but an opportunity to be integrated with traditional, prescriptive learning into a broader and more inclusive "ecology of learning". The degree to which learning should be based on self-motivation and self-organization depends on (Williams *et al.*, 2011)

a. the quality of the interaction between resource and facilitator,
b. the interaction among the peers,
c. on the balance between opening-up and constraints.

In principle and in reference to the authors just mentioned, the terms "self-organized" and "emerging" are similar, although the term "self-directed" seems to refer more to total autonomy, to the lack of external intervention. Beyond the lexical terms, the central question at a conceptual level

is the degree of external intervention conceived and the most appropriate school age: in fact, we pass from completely autonomous learning, in terms of instruments, management, evaluation, without any external intervention, especially for secondary schools (Robinson, 1999; Mitra and Dangwal, 2010), to a moderate position that sees complete autonomy only as an extreme possibility "even in the absence of direct education and teaching" (Semetsky, 2005), up to considering an integration between external intervention and autonomy, between prescriptive and emerging learning, between self-organization and traditional schooling (Mitra and Dangwal, 2010; Williams *et al.*, 2011) to have better results and fewer limits in primary schools and to support traditional schools (Mitra and Dangwal, 2010), for a more comprehensive "ecology of learning" (Williams *et al.*, 2011).

For the purposes of this discussion, we will use the term "self-organized" to include both the choice of ends and means, and the evaluation and management implemented in a decentralized way, and to emphasize the opposition to "organized" in the sense of decided, structured, managed and evaluated centrally.

For the purpose of this work, the definition of Istance (2010) – present in the OECD (2013) – will be used, according to which a learning environment is innovative when, in summary, it is "student-centered, structured and well designed, personalized, inclusive and social", characteristics that together make this an effective environment, as is shown by the scientific research conducted on the nature of learning (OECD, 2010a); integrated with the role that autonomous learning has, which emerged from the studies on self-organized environments (Mitra and Dangwal, 2010) and on emerging learning (Williams *et al.*, 2011).

Concluding Remarks

Traditional educational approaches are not able to cope sufficiently with the changes that the OECD countries are experiencing. More and more young people have access to *digital media*, and this is changing the way people socialize, play, learn and acquire and process knowledge, an increasingly social kind of knowledge, co-constructed, shared and less and less often transmitted passively. It is a kind of learning that takes place not only in places and times historically and institutionally devoted to this purpose but in any place and at any time, a learning environment that goes beyond the boundaries of the classroom and the school.

The OECD (2010a) investigated the ways in which learning is most effective, and innovative learning environments seem to be the most promising prospect. Such environments put students at the center and involve them in the construction of their knowledge; they leverage on group work and the motivations and emotions of the students;

they are sensitive to individual differences, based on demanding and challenging schedules for all those involved; they operate on clear expectations and continuous formative feedback; and they integrate other knowledge areas, the community and the world.

Effective, but in a different sense compared to the OECD criteria, are also those *Self-Organized Learning Environments* (experimented on by SOLE) Sugata Mitra starting from 1999 (Mitra, 2005; Mitra and Dangwal, 2010): given certain minimum conditions – a computer, a high-speed connection, companions – *education* is "a self-organizing system, where learning is an emerging phenomenon".

Ken Robinson (*Robinson Report*, 1999) hopes that in order to teach how to be creative in school, one must develop the *self-directed learner*, or the learner who gradually develops his own autonomy, establishes goals, plans, self-evaluates, self-manages, while self-monitoring.

But the conditions must be created: Innovative learning environments build up the conditions for emerging learning. The question now appears to be: To what extent should emerging learning, which is born of self-organized interaction between people and resources, be integrated with prescriptive, scholastic learning (Williams *et al.*, 2011)?

2 Innovative Learning Environments

2.1 Introduction

The analysis of the literature on the subject of innovative learning environments makes it possible to identify a series of significant contributions, which are reported in Table 2.1. Most of the contributions concern school learning environments (8); others are related to adult learning environments (5) and to the university (4). Some experiences described are design experiments with a definite duration (10); others are regularized experiences (5). The method, the criteria and the procedure for the analysis of the literature are summarized in Appendix A.

Table 2.1 Classification of the literature by object and type of project

Contributions		*School*	*University*	*Adults*⋆	*Project*	
					Single	*Permanent*
1	Milrad (2002)		●		●	
2	Boyd and Jackson (2004)			●	●	
3	Ramboll Management (2004)	●				●
4	Koper *et al.* (2005)			●	●	
5	Mitra (2005), Mitra and Dangwal (2010)	●			●	
6	Louys *et al.* (2009)			●	●	
7	Scott *et al.* (2009)			●	●	
8	Westera *et al.* (2009)		●	●	●	
9	Chang and Lee (2010)	●	●			●
10	Williams *et al.* (2011)		●			●
11	Casey and Evans (2011)	●			●	
12	Laferrière *et al.* (2012)	●			●	
13	OECD (2013)	●				●
14	Creative classrooms by Bocconi *et al.* (2014)	●				●
15	Boersma *et al.* (2016)	●			●	
TOTAL		8	4	5	10	5

⋆ Most are Life-Long Learning projects

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2.2 The Dynamics of the Systems for Collaborative Learning: Milrad's Model (2002)

A seminal article on the construction of innovative learning environments is that of Marcelo Milrad (2002). The author describes the modeling, simulation and experimentation of collaborative learning contexts with the use of ICT for computer science university students in Sweden.

Simulated learning environments play an important role in the ways of learning and teaching of complex phenomena and problems both in the world of nature and in the social world (Repenning *et al.*, 1999). The tools of the modelling of the dynamics of systems make it possible to experiment complex systems and to better understand the mechanisms that govern dynamic interactions. The researchers ask themselves how these can be used to encourage the learning of complex phenomena.

This experience is part of some developments in educational research on

a. complex domains that are significant learning contexts as they require great skills in building and using models for experimentation;
b. collaborative learning and socially situated contexts (Rouwette *et al.*, 2000): Interactive learning environments can increase the processes of the cognitive and social learning of science.

Milrad suggests that the design of interactive environments for learning complex domains should be guided by

a. authentic activities that present real cases and practical implications;
b. construction and sharing of artifacts by students;
c. collaboration for the construction of knowledge through social negotiation and not competition;
d. reasoning to favor the practice of reasoning;
e. contextualization to allow the construction of knowledge dependent on the context;
f. multi-modal interaction to provide multiple representations of reality, and thus represent the complexity of the real world.

The activities designed on the basis of this framework lead students to identify research questions and variables, develop hypotheses, construct experiments, test results, analyze observations and improve hypotheses (see Figure 2.1).

The framework applies to a project of scientific study by university students that aims to understand the behavior and structure of a complex phenomenon in an ecological system – in the specific case, the impact of acid rain on the fish population of a lake – with the use of real data and the prediction of its future behavior. The learning environment is inquiry-based, involves a participatory kind of teaching and is technologically rich.

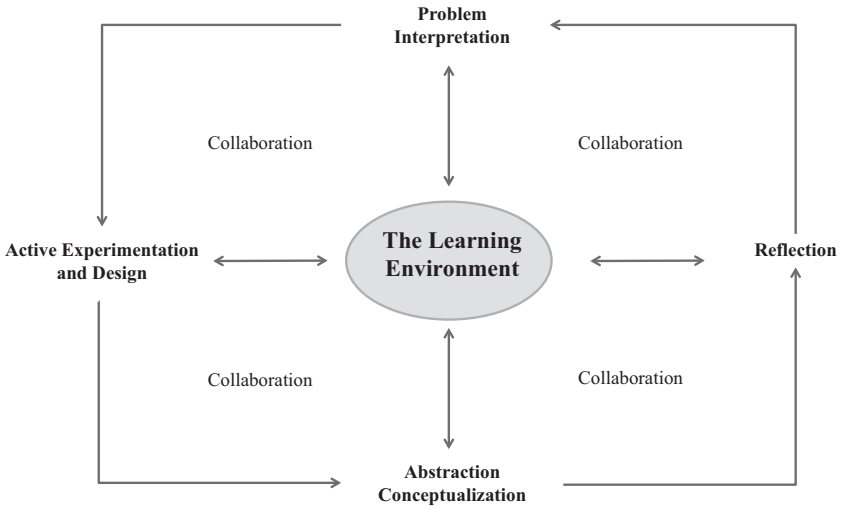

Figure 2.1 The framework used for the interactive learning environment (Source: Milrad, 2002, 80 © ET&S)

In order to analyze the problem, students must learn the specific aspects of biodiversity, collect data, design scientific instruments through ICT technologies, interpret data and use them in interactive simulations. The tools used are the *Model Builder*, the *LEGO-DACTA Robotics System*, the *ROBOLAB* programming system and the *Powersim Model Builder*.

The first step of the activity (Table 2.2) is brainstorming, where six students discuss the problem by means of the following guiding question: What are the factors that influence the issue in question? Then each student builds a mind map and, together with the others, a collective mind map. In the next step, the students create some models of the problem and obtain the results of the models using the *Model Builder* program. With this tool, through modeling and simulation, the students, divided into two subgroups, can test the hypotheses they have formulated, and by interacting, they can come up with a more accurate model. After a few weeks, the knowledge of the subject and the motivation of the students increase, and they want to test their hypotheses in an environment that is more true to reality than that of simulation: an aquarium. Using the *LEGO-DACTA Robotics System* program, ROBOLAB programming and a series of tools (temperature, pH, light sensors, etc.), the students collect and process the data.

To be able to infer and evaluate what might happen in the following five years, the last step is the examination of the problem through the *EcoSIM* software which, using dynamic systems, makes it possible to simulate the impact of pH and temperature on the fish population of the lake from 2001 to 2006. The students must deal with different cases, predict the results of the cases before

Table 2.2 Table of activities, skills and tools used for learning in complex domains

Task/complex thinking component	*Cognitive/social skills*	*Learning tools and strategies*	*Computational support*
Which are the factors that influence the pH level of a lake? **Problem Orientation**	Identifying main ideas Inferring Hypothesizing Reflection	Mental Models Concept Mapping Modeling **Problem-Based Learning**	Inspiration *Model Builder*
Putting the problem in a context. Build a device that can monitor the pH and the temperature of the lake? **Inquiry Exploration**	Planning Determining criteria Concretizing Inventing a product Group discussion Collaboration	Construction Manipulation Visualization Situated Learning Constructionism **Inquiry-Based Learning**	Lego Robotics System Robolab Software
Giving the problem a time perspective and a new context. What will happen with the fish population of the lake in 5 years from now? **Policy Development**	Hypothesis formulation Identifying causal relationships Inferring Prediction Assessing Group discussion	Casual Loops Model-building Simulation **Decision-Based Learning**	PowerSim Simulations PowerSim + Robolab

(Source: Adapted from Milrad, 2002, 82)

simulating, carry out experiments and modify their models while monitoring their behavior. Then, the predictions are compared with the results.

In the evaluation, the methodology during the entire project is qualitative: the students are interviewed before the activities; they keep an online diary of their experiences on the individual and group aspects of the project, on the skills related to technology-based learning; and they are interviewed after the project ends. The results show that the approach is effective in the sense that it motivates students in interactive modeling, designing and using simulations. The major advantage of this approach is that the project stimulates discussion and peer collaboration; the biggest disadvantage is that a long period of time is needed to complete the job.

2.3 Simulation and Integrated Learning Environments: The *EnterTech Project* (2004)

EnterTech (Boyd and Jackson, 2004) is a project based on a collaboration among 80 members (employers, teachers, government and associative bodies) for the development of a training program for non-specialized workers for use in the high-tech sector in Texas during the period 1998–2005.

In 1998, high-tech companies reported a lack of skilled workers, and hired workers lacked computer, communication and problem-solving skills.

The learners covered by the program were unemployed or under-employed, beneficiaries of state aid, youths at risk, teenage parents and workers on income support. The objective of the project was to meet the needs of those companies by providing learners with the necessary knowledge and skills. Normally, the most appropriate form of training in these cases is apprenticeship; however, given its cost, the recreation of a real work environment through computer simulation is an alternative.

The so-called integrated environment, *blended learning*, consists of a simulated high-tech company in which learners "play" the role of employees, who perform actions, foresee the consequences of those actions, carry out group projects, all with the tutoring of a teacher who certifies skills by building a portfolio of student work. The curriculum design is based on the guidelines proposed by a study on the training needs of people, a study that used the principles of constructivism, the social theory of learning and cognitivism.

The project, carried out during the period March 2000–November 2001, involved 238 students and consisted of 45 modules of 50 minutes each; 70% of it was based on IT activities and 30% on both individual and group work, all led by a tutor. Students could choose the frequency of class attendance, on average for six weeks, some in the weekend, some in the evening. The environment consisted of a computer lab attended by 5–20 students and a tutor. The object of the training was knowledge, skills and competences for the achievement of 44 performance objectives organized in eight areas:

1. generic work skills, that is, the processes and procedures common to any workplace;
2. human abilities, such as awareness and interaction with colleagues and superiors;
3. organizational skills, such as the management of information, time, emails and IT tools;
4. communication skills in giving and receiving instructions;
5. skills in reading and writing graphs and diagrams;
6. calculation skills;
7. strategic problem-solving skills;
8. skills related to personal growth through meta-cognitive activities.

Skills were learned in three simulated environments typical of a high-tech production company – the warehouse, materials management and material assembly. In these environments the students met virtual colleagues, supervisors, and they simulated the typical activities and lived that environment with the noises and terminology peculiar to them.

The components of the integrated learning environment were as follows:

a. Computer-based training, therefore virtual meetings, simulated activities, a virtual library, repetitions when "needed", multimedia hypertexts with cartoons to make decisions, interactive audio and visual

stimuli, work previews; each "worker" had a badge and a registration number, and every working day began with a meeting with the supervisor, the virtual colleague showed how to perform an activity, then the work continued with more difficult activities; the library contained tutorials on activities, a dictionary for each activity, bibliographic information on colleagues and the *EnterTech* regulations.

b. A realistic working environment in which the tutor has electronic tools available for class management, to add students, to monitor performance and be warned of difficulties and to modify the program.
c. Group projects based on peer interaction and presentations.
d. Printed materials, such as a workbook for activities, a logbook for personal and work responsibilities, for managing stress and working on self-esteem, for managing money and various contingencies.
e. The skills certificate, with a performance assessment for each of the skills and a qualitative assessment by the tutor, as well as a portfolio of work with all the material produced by the student.

The results took into consideration both quantitative and qualitative aspects through the analysis of performance objectives: most (93%) of the learners reached level 4 (out of 5) in each of the skill areas without the need for special help or significant errors; 53% managed to integrate the skills learned with solving problems (level 5). As for the employment rate, 44% got a job and 29% continued their studies. The employers of those who got a job expressed a high degree of satisfaction in their performance at work.

2.4 Innovative Learning Environments: The Study of Ramboll Management (2004)

Between August 2002 and December 2003, Ramboll Management conducted a study on innovative school learning environments for the Directorate General for Education and Culture of the European Commission (Ramboll Management, 2004). The purpose of the study was to present to the Commission the state of the art on theoretical and practical trends in innovative learning environments within the European Union. The report describes the European situation through case studies, develops a prospective analysis aimed at identifying trends and concludes with a series of recommendations for future action. The study focused on e-learning and indicated the particular relevance of new information and communication technologies.

By "learning environment" we mean "a place or a community in which a number of activities takes place with the aim of supporting learning and where the actors can draw on a number of resources" (ibid: 50). There is a strong emphasis on the constructivist approach to learning and the use of ICTs. Activities occur between teachers and students according to a framework that includes resources and rules.

Since an environment can be innovative in one country and not in another, a general four-level model is used to describe a learning environment:

1. the external structure, such as national policies, technological development of the country, curricula and funds;
2. the educational context, that is, educational theories and teaching methods, the role of teachers and students, learning objectives, and the organizational context, that is to say the funding for the learning environment, the technological structure, management and administration, the strategy of the single school and the teaching materials;
3. the learning environment in which teachers and learners interact, the educational theories employed, the teaching methodologies and the technologies used;
4. the actors, as individuals involved in the activities.

The change can occur at any of the four levels, and this affects the existing structures, consisting of:

a. rules, that is to say habits and practices, such as the roles of teachers or students, the ways in which communication takes place, sanctions, cooperation among teachers and management of principals; and
b. resources, divided into "authoritarian" (e.g., directing because a person occupies a position or because a person is more competent) and "allocative", that is to say materials (such as money, technology, buildings).

Ultimately, an innovative learning environment is seen as the result of social, organizational, institutional and individual changes.

The six case studies are considered as innovative in their national contexts and analyzed through the framework, five within the European Union and one outside of it:

1. the De Lindt elementary school (which covers an age ranging from 4 to 11 years) in Helmond (the Netherlands);
2. the Gylemuir primary school (from 3 to 12 years of age) in Edinburgh (Scotland);
3. the Maglegårdsskolen primary school (from 5 to 16 years of age) in Gentofte (Denmark);
4. the Lavinia Educational Center (from 3 to 12 years of age) in Barcelona (Spain);
5. the Vinstagårdsskolan (from 11 to 14 years of age) in Stockholm (Sweden);
6. the Coal Tyee Elementary School (from 3 to 12 years of age) in Nanaimo, British Columbia (Canada).

These schools have classes with students of different ages that work in large or small groups; teachers' activities are reorganized to allow more teamwork

and collaboration; also the interior spaces have been revisited. Key relationships are less and less teacher–student, more and more student–student, and the teacher is increasingly a tutor, a guide, a supervisor who provides the framework within which learning takes place.

The case studies highlight how learning is achieved through a new organization of the class space, through ICTs, with personalized paths, minimum or different objectives, especially through tasks limited in time and in purposes. The involvement and commitment of parents in the development of schools are essential. The school uses and develops its own educational material so as to personalize learning.

The six case studies show that innovative learning environments are not so dependent on the use of ICTs, but rather they are based on the reorganization of the learning situation and on the ability of teachers to use ICTs.

For example, ICTs are used as a tool for exchange, collaboration, twinning among students, teachers, classes, schools, although this often occurs within the classroom and less often among classes or schools, and less frequently for simulations or for using play for learning.

The new ways of learning are also realized through a new scholastic architectural structuring, thanks to the introduction of new spaces or new buildings. According to many teachers and principals involved, innovative learning environments can be created anywhere regardless of buildings.

The results of the study suggest a paradigm shift, from the transmissive paradigm to the constructive one: therefore a more active and responsible role of the students, the need to individualize learning, the importance of participation and group work, the teachers' role more of guidance and supervision rather than that of transmitter of knowledge, the transition from reproduction to knowledge creation and a reorganization of learning time and teacher work. The role of ICTs in learning seems preponderant in this transition to the new paradigm, especially to allow social inclusion and equal opportunities; however, there are important differences in the public investment of member states, as the result is ambiguous: support for traditional methods or a means to radically transform the methods.

The study also shows critical issues in the implementation of these new environments. For example, there is a need to evaluate the new skills acquired in new ways that do not fit into the present national systems of assessment. There is still some concern among parents and teachers about the effectiveness of these methods on national tests compared with more traditional ways of learning: In two case studies the results are excellent, the schools are ranked second nationally. For some schools the use of ICTs is an excellent tool for students with dyslexia or with impaired mobility. Sometimes teachers show resistance to change because of the extra work to be carried out, especially at the beginning.

The case studies support the main thesis of the relationship, that is that there are multiple variables, and not only ICTs, at the base of the development of innovative learning environments, especially the strategies of the single schools, the management style, the attitude of the parents.

2.5 Self-Organized Networks of *Lifelong Learning*: Koper's Model (2005)

A forward-looking approach to *Lifelong Learning* is the use of ICT networks to connect students and teachers in learning networks with widespread access and linked to all the tools and learning resources (Koper *et al.*, 2005). Resources from schools, libraries, companies and the students themselves are made available to students.

A learning network consists of "a team of people who interact to create and share learning units in the development of their skills in a subject" (ibid: 72). It is a network with two types of bonds:

1. the members who form the learning community share a common practice, are interdependent, they govern themselves and organize themselves in a decentralized structure where there is a common commitment to generate and share knowledge; the activities are flexible and discussed, and the objectives (a problem, a project) are shared;
2. the learning units, which consist of activities such as courses, laboratories, seminars and tests, based on pedagogical models such as *Mastery Learning*, problem-based learning, active learning.

From an organizational point of view, the best approach to the learning network is self-organization as it is more efficient; it requires teachers to correct activities and participate in discussions; it requires little planning and control, it is flexible and allows two types of feedback:

a) Every participant in the community knows what the others are doing regarding the learning activities;
b) The quality of the performance is guaranteed through comments on the activities and the rankings.

The study involves 25 users. Each participant dedicates two days a week for six months through weekly plenary meetings (six hours) and work to do at home. The activities take place in the group as a whole or in smaller, formal or informal groups. Each user must start with any two "core" activities, being able to choose different routes: each activity/core is made up of the members and learning units, and also of all the activities (in class, individual, group, laboratory, project, etc.), of information on participating users, their feedback, the rules of the core, that is how one passes the exam and how one fails. Each user chooses a route: Everyone starts with two introductory activities/cores and then chooses others in any order (in Figure 2.2(a), a possible route); the itineraries can also be planned (as in Figure 2.2(b)) as happens in traditional education, where the teachers are responsible for them, or they can be constructed by sharing users' routes, their experiences and the resulting itineraries that are most effective. Each member is involved in

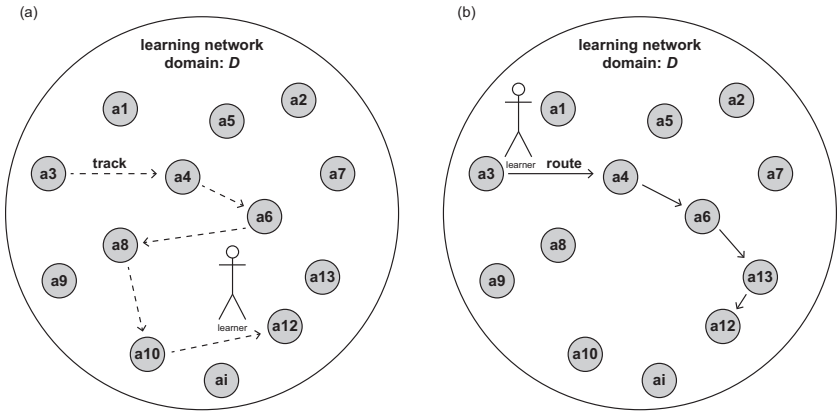

Figure 2.2 (a) A route of activities/cores for a single learner; (b) a pre-planned route that a learner can follow

(Source: Koper *et al.*, 2005, 82 © Interactive Learning Environments. Reuse not permitted)

the creation and development of the activities/cores, organized as follows: introduction to the topic of future work, units that cover the pre-requisites required for the topic.

Every week users leave their comments in the interactive *Groove.net* environment, which, besides providing this function, has a discussion forum, a file-sharing platform, collaborative writing, shared calendars and so on, and a system of assessment of the platform after four months.

Regarding the results of the project, most of the requirements that a learning network has are fully satisfied: each student can take on a different role (learner, teacher, discussant, activity builder, etc.); the starting knowledge is heterogeneous; there is interaction and support among the participants; as well as distributed control so that everyone can take the initiative to develop an activity-core, start a discussion or plan a topic.

Other objectives are achieved in a partial way: from the pedagogical point of view, the activities must be centered on the learner, but the "natural" knowledge of the learners is not always taken into consideration.

2.6 Sugata Mitra's Self-Organized Learning Environments (2005)

Sugata Mitra is Professor of Educational Technology at the School for Education, Communication and Language Sciences of the University of Newcastle in the United Kingdom. He is the one who conceived of the *Hole in the Wall* experiment in 1999, a computer with an Internet connection lodged in a wall in a degraded area in New Delhi to allow the children of

the place to freely use it, and the children's behavior was video-recorded. Within a month, the children showed that they knew how to use the computer and had acquired basic skills in English and mathematics (Mitra, 2005). Hundreds of workstations of this type are operating in India, Cambodia, in six African states and at the University of Newcastle (Mitra and Dangwal, 2010).

The experiments show that children can self-educate themselves using public workstations with computers and Internet connections (Mitra and Rana, 2001; Mitra, 2003) and that these can help them learn and have an impact on the acquisition of social values (Inamdar, 2004; Mitra, 2004).

Between 2001 and 2004, Mitra conducted an experiment to verify and assess these results. Workstations were set up in thirty-one places (twenty-one in rural villages in India, six in urban suburbs of New Delhi and four in rural villages in Cambodia) for a total of 100 computers, one for every 200 children. The workstations, usually close to school areas, had no teachers, also because in those degraded areas there were few teachers willing to work; an employee had to turn the computers on and off every day: the workstations were open from 8 am to sunset, every day, even on holidays.

To work in hot climates with the little electricity available, the computers were placed in niches of a stone structure (hence the term *Hole in the Wall*) protected by a screen. A special device replaced the mouse, which, because of where it was placed, made access for adults difficult, while it was ideal for children under the age of thirteen.

To avoid vandalism, the workstations were located in safe places, visible to passers-by. Each computer was equipped with a web camera and a microphone and in order to promptly monitor the activities, the chronology of the programs and open images, the sites visited, the video images and the audio of the children who used the computer were recorded. Furthermore, the system did not allow any tampering with software or icons. During the four years of experimentation, only four computers suffered damage and only 0.3% of the time available was used to access pornographic sites (Mitra, 2005).

In the experimentation of the first twenty-one villages, in each location, a focus group of fifteen children was randomly identified and given a test to check their computer skills once a month for nine months. Two control groups were set up: a group of as many children who could not use the workstations and a group of regular users.

The workstations were distributed in different villages in terms of climate, environment, culture, socio-economic, genetic and educational backgrounds. The results showed an increase of IT skills from 6.65% on the first day to 43.07% for the focus group on the last day of the nine-month period of experimentation; for the control group at 6.94% and for the group of frequent users at 43.73%. Therefore, the experiment shows that children are able to learn computer skills by themselves if they are given what they need, regardless of who they are or where they live. The fact that this self-learning

does not take place at school where children are divided by age or gender groups, suggested to Mitra that the learning group must be diversified; and this can also be extended to the learning of other disciplines (Inamdar, 2004): the *Hole in the Wall* workstations can constitute an alternative learning environment that obtains results at a reasonable price (Mitra, 2005).

The positive results of the research led to new investigations (Mitra and Rana, 2001; Mitra, 2003; Mitra *et al.*, 2005) which confirmed the fact that children can become IT proficient on their own to find answers to their questions through the use of the Internet; they can learn the amount of English necessary to use emails, to chat and to use search engines, to improve their pronunciation in English (Mitra *et al.*, 2003), to improve school results in mathematics and science (Nicaud *et al.*, 2006), and to develop social skills and the value system (Mitra and Dangwal, 2010).

There are various areas of the planet where geographical, economic, social, political or religious factors limit access to the schools and where good teachers do not or do not want to go. Mitra then wondered whether self-organized learning in these areas was possible (Mitra and Dangwal, 2010). In the new project the question is whether Tamil-speaking children with a minimal knowledge of English, in an Indian village, could learn basic concepts of molecular biology in English by themselves; if a friendly mediator, with no teaching or science skills, could help them; and what the relationship was between the results of this village and those of children with fluent English in a local public school and those of a private city school.

The research project took place in a remote village, Kalikuppam (Pondicherry, India), with a primary school for children from 5 to 15 years of age in which English was taught, but it was not the means of communication either at school or in the village. The material of the subject was loaded into the workstations; tests were built to be given beforehand; within a time period of 75 days the students (34 randomly chosen between the ages of 10 and 14) could access the materials through two *Hole in the Wall* workstations after having asked them to have a look at some interesting but a bit difficult English material on the computer. After that interval of time, the chosen group took verification tests. A local adult mediator was then identified (open and sympathetic toward students) who was not a teacher, who had no knowledge of molecular biology but was willing to work for another 65 days with the students. At the end of the period, a test was given to the group. The test was then extended to a group of the same age at a local public school of lower-middle class where the subject was taught and who had better skills in English and to a private elite-town school in the same conditions.

The results of the study show that unsupervised students are able to self-organize into work groups and achieve the same results as the local public school, but not those of the private urban school. Left alone, the students are inclined to choose and excel in what they like best, not everyone learns everything; some reach positive results, some reach none. However, if they

are supported, supervised by a mediator who encourages rather than teaches them, students achieve higher results compared to the state school and equal to those of the urban school. Mitra hypothesized that the approach can support reinforcing traditional schools and completing part of the program in an autonomous and semi-autonomous way.

The question then arose as to whether this type of learning could also take place in other educational and cultural contexts, and experiments were then conducted in England in 2009 with students between the ages of 8 and 12 in answering questions for a GCSE (General Certificate of Secondary Education) exam to be taken at age 16. The results confirmed the initial hypotheses provided that it was possible to work in groups of four, that each group had a computer, that it is possible to have a dialogue among the groups and that there was not a teacher, but at most a non-invasive mediator.

Based on these results, 12 *Self-Organized Learning Environments* (SOLEs) were built in degraded areas of India, consisting of a room located near a school and visible to all, equipped with nine computers arranged in groups of three to facilitate the interaction among the groups and within the groups. Each computer was normally used by four children, with a dense array of observers behind them. In 2010 a SOLE was established at the University of Newcastle and in Turin.

When, instead, the environment is mediated, not necessarily by teachers, then the *Self-Organized Mediation Environments* (SOMEs) are introduced, that is environments that use some mediators, mainly pensioners who voluntarily dedicate an hour a week to supporting groups of children via Skype for the purpose of learning English, social skills as well as improving school results in general. The so-called *granny clouds* can be a resource, according to Mitra, to support and encourage children in learning, to read stories, talk and sing.

2.7 Social Inclusion and Skills Development: *The TENCompetence* Project by Louys (2009)

The *TENCompetence* (Louys *et al.*, 2009) is a four-year project – within the 6th Framework Program of the European Commission for technology-supported learning – which has as its object the education of adults who have in some way been "excluded" from institutional education.

The objective was the construction of a technical and organizational infrastructure for the development of lifelong skills that are typically learned in a self-directed, self-organized manner. The experimentation on groups with high-level schooling works and the question posed by the authors was to what extent it might also work for users with low-level schooling.

The *Àgora* association, part of the La Verneda Adult Education Center – Sant Martì located in Barcelona, is a non-profit organization for training in non-formal contexts. The primary objective is to promote educational and

social inclusion through democratic participation. It provides a daily service, seven days a week, for 1600 users with the use of 100 volunteers and 10 salaried people.

The activities are free of charge and cover the learning of languages (Catalan, English, German, etc.), basic skills, computer science, preparation for university entrance texts. The users are mainly adults without a degree, young people who have not finished school, women, immigrants and disabled users who have a motivation to learn. The priorities of the association are the use of ICTs in all the courses offered, the development of communication skills through interactive groups in the classroom and respect for the values and the ethical competences of the Charter of the Rights of Adult Education.

The first *Àgora* pilot project took place in a computer room equipped with nine computers where the *TENCompetence* infrastructure could be used at any time, on weekends, at home and at the end of the project.

The ten skills on which participants could participate in were ICT (as for example Word, emailing, the Internet, PowerPoint, Blog) and English. Each skill contained from three to twenty activities to choose from, and lasted from 15 minutes to 3 hours. The pilot project included more than 100 participants, 7 experts and 13 IT technicians.

Since 2008, the *TENCompetence* server has been equipped with a software tool for the planning of personalized learning (*Personal Development Planner*) to define a skills profile, objectives, and motivation, creating a personalized learning plan, according to one's own rhythms and times, with a continuous process of self-evaluation.

The tool began with a self-assessment of one's own levels for each key competence determined by the experts of the association, then a personalized plan was generated with the activities necessary to reach the competences. Each activity also included a brief description of the contents and links to external learning environments. As the activities were carried out, they disappeared from the "to do" area, and activities could be found in the "chronology", as activities for future use. The software tool also had a blog to post comments on.

The evaluation of the pilot project, both quantitative and qualitative, included the background of the participants: how much and how they used the functionality of the infrastructure; how much they appreciated the resources, collaboration, control over their learning; how much time they spent in the system, etc.

The results showed that a technology-centered self-learning project is successful even with participants with different backgrounds and low educational levels; the participants liked the concept of self-organized learning because they were able to choose to learn on their own time, select activities according to their interests, and they continued to use the *Personal Development Planner* at home after the project ended. However, it takes time to change habits.

One of the skills acquired by users was to reflect on the present activity in order to guide the future one in a continuous process that also made it possible to acquire security and see possibilities for subsequent development.

Among the aspects to be improved in self-organized learning technologies are: the need for more interactive features, feedback and support within the system.

2.8 Self-Organized Online Peer Learning: Scott's *Prolearn Network of Excellence* (2009)

The *Prolearn Network of Excellence* is a project funded by the program of the European Commission known as *Information Society Technology*. The purpose of the study was to find out whether learners can effectively and responsibly have self-directed learning strategies, that is have an active cognitive role in their own learning, through an informal online context that accompanies more formal study programs. The online context consists of videoconferencing systems, SMS telephone messages, computer instant messages, chats, forums, shared browsing and virtual whiteboards without any direct supervision or external support. According to the authors, a probable scenario is that this type of learning will replace the more formal and conventional learning models (Scott *et al.*, 2009).

The survey covered 100 students from all over the world who, for 18 months, attended a course entirely online in techniques and animation tools (traditional and digital) designed by an American company that had provided video tools, case studies for this purpose and professionals for discussion groups. Within this virtual environment, the student could use the course materials, the web space to publish the tasks, write in a forum, compose messages in a chat, etc. The course consisted of 12 modules for each of which the student has an individual tutor/mentor online for guidance, support and evaluation.

The interesting part of the research consisted of the fact that in the middle of the course a student asked if it was possible to use the video tool, provided by the web platform, for personal reasons. The request is granted and the student was given an account with which he could book online video appointments with up to 25 participants at the same time. The student community was therefore left to itself for eight months although all video conversations were recorded. The community was made up of 58 active students, that is, the students participated in at least three online meetings; they were between the ages of 18 and 50 – half of them were American and the other half came from all over the world. The software tool used was *FlashMeeting*, which allows, in addition to video communication, a chat with text, a system for voting, sharing web addresses and using smileys. During the six months the research was conducted, the community met 99 times (four times in a week) for an hour and a half/two hours each time and involved between 2 and 34 people per event. At the end of the research, a questionnaire was given to the active community and an interview was conducted.

Among the results of the research, the fact that the community made use of the system for such a long time is an indication of the value it had for the participants, taking into account that no positive or negative incentive was provided. From the interviews, it emerged that the first result of the video appointments was the maintenance of the community, the perception of being "connected" even if at a distance. The effort is impressive; there was no need for a formal structure of teachers or professional mentors to make the value of help be perceived among peers, but the community managed itself in its own way. Students could download the work of their colleagues and review it. Not having any external intervention, informal rules were established for the community to keep their attention on the task, although the student who started the videoconferences had a facilitating role. An important aspect for the participants was that the community was international. Finally, the authors argue that it is possible that the subject of the course, animation, is particularly suited to peer learning.

2.9 A 2.0 Approach to *Peer Tutoring*: Westera's Model (2009)

The work of Westera *et al.* (2009) focused on a 2.0 approach for the development of *peer tutoring* in an online learning environment. Generally speaking, online environments require teachers to receive frequent and "tailor-made" individual support with the consequence of a great workload for teachers or tutors, especially if the distinctive feature of online environments is the high individualization of the routes. Therefore, either the number of available teachers/tutors is increased, making the courses economically unsustainable, or the quality and effectiveness of the service are lost. An alternative is the use of *peer tutoring*. A good deal of the research holds that *peer tutoring* obtains higher results (Fantuzzo *et al.*, 1989; Gyanani and Pahuja, 1995; King *et al.*, 1998; Wong *et al.*, 2003) and that it improves motivation, reasoning, esteem and effort (Fantuzzo *et al.*, 1989; Anderson *et al.*, 2000).

Instead of having students request help in forums or shared spaces, the authors proposed a model for the assignment of tutor-peers. When a user asked for help, the system selected a peer student, within the student population, who:

a. had, in the past, acquired the competence necessary to satisfy the user's request;
b. allowed for a fair workload among the students and therefore avoided an excessive commitment for the best students.

By student population we mean all those who were individually and remotely working on learning units, problems, tasks, chapters, pages, paragraphs or exercises: in this way, students were placed in different "parts" of the course, and traces of individual routes and the progress made were constantly updated.

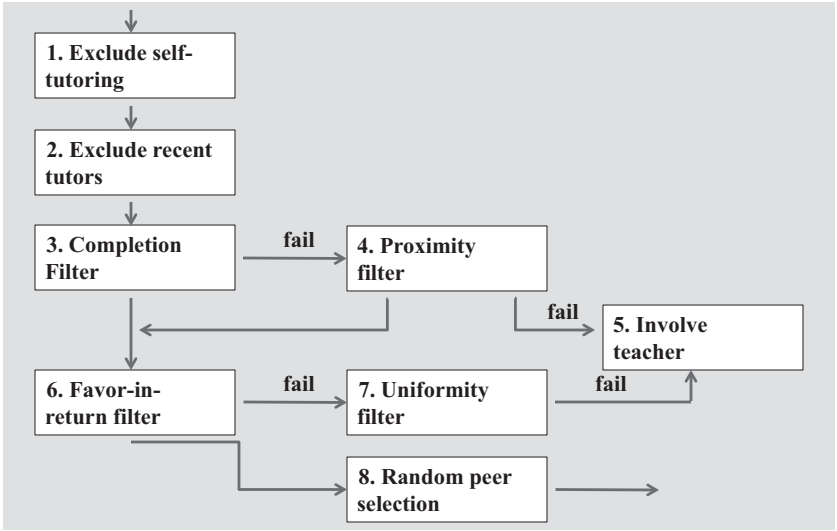

Figure 2.3 Representation of the algorithm for assigning peer tutoring
(Source: Westera *et al.*, 2009, 344 © Interactive Learning Environments. Reuse not permitted)

The assignment algorithm used two separate but combined filters (Figure 2.3):

1. the qualitative one chose the candidates on the basis of completeness, that is on the basis of whoever had finished that particular task/activity even considering how much time had passed since completion (most recent users were preferred) and based on proximity, that is, with respect to those who were doing the same activity at that time;
2. the "economic" one chose on the basis of whoever asked for assistance previously and therefore had to "return the favor" and taking into account the students who had given fewer hours of tutoring, based on the principle of uniformity.

Once the student's question was matched to the most appropriate tutor, the system had to support a communication between the two and verify its effectiveness. For this reason, a *client-server* solution was developed based on a TCP connection, a database with user data and software for the management and monitoring of the courses.

The prototype was built with a *Borland Delphi 7*; it used tools such as *Indy*, *Nextsuite*, *IvkActiveScript* and *scCom*, and was made available to students and teachers via web, online and off-line, with an interface similar to that of Microsoft applications.

Two pilot projects were implemented. The first with psychology students at the Open University in the Netherlands, in a course on statistics, chosen

because it typically requires a great deal of support: 104 students, between the ages of 25 and 55, chose to participate in the experiment. The second with the Fontys University of Applied Sciences as the only support available in an ICT Media Design course with 20 participating students aged between 19 and 21. The two programs lasted for three months.

During the two pilot projects, the system was constantly monitored; however, participation was limited even after several invitations: Only a quarter of the students loaded their workstation after three weeks; at the Open University, out of 104 students only 41 actually used the system and only 19 posted questions; at Fontys University, nine students out of twenty installed the program, but there was no interaction.

It is, therefore, necessary to understand what barriers were encountered by the participants: At a theoretical level the tool is useful for giving and receiving information provided that it does not take much time and does not hinder one's own learning. Some criticism was put forward:

a. regarding the lack of personal involvement, given that the system is a prototype and it gives the impression of a lack of real willingness to help, so much so that the participants preferred to use emails, the telephone or a discussion forum;
b. regarding the inadequacy of the courses in which the requests concerned information, so that a search on the web was sufficient to finding the material and therefore, that support was not required;
c. regarding the interference caused by the continuous live meetings between students and teachers that clashed with the sense of the pilot program.

As a result, the 2.0 approach to *peer tutoring* is useless when live communication remains and the course consists of only a few people as in the case of Fontys University. The system can instead succeed when:

a. the population is large (at least 100 students);
b. the participants do not know each other;
c. there are no teachers, or alternatives such as forums, teachers themselves or the web do not give solutions;
d. the activities to be carried out have as their object, problems and not information (obtainable in another way).

The fact that the system creates a sense of belonging to the community must not be forgotten, and this favors its success.

2.10 The *i*^{4} *Future Learning Environment* by Chang and Lee (2010)

The *Center for Excellence in e-Learning Sciences* (CeeLS) was born within the National Taiwan Normal University (NTNU), funded by the National Science Council of Taiwan in collaboration with other institutes and

universities in the world dedicated to science education, to computer science and computer engineering, and it aims at developing an innovative learning environment for science. Innovative is understood as integrated, intelligent, individualized and interactive, hence the name *i*^{4} *Future Learning Environment*.

The integration is related to image processing technologies, speech processing, automatic video processing, speech recognition, mobile technologies, automatic translation, natural language processing (data processing), data mining and machine learning. The goal was to build intelligent classes that made use of individualized and interactive learning and evaluation materials (Chang and Lee, 2010).

This happened via three research directions:

1. Class 2.0: A class equipped with technologies, for example for the automatic video processing or for speech recognition, the fact that they were intelligent, in the sense that they were aware of the context and that they reduced human work; interactive, in the sense that they had to facilitate interaction between student and teacher; individualized, that is they behaved differently depending on the user; and integrated, in the sense that they constituted a single system.
2. Mobile 2.0: A class that allowed widespread interaction among students, teachers and peers through a common platform that exploited the devices in the hands of the users and included security systems.
3. *Testing* 2.0: Some technologies, such as machine learning, natural language processing, automatic translation and modeling, were used in order to improve the evaluation of content, of score assignment and of the tools of the method of analysis with the aim of developing tools to build tests with items, to correct, to deliver and record grades, to store and classify test items by topic, for the automatic translation of international tests into Chinese.

The project lasted three years (2008–2011) and was divided into the following phases:

a) Development (2008–2010): A learning environment was built for the study of science using, for example, technologies for automatic video processing; the pilot courses chosen were those of earth sciences and computer science.
b) Collaboration (2010): The University of Taiwan established cooperative relations with Carnegie Mellon University, the Georgia Institute of Technology, the Universities of Oxford, of Texas and of California for the design of new materials and the exchange of ideas.
c) Implementation of assessment tools (2010–2011): Tools were developed for the evaluation of teaching methodologies, learning strategies, student–teacher interaction, learning outcomes.

d) Evaluation (2011): The results of the research formed the basis for the development of future environments not only at universities but also at high schools.

2.11 Emerging Learning in the 2.0 Network: The Williams's Model (2011)

Williams *et al.* (2011) investigated the nature of and the conditions that allowed self-organized and emerging learning. In particular, they studied whether emerging learning can self-evaluate and correct itself and whether it can be integrated with the prescribed one, in this case university learning. The authors drew from the theory of complexity (Cilliers, 2005, 2010), from the Community of Practice (Wenger, 1998) and from Connectivism (Siemens, 2005) to develop a framework for the management of emerging learning and networks in which agents and system co-evolved.

Even if the increasing availability of resources for teaching and learning such as e-books, online magazines, blogs, wikis, Skype, virtual conferences and Twitter seem to have been received positively by universities, in practice there is a predominance of traditional teaching methods, prescribed learning outcomes and conventional hierarchies, for which the universities have not always managed to address the issue that, although the students are in school, part of their schooling comes from out-of-school (Collins and Halverson, 2010, 19).

The fact is that although many students use social networks (Barnes and Tynan, 2007), they prefer to keep the "private" space of smartphones separate from the space of institutional learning, with the consequence that students become "silent" experts on how, where and by whom they want to learn (Alexander, 2003; Schmidt *et al.*, 2009). It is therefore important to understand how to manage and integrate the "silent" skills of these students within the institutional framework. The authors propose a framework (Figure 2.4) for emerging learning that can be applied to education, work, social networking, worlds with increasingly less marked boundaries.

Drawing from Snowden and Boone (2007) and Cilliers (2005, 2010) the authors distinguish two domains of application for learning and consequently two modes of learning:

a) that of predictable events, in which knowledge is controllable from the start, learning is hierarchically organized within centralized institutions and therefore prescriptive in the sense of under control, non-negotiable; knowledge is predetermined and transmitted through schools and universities by means of paper, whose quality is certified by the institutions. Assessment and self-correction methods are scientific and based on review by the peer experts; examples are formal education and many virtual learning environments. The learning mode is called the Prescriptive Learning System.

Modes of learning	Domains of application	Types of knowledge	Organization	Modes of production	Validation & self correction
Pre-scriptive learning systems	Predictable, complicated	Prospective control	Hierarchy, institutional control	Centrally predetermined for users; replicated & distributed at scale, at increasing, high cost.	Scientific method, Objectivity, Elite peer review. > Intellectual capital
Emergent learning networks	Complex-Adaptive	Retrospective coherence	Collaboration, self-organization	Open & distributed. Created at scale by users. Replicated, distributed and reworked at decreasing, low cost.	Openness, Interaction scale, constraints values. > Narratives, Ethnographic accounts.

Figure 2.4 Framework for prescriptive learning systems and emerging learning networks
(Source: Williams *et al.*, 2011, 43 © IRRODL)

b) that of complex-adaptive events, which are not predictable because the agents organize themselves, those in which knowledge is not controllable from the start, but it is only coherent afterwards, retrospectively; it is not total disorder, but the order is not predictable; learning is self-organized and usually collaborative, open, created and distributed by the students themselves. It is a flexible type of learning, sensitive to the context, which can adapt quickly. Examples are learning networks and practice communities. This mode is called Emerging Learning Network.

The distinction itself is not new, the two modes often complement each other, at school or at work, in some way the learners organize themselves within institutional boundaries. What changes is the manner of interaction, communication and distribution, known as Network 2.0: not only can the student individualize his learning, but he does so within self-organized networks.

The first way of learning was born with the Industrial Revolution and standardized mass production, the second with the Information Revolution. In the "interactive" age, the accent is no longer on the transfer of information through individuals and institutions, but on interaction and communication in social networks. It is interesting to note that in the management of emerging learning, there are a number of constraints that determine what should not happen, more than what must happen; the emphasis is more on resilience, which allows for error, but responds and corrects itself quickly, rather than on robustness, which does not tolerate errors and learning through errors. It is a non-designable type of learning (Wenger, 1998), if not through a series of guiding principles: learning will emerge anyway, what matters is the interaction between the designed learning and the emerging learning, and the continuous process of feed-back/feed-forward between the two.

The framework is applied to four case studies:

1) Wikipedia is an excellent example of emerging learning based on the frequent interaction of micro-agents, which is also the basis for verification and correction;
2) in some research conducted for the Learning Observatory in the Academies of Higher Education of the United Kingdom, some narratives are collected and one of these, the *Learning Journey*, is an example of emerging learning: a part-time student of a university course for education in childhood, also director of a kindergarten, visits a kindergarten of excellence, discusses with her colleagues and becomes part of an informal Community of Practice; participating in it, she begins a program of change in her own school. It is clear that the journey goes well beyond the requirements of the university program. The problem is to see if this emerging learning can be integrated within the institutional system;

3) another case is the CCK08 online course on connectivism offered by the University of Manitoba in 2008: Content is immediately available in the wiki mode, and students are free to design their routes, at the level they want and with the tools they prefer. It goes without saying that information and competence are shared and knowledge is created in a collaborative way. The course provides a blog for sharing; discussions and links are published in a daily newsletter. However, the experiment fails to balance freedom and constraints: it is impossible to manage a student who, at the beginning of the course, left free, intentionally and aggressively provokes the community (a so-called troll); and in the end, in extremis, one is forced to block him by acting with authority, failing the guiding principles of the project. In this case, the crucial question seems to be whether a course should be self-organized and self-managed or whether the two should be separated;
4) also the curriculum can be totally free, emerging, as in the case of the Master's in Management Leadership at the University of Lancaster, present for more than 30 years, in which, in any case within the National Framework for the quality of Master's programs, the students negotiate their curriculum several times resulting in programs that are all different from each other. The Master's course also exalts diversity, with students from all over the world coming from the most varied sectors that meet in the forum set up for participants, professors, researchers and former students. In this case, it is possible to balance collaborative evaluation and peer feedback with the intervention of the tutors and the institution.

The authors conclude that we need to move from a unilateral learning environment in which everything must be controllable and predictable to a multi-faceted ecology of learning in which both traditional prescriptive learning and emerging learning can be integrated, where there is room for resilience – which tolerates error, but responds quickly – and for robustness, for design and for its retrospective search for meaning. The degree to which learning should be based on self-motivation and self-organization depends on:

a) the quality of the interaction between the resource and the facilitator,
b) the interaction with peers,
c) and the balance between openness and constraints.

(Williams *et al.*, 2011)

2.12 A Learning Environment Based on *Social Networks*: Casey and Evans's Research (2011)

Social networks are an important tool in today's schools; students use them with or without the consent of teachers through Facebook or other study groups. They are important because they allow you to interact and create

a sense of community. In some cases, they lead to addiction, but positive qualities remain because students participate, think, contribute and have an active role in learning (Casey and Evans, 2011). In this study the authors investigate, by means of the action research method, the use of a private social network, *Ning* as a learning environment, by seven classes (150 students) between the ages of 13 and 16 attending an Australian school, the reactions and the online student activities.

The research involves all the classes of a public high school of about 900 students, 80 km from Melbourne, where one of the researchers (Casey) teaches Computer Science, Mathematics and Multimedia also for vertical classes, that is with students of different ages. Throughout the research project they use online tools and environments, the social platform Ning to communicate, publish and show links of other resources. The 150 students are registered on Ning, they use non-identifiable nicknames, they form 77 groups, they create a discussion forum and participate in those of others, sometimes they work on the same project during the same period: "students are able to be explorers, designers, editors, and this encourages them to support their peers, to reflect, and to provide for the evaluation of peers and of themselves" (ibid: 3–4). The social community gives them flexibility in reading and writing comments, in asking questions and asking for explanations, the possibility of accessing the virtual class and the availability of online help at any time. In the beginning, some people find the social community difficult to use, but in the end they all become experts: "an interactive, complex and self-organized environment" develops (ibid: 4). Teaching and learning take place both formally and informally. In the beginning, "cheating" is a problem, but at the end of the project students have the perception that it is no longer a problem and give value to learning from others and this results in more in-depth tasks: as they move forward, students are given more decision-making power and responsibility in evaluation and providing feedback to others, which is different from the traditional approach in which it is only the teacher who has this role: "even if in the teacher's own territory, the classroom, the student audience is made up of peers, there is more communication within the culture of peers than within that of the school and of the classroom" (ibid: 5). *Ning*, by allowing interaction with peers also on a personal level (sports, games, music, etc.), gives learners the opportunity to express themselves freely, to develop self-esteem, to be valued while remaining anonymous.

The project also calls for some students to be among the teachers, and they teach their peers or younger students. Since it was necessary to spend a lot of time monitoring what they were understanding and learning, in planning and carrying out the activities, it was not possible to include all of the official program, but the students had to choose from among some of the topics proposed by the teachers.

Among the negative aspects, we note that many groups, more than 40 out of the 77, have nothing to do with the projects of the class or with the

teacher; in some periods, the number of groups grew exponentially creating a sense of confusion and disorder. *Ning* is not a linear and simple environment: at times the emotional behavior of some students is unpredictable. In fact, the way students interact is very complex: "a wrong move by a student can exclude him from friendship groups" (ibid: 8).

Furthermore, there was an increase in the time needed to interact and monitor *Ning*, to publish the projects on the online sites, although the time required for the evaluation was reduced with peer evaluation and self-evaluation.

2.13 An International Network Among Classes for the Construction of Knowledge: Laferrière's Study (2012)

Laferrière *et al.* conducted research between 2007 and 2009, the *Knowledge Building International Project* (KBIP), in which various primary and secondary school teachers from different countries collaborated with their classes in a school "network of networks with weak ties", with the goal of building distance knowledge through technology, as an alternative way to learning in the classroom (Laferrière *et al.*, 2012, 148). It was also an attempt to develop an "ecological model of change" for interaction and collaboration among institutions in various countries, inspired by the theory of self-organization. The autonomy assigned to the work of schools and teachers was indeed high.

Knowledge Building embraces epistemology, pedagogy and technology developed by Scardamalia and Bereiter (2006) and consists of the development and improvement of ideas that are of value to a community, through collaborative research, the development of school classes as a community for problem-solving and the creation of knowledge. It is based on twelve distinguishing principles, and the teachers who participated in the project had to implement them in classroom interaction. They are (Scardamalia and Bereiter, 2004): the democratization of knowledge; the collective responsibility of knowledge; authentic problems; the improvement of ideas; the diversity of ideas; epistemic action; constructive use of resources; dialoging about knowledge building; the summary notes to be posted online, the progress of symmetrical knowledge; the building of pervasive knowledge; concurrent evaluation.

Various schools, including the three main ones located in Barcelona, Hong Kong and Quebec, participated in the research project. It was desired and financed by the respective Ministries. The technology used for interaction, the Knowledge Forum – a platform that allows for in-depth work in the classroom and includes assessment tools for individual or group paths – was used as a "collaborative space" for students, teachers, managers and staff of the ministry, university professors and researchers. The *multi-user web-based videoconferencing system* (VIA) was used for synchronic communication.

The central idea of the project was to bring together students in international classes to build knowledge on global issues – in the case under examination, climate change – but it was also designed to bring teachers

and researchers together. Students entered hundreds of forum posts and over 20 videoconferences. The school and ministry staff focused on the requirements of their national programs, while the researchers worked on workshops for the professional development of teachers.

The research project showed that there was online collaboration both among learners of the schools (the classes invited other classes to work on a problem), and among the teachers (it was necessary to plan the procedures for the development of the activities together and jointly manage their collaborative aspects).

Coordination between schools to synchronize events, manage time and support was essential in order to achieve collaboration. In interfacing time management, it is interesting to note that some teachers chose an hour a week on a regular basis, some preferred intensive weeks, others interfaced from home, so there was great freedom and flexibility in the management of time.

The integration of the project into national programs was also essential, so that it was possible to collect data in one's own city.

All the protagonists of the project were involved:

a) students could connect and interact with their peers at the other end of the world and this increased the energy, motivation and commitment they put into it; they could see that, even if in places distant from each other, the challenges and problems of the environment are common. There was evidence of this, also in the results, in the knowledge acquired, in communication and collaboration skills, in awareness and sensitivity faced with global problems, in technological competence and in the matured sense of community. And of course, the teachers gradually delegated responsibility to the students.
b) the teachers were involved by university researchers in the development of events, and subsequently, in a perspective of distributed leadership, they promoted contacts and organized events and conferences jointly with students, experiencing professional, social and emotional enrichment.
c) there was a change in roles: some university students, very proficient in languages, acted as an interface between teachers and managers, thus assuming an unexpected role.
d) in the partnerships among the school, the University and the Ministry, principals were often able to modify and integrate the school curriculum.

The authors conclude that:

> the network model of self-organization and change actually works! It is not a fragmentary change, it is not revolutionary, it is not from the top down. It is gradual and evolutionary. The participants have the space

> and the opportunity to learn from each other and each one to organize himself. The most important thing is that the real change happens from below, at the classroom level.
>
> (Laferrière *et al.*, 2012, 158)

The involvement of new teachers – slow and unpredictable – remained an open problem.

2.14 The OECD's International Project of *Innovative Learning Environments* (2013)

The project of the Center for Research and Educational Innovation (CERI) of the OECD – started in 2010 (Istance, 2010) and ended in 2013 (OECD, 2013) – had as its object the learning of students aged 3 to 19; it focused on which are the best conditions and dynamics through which one learns effectively. It analyzed a total of 40 international case studies.

The study started out from the fact that traditional scholastic approaches do not adapt to the achievement of 21st-century skills, such as deep understanding, flexibility, the ability to make creative connections, the ability to work in groups, to learn and innovate throughout one's life (*lifelong learning*). It aims at promoting scholastic reforms through the evidence coming from learning sciences and from particularly innovative examples.

The study proposed a framework (Figure 2.5) divided into ten elements for the development of innovative learning environments.[1]

Figure 2.5 The framework for innovative learning environments
(Source: Adapted from OECD, 2010a, 317–336)

The fundamental elements and dynamics of learning environments are called the "pedagogical heart" consisting of: learners (who?), teachers (with whom?), contents (what?) and resources (with what?). They are the four central elements of the framework. According to the authors of the study, innovating means rethinking these four elements:

1. new students can be added through the Internet in virtual classrooms, or parents can become students themselves;
2. the teachers are not just the actual teachers but also the teachers connected to the network, the volunteers, the learning professionals, the experts, the adults, the students (*peer teaching*);
3. innovating the content – knowledge, skills, values – means focusing on 21st-century skills such as social learning, creating connections among subjects with interdisciplinary approaches, focusing on language and sustainability;
4. resources can be buildings, equipment, infrastructures and teaching materials, but also and above all those resources that have a direct relationship with innovation in learning that is, digital resources and the rethinking of spaces.

The organization and relations among the four central elements (learners, teachers, contents and resources) are the "engine room" of innovative learning environments. They concern:

- the organization of learners: in groups of different sizes, ages or profiles;
- actions on teachers: group teaching, which gives more educational opportunities; professional development that comes from teamwork; alternation between individual and group teaching;
- planning of learning time: in the sense of flexibility and/or customization of the time, in the use of time for daily rituals (e.g., the radio message given by students at the beginning of school), in the integration of non-formal learning;
- didactic innovation: new pedagogical approaches, inquiry-based methods, on authentic problems, telecommunications technologies.

The framework is then enriched with three more intermediate elements:

1. learning: intended as a process;
2. learning leadership: those who organize, prepare, program the environment, with their own vision, strategy, planning; distributed leadership of coordinators, teachers, learners, partners;
3. learning evidence: information and evidence of learning that takes shape in the visibility of the teachers' work, in research on the environments and in their evaluation, in feedback to teachers and to the leadership.

Three more elements constitute the most peripheral part of the framework. They represent the relationships with external partners, that is the degree of openness or closure of the learning environment to the external environment:

1. other learning environments, in order to extend borders, resources and spaces;
2. families and local community resources, that is families and businesses in the economic fabric;
3. higher education and other expertise, that is universities, cultural institutions, etc.

2.15 ICTs in Formal, Non-formal and Informal Learning: The *Creative Classroom* Framework (2014)

The *Creative Classroom* framework was proposed as part of the "Up-scaling Creative Classrooms in Europe" project promoted by the Institute for Prospective Technology Studies in Seville (IPTS) on behalf of the General Directorate for Education and Culture of the European Commission (GD JRC).

The role of Information and Communication Technologies (ICT) is recognized as an important factor for innovation and creativity in learning in order to achieve the skills and competences outlined by the *Europe 2020* strategy. However, while the necessary infrastructure is mostly available, the potential of ICTs in learning has not been fully exploited in formal institutions, with a few exceptions. Bocconi *et al.* (2014) propose a framework with the key dimensions of innovative learning environments capable of exploiting the potential of ICTs in learning.

Innovation is conceived of as a process consisting of two elements: the development of creative ideas and the realization of ideas in teaching and learning practices, through technologies. The classroom is intended as a container of various learning environments, not only formal but non-formal and informal as well.

Creative Classrooms can be seen as "complex ecosystems that evolve over time, depending on the context and the culture to which they belong" (Bocconi *et al.*, 2014, 108). The proposed framework is multidimensional and includes the established learning outcomes and pedagogical, technological and organizational factors that promote innovation.

There are eight dimensions of the framework (Figure 2.6), which are based on the literature regarding creative learning and innovative pedagogies with ICTs, and they are described here.

1. The content and curricula, that is, the resources for innovative teaching and creative learning, the objectives and the organization of the activities, which must be regularly updated by the stakeholders.

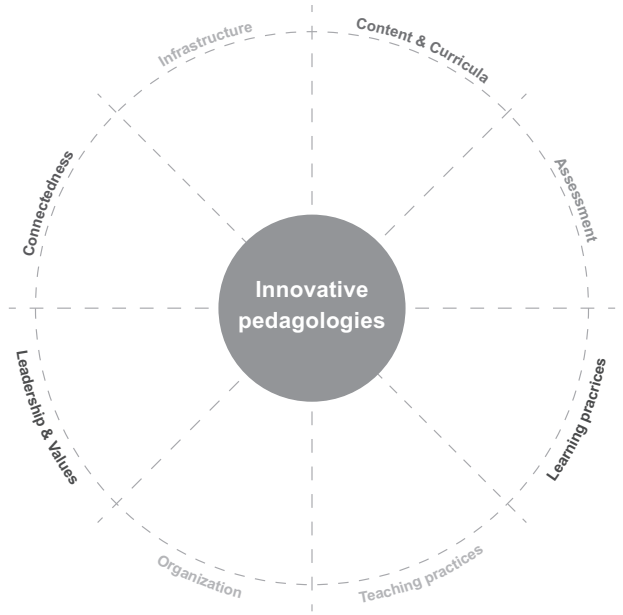

Figure 2.6 The key dimensions of Creative Classrooms
(Source: Bocconi *et al.*, 2014, 109 © Springer Nature. Reproduced with permission from Springer Nature)

2. The assessment of learning, which must overcome the traditional paradigm and assess the skills of the 21st century and therefore contemplate a wider system that includes activities that simulate real situations, which can be solved with technologies and that also assess non-formal and informal experiences.
3. Learning practices, therefore personalization, collaboration and the role of informal learning. Learners must take a more active role in supporting themselves, in developing the contents, with more engaging and playful teaching methods to develop life-long skills and soft skills in a self-directed way.
4. Teaching practices, in which the teacher plays the role of facilitator, tutor, organizer, model of creativity and innovation; expert in pedagogy, in classroom management and in the use of ICTs.
5. The organization, at every level, in which all aspects of an organization in learning must be valued, and that must be assisted by continuous monitoring systems.
6. Leadership and values, which are fundamental to driving innovation, initiating and monitoring changes, obtaining resources and infrastructures, supporting professional development and creating strategic partnerships.

7. Connectedness, which deals with relationships – and with the emotional and social factors that influence them – which play a fundamental role in the involvement and motivation of the students; learners should be able to relate to many actors – among the actors, the peers, parents, experts, etc. – that serve as different channels from which to obtain the different knowledge and personalities with which to grow.
8. The infrastructure, which must be adequate and accessible, it must extend the spaces and times of learning; the physical space must be rearranged, taking into account also the colors, the lighting, the sounds.

These eight key dimensions must all be present to create innovative environments. The authors then present some "facilitators" of *Creative Classrooms*, a series of fundamental reference variables, the *building blocks*. There are 28 of these facilitators, taken from the literature and case studies (Figures 2.7(a) and 2.7(b)). Crossing the 28 facilitators with the eight dimensions generates the *Creative Classrooms* framework. With gray dots of different sizes, the approximate impact of the facilitators on the key dimensions is described.

The framework is then applied to two case studies, *eTwinning* and *Vittra*: see Figures 2.8 and 2.9.

eTwinning is a platform, funded by the European Commission, which has connected more than 230,000 teachers and principals from 37 European countries since 2005 and has promoted collaboration among schools with the use of ICTs, providing help and support to create educational projects and partnerships in any educational area. The *eTwinning* platform covers 5 dimensions (out of 8) and 10 (out of 28) facilitators of the framework.

Vittra is a private body that has been running some independent schools since 1993, but is financed by the State in Sweden, and it is based on the development of individual action plans and the massive use of ICTs to achieve European key competences: the organization includes 6 dimensions and 17 facilitators.

2.16 Construction of Student Communities for Learning in Non-formal Contexts: Boersma's Model (2016)

Boersma *et al.* (2016) investigated the potential of student communities for the design of innovative learning environments in the early years of vocational training. As we know, the primary objective of vocational training schools is the training of the student for work, to provide them with the knowledge and skills necessary for their future employment; however, it is also necessary to promote an orientation toward work.

The authors proposed a framework that aimed at encouraging teaching/learning processes so that students could effectively orient themselves to their future employment. The framework was then used by teachers and researchers to design learning units in two Dutch schools for vocational training.

	Content & Curricula	Assesment	Learning Practices	Teaching Practices	Organization	Leadership & Values	Connectedness	Infrastructure
1. Fostering emotional intelligence	Promoting a variety of activities to help leamers recognize and manage emotions and form positive relationships. ICT enable the delivery of multimedia learnings materials, awareness and control of self, along with empathy for others.							
2. Fostering multiple modes of thinking	Encouraging leamers to develop their talents and creative potential in all possible areas (notion of polymathy). ICT applications offer unprecedented opportunities for exploratory learning and creative expression.							
3. Building on indiviual strengths and preferences	Building on learners' strengths, potential and preferences as motivation to learn. ICT offer learners new ways of expressing their interests and preferences.							
4. Fostering soft skills	Designing activities that address transversal soft skills (e.g. problem-solving, collaboration, cultural awareness) and hard, subject-specific skills, ICT provide ways of fostering transversal soft skills in authentic contexts.							
5. Facilitating (social) entrepreneurship	Offering opportunities to implement real-life projects (e.g. innovative products, services for the school community), risk taking entrepreneurship, and innovation, ICT offer means for both real and/or virtual entrepreneurship.							
6. Applying in practice social inclusion and equity	Providing all learners (gifted students, migrants, drop-outs, ect.) with equal opportinities and appropriate means for quality learning. An ICT-based approach offers tailored learning opportunities (and contents).							
7. Recognising non-formal and informal learning	Recognition of non-informal and informal learning as the basic for real life, context-based, and learner-centred activities for creating innovative solutions to local needs. ICT facilitates ubiquitous learning through open educational resources where and when needed.							
8. Monitoring quality	Developing a clear framework for quality, transparent to all members of the school community, enhancing quality with all its implications for teaching, learning and assessment. ICT offers variety of tools to support incremental approaches to quality.							
9. Innovating timetables	Setting flexible timetables that provide teachers and learners with more opportunities to engage in creative learning in CCR. ICT facilitate time management and offer the possibility of just-in-time learning.							
10. Levelling-up and functioning ICT infrastructures	Providing learners and staff with access to multimedia-rich contents and online services (such as broadband networks, clouds computing, web applications) for innovative teaching and creative learning.							
11. Innovating and renovating services	Making use of ICT infrastructure to modernize services and/or offer totally new services both for formal and informal learning. ICT offer powerful tools for updating existing services (e.g. the school library cloud offer e-books and audio books).							
12. Rearranging physical space	Re-designing physical spaces using colours, lights, sounds, materials, to provide a flexible and stimulating environment, accessible to all learners. ICT tools (e.g. video projectors, tablets) provide new means for easily adaptable physical spaces.							
13. Learning across disciplines/subjects	Using a variety of materials to foster "horizontal connectedness" across knowledge areas and enabling learners to utilize multiple perspectives. ICT offer cost-effective ways to retrieve information from contexts and to create multimodal contents.							
14. Learning-by-exploring	Enabling learners to explore complex concepts and manipulate ideas to make connections about seemingly unrelated concepts. ICT offer new tools exploratory such as online access to remote laboratories.							
15. Learning-by-creating	Engaging learners in producing their own contents in order to nurture their creative imagination, innovation attitude and authentic learning. ICT offer the means for (re)creating, and sharing learner-generated content such as blogs, wikis, and videos.							

Figure 2.7(a) The 28 facilitators and the 8 dimensions of Creative Classrooms

(Source: Bocconi *et al.*, 2014, 112–113 © Springer Nature. Reproduced with permission from Springer Nature)

	Content & Curricula	Assesment	Learning Practices	Teaching Practices	Organization	Leadership & Values	Connectedness	Infrastructure
16. Learning by playing	Embedding extensively playfulness (both physical and mental) to fully engage students in the learning process. ICY offer opportunities for playful thought a great variety of digital games and simulation.							
17. Addressing multiple intelligences and learning styles	Giving value and providing means (i.e. plurality of task, educational contents, ect.) to address multiple learning styles and (Gardner's) intelligences to help learners reaching their personal learning objectives. ICT provide the means to support it.							
18. Empowering self-regulated learning	Helping learners to take control of their learning process, promoting self-directed learning skills and supporting reflection and metacognition. ICT provide encouraging enviroments that foster self-directed skills for life long learning.							
19. Personalised learning	Adapting sensivetely curricola and methods to respond to individual learners' needs to foster their intrinsic motivation and allow for self-expression. ICT increases opportunities for personalized learning both in formal and informal settings.							
20. Meaningful activities	Carrying out activities in an authentic context, encouraging learners to apply their prior knowledge, inquiry and independent thinking. ICT can be used to engage learners in meaningful, authentic learning (e.g. virtual tours in museum, geo-tagging ect.)							
21. Facilitating peer-to-peer collaboration	Fostering learners' ability to think both independently and with others, considering a plurality of points of view that helps creative thinking. ICT provide means for online synchronous and/or asynchronous peer collaborations across network.							
22. Using/Re-using & mixing open educational resources (OER)	Making consistent use/reuse of existing OER to broaden and update the curriculum and achieve the desired/expected learning outcomes. ICT increase the sharing/reuse/adapt OER, promoting social mechanism (e.g. recommending, ratings).							
23. Engaging assessment formats	Incorporating creative tasks to engage and motivate learners while assessing complex skills /e.g. collaboration, problem solving) developed inside and outside school. ICT allow to record/retrieve individual learning progress /e.g. e-portfolios).							
24. Embedding formative assessment	Embedding methods and tools to provide a record of learners' thinking and reasoning, assessing competences rather than factual knowledge. Open ICT tools (e.g. web2.0) foster peer2peer assassement and meaningful data to teachers.							
25. Learning events	Participating actively and systematically organizing learning events (f2f, online and blended) at community level. ICT have the potential to deliver (massive) open educational courses worldwide and offer innovative ways for online lifelong learning							
26. Engaging through social networks	Using social networks to increase interaction opportunities within the school community, opening up and modernizing Internal processes. Social computing (blogs, Twitter, LinkedIn, etc.) supports collaboration across borders & cultures.							
27. Implementing innovation management	Implementing a systemic approach to learning, creating a school culture that favors sustainable innovation and makes effective use of human resources. ICT tools help learning organisations become more dynamic, flexible and open.							
28. Networking with real-world context and actors	Interacing effectively and cooperating whit a plurality of actors (e.g. industries, museum), on a regular basis to support and foster learners' motivation. ICT offer cost-effective ways for online networking and interaction across time and space.							

Figure 2.7(b) The 28 facilitators and the 8 dimensions of Creative Classrooms

(Source: Bocconi *et al.*, 2014, 112–113 © Springer Nature. Reproduced with permission from Springer Nature)

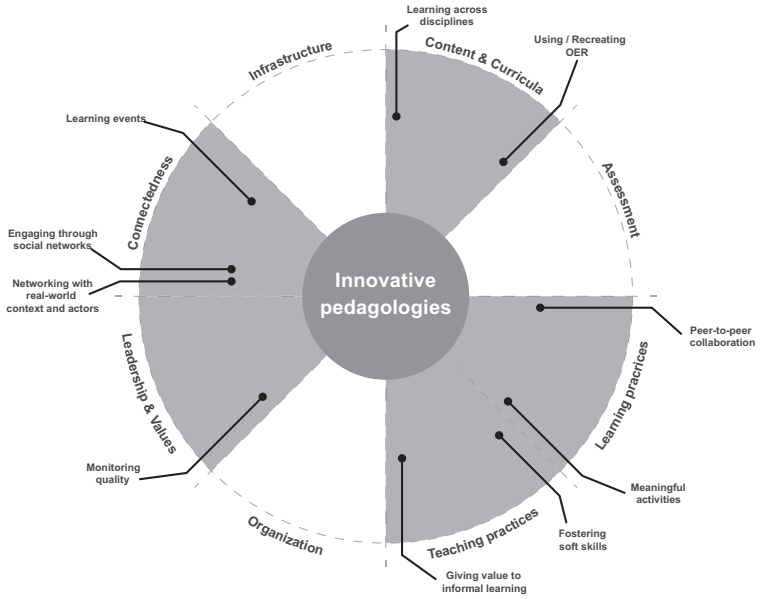

Figure 2.8 The five dimensions and the ten facilitators covered by eTwinning
(Source: Bocconi *et al.*, 2014, 114 © Springer Nature. Reproduced with permission from Springer Nature)

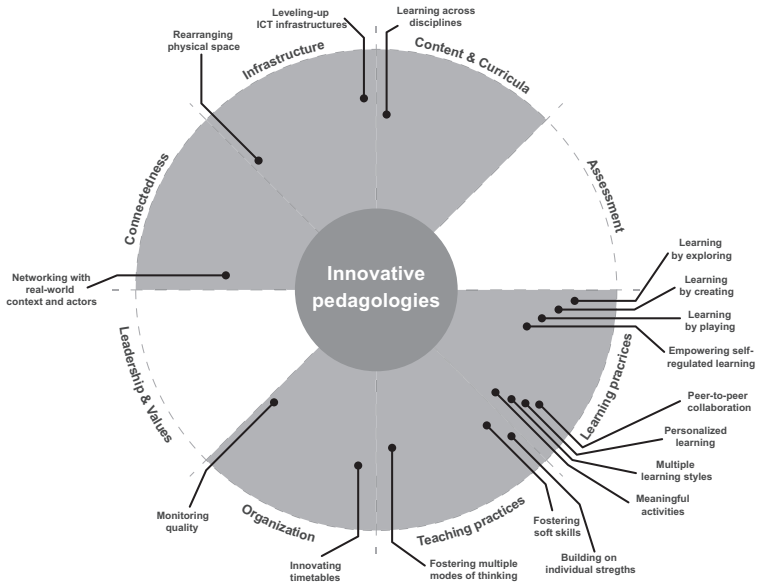

Figure 2.9 The six dimensions and the seventeen facilitators covered by Vittra
(Source: Bocconi *et al.*, 2014, 116 © Springer Nature. Reproduced with permission from Springer Nature)

Our interest in this study derives from an in-depth study of the concept of student communities, of the active role of the student in building a type of learning that is in some way self-directed, as well as for the integration of non-formal environments at school.

The authors started from the dissatisfaction with and limits of traditional approaches to work as a learning environment: from its ineffectiveness in achieving competence, to its inability to grasp the affinities and skills of students. Both companies and teachers were not satisfied with the levels of knowledge and skills that students reached after the first year, and only half of the students had understood which sector they wanted to work in in the future, resulting in a greater probability of withdrawal from studies. The objective of the proposed framework was to overcome these limitations and to integrate work and school as learning contexts.

The concept of "community of practice" (Wenger, 1998) to which the authors referred emphasizes the ever-greater centrality of learning in vocational schools. The concept of "community of learners", on the other hand, has to do with a more intentional kind of learning that makes it possible to distance oneself from the real situation and to assume an attitude of research. The two concepts (practice and learners) are integrated into the "community of learners for vocational guidance" which allows students, while participating, to make technical and ethical decisions, guided by material and mental tools that reflect the experiences of the community. In this way, the students meditate on what they are doing and, on their affinities, skills and potential and therefore on the direction in which they want to develop in order to become professionals in their work. The potential of this approach manifests itself only if the students:

- cooperate with teachers and professional experts for a shared purpose (shared learning);
- participate in authentic activities that have value for society, but for which they often lack the necessary skills and therefore, they feel the need to acquire them (meaningful learning);
- are surrounded by older students, teachers and professionals who discuss the ideas and actions of others to achieve shared goals, developing better ways of reasoning and behavior, of connection between theory and practice, and they understand what the importance of being an expert for society means (reflective learning);
- are provided with skills to transfer knowledge and skills acquired at school to other contexts and vice versa (transfer-oriented learning)

In the implementation phase of the framework, the teachers of two innovative vocational schools and researchers worked to rethink a part of the program for the first year of high school for the subject "Care and Welfare". In the first year, two learning units were created and then evaluated also with the opinion of the students. In the second year, another eight

learning units were realized. The project involved two cohorts of students for a total of 68 students between the ages of 14 and 15. As an example, in a learning unit in which the objective was to know the primary school in order to move toward the profession of teaching assistant, students prepared all the activities, managed the event on their own and evaluated their experiences. Students met teachers to understand the characteristics of children as if they were teacher assistants; they designed and prepared group lessons; everyone had to study a particular aspect of the development of the children of that age to adapt the activities; a role-play was carried out to predict difficult types of behavior; during the course of the activity the students had to monitor the acquisition of skills and at the end, evaluate the activity.

During the assessment phase, the results of a classic learning unit were compared with those of the new framework based on the four characteristics described above (shared, meaningful, reflective, transfer-oriented learning) with positive effects in almost all features.

2.17 International Case Studies of Innovative Learning Environments

The literature on the subject considered offers some aspects of the environments, but there are other dimensions not considered or partially considered by the literature which, on the contrary, are present in some particularly significant international realities. Five are examined: the *Homeschooling* movement, the Self-organized High School in Paris (LAP), the *Blended Learning* of the Christensen Institute in San Francisco, the *Institute of Play* and the *Quest to Learn* in New York and Chicago, the *School of One* in New York.

The Homeschooling/Home Education *Movement (Since 1977)*

Parental education is the education of children outside the formal institutions of public or private schools and is usually carried out by parents, or tutors chosen by them, using all the knowledge and skills present in the surrounding environment and in the local community.

The term *Homeschooling* is typically used in North America while *Home Education* is used in the United Kingdom and Europe. In the United States, 2.5 million children study with their parents, between 20,000 and 100,000 in England; 60,000 in Canada; 5,000 in France; 2,000 in Spain (2016 data). In some countries, it is the third generation that follows parental education and many universities, even prestigious ones (e.g., Harvard, Princeton, Yale), accept students coming from these paths, even before their peers who attended schools. In Italy, it is difficult to quantify, an estimated 1,000 children, and the number is on the increase (Pigmei, 2016; controscuola.it, accessed in July 2016).

In England, the law provides for the right to provide education outside of school ("education, not school, is an obligation" is the motto of *Education Otherwise*, the reference portal of the movement in the United Kingdom), without the obligation to follow the national syllabus. *Education Otherwise* was born in 1977 and was foreseen as an alternative to school by the *Education Act*. In Italy, the law provides that one can follow a path of parental education for the whole scholastic period, including University, provided that it is communicated every year to the Local Education Authority, which can do background checks. If and when one wishes to re-enter the national school system – it is not a choice for life – the relative exams must be taken and, in the case of primary school, it is not necessary for the programs to follow the national ones (controscuola.it).

At the international level, there is the *International Democratic Education Network* which deals with alternative schools. In Italy, this movement has been present since the 1970s, and there are various parent organizations or networks including *Homeschooling & Unschooling* and *Parental Education*. Moreover, there are the *Libertarian Education Network* and the *Terra Nuova* magazine that combine various alternative realities in Italy.

There is no single method: there is the parent who acts as a tutor and follows the ministerial syllabus, with schedules, textbooks and established study plans; others prefer to fully support the needs, interests and natural dispositions of the children, acting as tutors, with more flexible syllabuses and schedules. Some propose one subject at a time, even for long periods of time, until it has been understood "entirely"; others integrate with foreign syllabuses; still others implement *Unschooling*, that is, a kind of education that is completely focused on the student who freely chooses what, how, where and when to learn through dialogue, play, reading, writing, manual work, home or outdoor activities. There are those who enroll at the same time in a school that provides them with the programs, or those who enroll in distance courses (by correspondence and online). Also the teaching methodology is free in the *homeschooling* courses: there are those who use a traditional method, the Montessori method, the Theory of Multiple Intelligences, Rudolph Steiner's pedagogy, the apprenticeship, the laboratory, volunteering, art lessons perhaps with museum events, music at the theater, at cultural or sports associations. The materials can be the most varied: textbooks or not, short stories and novels, materials available on the Internet (Coppola, 2010; controscuola.it).

On the other hand, as stated by Erika De Martino (controscuola.it), who has been dealing with *Homeschooling* for years and is the founder of the *Parental Education* network:

> [F]or millions of years human beings have handed down their knowledge from parents to children, . . . at a close look it is the school, as it is understood today, that is a recent thing: the intrusion of the State in this task dates back to the times of the Industrial Revolution.

In fact, it is not possible to follow the pace of learning of individuals in classes of 20–25 students, and often more than 25, and therefore there is not much time to listen to all of them and create an authentic personal relationship.

In a study conducted on 55 workers in charge of the entry into American colleges and universities (Gloeckner and Jones, 2013) it appears that for 78% of the respondents, the students coming from *Homeschooling* courses, compared with students coming from traditional paths, have similar or better results in the average of first year exams (*Grade Point Average*).

The Self-Managed High School in Paris – *Lycée Autogéré de Paris (Since 1982)*

The *Lycée Autogéré de Paris (LAP)* (Paris Self-managed High School) is an experimental high school founded in 1982, under the Mitterand presidency, with the Minister of Education Alain Savary who supported an initiative by a group of professors to create a public institution that was inspired by libertarian pedagogy (Piaget, Dewey, Neill, Freinet) and by a certain kind of socialism of self-management, following in the footsteps of the experimental high school in Oslo, which opened in 1968. Teachers and young people (some who had "broken away" from the educational system) were its founders. The *LAP* is aimed at adolescents and young adults, aged 15 to 21, as an alternative to the traditional system of education. It currently receives 250 students a year.

For teachers, it is first and foremost an experimental center, where another kind of pedagogy is tested, under continuous observation by university researchers or the Ministry as an alternative to normal French schools. There is no principal; there is no school staff of any kind except teachers: all of the life within the high school is managed by bodies composed of students and teachers and every decision, without exception, goes through the general assembly that meets every week. The only body composed solely of teachers is the educational team that meets on a weekly basis, and it deals with all matters relating to teaching including the assignment of new teachers, who arrive only by a "call". Every Tuesday there is a meeting of the so-called "grassroots groups", which are composed of three teachers and about thirty students, with the aim of discussing and voting on every issue. The delegates from these groups meet on Thursday mornings at the general management meeting, to discuss the issues raised and report back to the "grassroots groups" the following Tuesday. The other students all have a specific role and they meet up in commissions that deal with the various aspects of the life of the high school, for example, the library, the reception, the cafeteria: what is most important is the students' assuming responsibility for the running of their own school.

Regarding the teaching method, the division into subjects and individual notions has been overcome, attendance is not compulsory and there is

freedom in the choice of courses and course levels. The assessment in grades has been replaced by reports and annotations avoiding any ranking. The classrooms are atypical, decorated with graffiti, desks and chairs are arranged in a circle: the teacher is not the only one to hold knowledge, there is a lot of conversing and one learns to reason. The courses of the various subjects are held in the morning, taught with a methodology that is anything but traditional and lecture-type, and in the afternoon there is a series of laboratories called *atéliers* that have the purpose of confirming, studying in-depth or discovering an interest; there are also projects or alternative courses, such as theater, music, cuisine, in which students are involved throughout the school year, with a final product. There are four pillars of learning: management, courses, ateliers and projects that also help students to pass the BAC, that is the French secondary school-leaving examinations, which however is not the purpose of those who enter this school. In fact, only 30% of the students take the exam, generally passing it. The sense of school is taking charge of oneself, and one's own education (Vannucci, 2014; l-a-p.org).

The Blended Learning *Model of the Clayton Christensen Institute in San Francisco (Since 2007)*

The Clayton Christensen Institute is a non-profit organization founded in 2007, based in the San Francisco Bay area in California, which brings together a group of experts with the aim of "improving the world through disruptive innovation". It is based on the theories of prof. Clayton M. Christensen of Harvard University and was created with a special interest in education and health by offering a model with which to address particularly relevant social issues. One of the institute's products is the *Blended Learning* model, implemented in 368 primary and secondary schools, mostly in the United States, with some schools in Brazil, South Africa, India and the United Kingdom (www.christenseninstitute.org).

The model (Figure 2.10) consists of a formal educational program in which the student learns:

a) at least one online part with checks on the times, spaces, routes and pace of learning;
b) at least one part using the traditional method;
c) in an integrated manner, that is, the subjects are connected to provide a learning experience.

The model includes four sub-models described below.

1) *Rotation Model*, where in a subject one rotates around a plan established among different models, one of which is online and the others are in small groups or in class, projects, individual tutoring and homework. Most of the learning takes place at school. There are four rotation models:

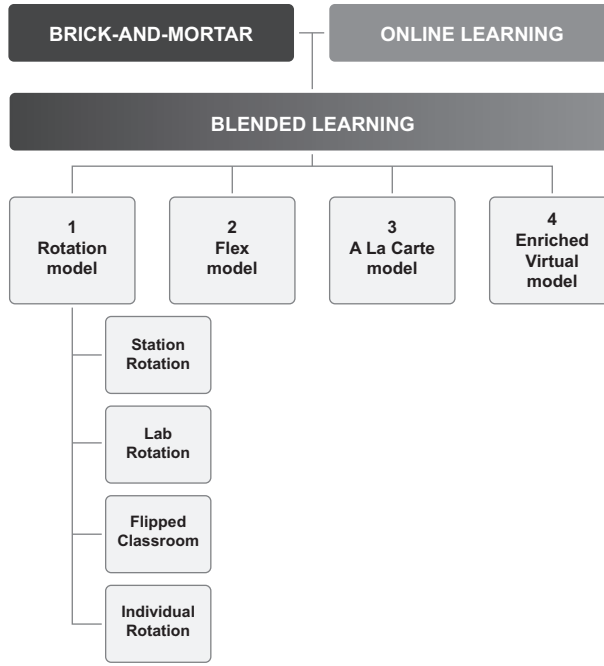

Figure 2.10 The Blended Learning model
(Source: www.christenseninstitute.org © Christensen Institute)

- *Station Rotation*, a course in which one rotates among different classrooms;
- *Lab Rotation*, a course in which one rotates among different laboratories for online learning;
- *Flipped Classroom*, a course in which students participate online outside of school instead of traditional homework and then attend the normal class with the teacher at school for projects or practice;
- *Individual Rotation*, a course in which each student has a personalized schedule, but does not necessarily rotate around any station or learning laboratory. A teacher establishes the plan.

2) *Flex Model*: a course based on *online* learning that also includes *offline* activities. The student has an individualized and personalized plan and the tutor teacher at school provides face-to-face support on a flexible basis, thanks to activities such as teaching a small group, group projects and online tutoring. They range from models that provide a lot of individual online support to models that provide less.
3) *A La Carte Model*: a course completely online under the guidance of the teacher (online), at school or outside of school, completed with other lecture-type courses at school.

4) *Enriched Virtual Model*: a course where some face-to-face sessions with the teacher are required, completed online outside the school. The online sessions are the framework of the course, which often begins virtually to then be completed in a traditional way at school.

The institute provides an online platform, the *Blended Learning Universe*, with the resources to implement the model: practical guides, tutorials, a blog, seminars, downloadable educational material, publications and a list of primary and secondary schools worldwide that apply the model, distinguished by the different methods of implementation.

The *Blended Learning MOOC (Massive Open Online Course)* is a course taught by the staff of the Christensen Institute, of the Silicon School Fund and of the *New Teacher Center* in order to learn the model in all its details.

In a study conducted on twelve case studies in 2015 (*Blended Learning Success in School Districts*), the model improves students' learning outcomes. According to the institute, the effectiveness of the model depends on its practical implementation and on the problem it must solve, that is, it is a matter of understanding which of the specific modalities work, with which technology and for which students.

The Institute of Play *and the* Quest to Learn *in New York and Chicago (Since 2007)*

Nancy Nassr, the director of the charter school of Chicago *Quest to learn*, claims that the apathy that is spreading among pupils and primary and secondary school students in the United States has urged academics and educators to try to re-imagine the school in its structures and ways of learning. As she says: "if we really need to change the face of education in the United States, we must educate teachers and students to think, using processes based on inquiry" (Nassr, 2016).

The *Institute of Play*, to which the *Quest to Learn* in New York (since 2009) and Chicago (since 2011) are affiliated, is a non-profit design studio founded by game designers in New York in 2007 and consists of a group of designers, researchers and learning professionals who create learning experiences based on the principles of the game. The institute has been supporting innovative projects in public and private schools and in charter schools (US private schools subsidized with public funds) for 10 years. The first successful project, in 2009, was the *Quest to Learn* in New York, a public junior and senior high school. So far the institute has developed 70 class games. All of the schools that adopt this methodology are autonomous, but they reflect a common vision of education (instituteofplay.org):

- schools should involve every student;
- the classrooms should support collaboration, creativity, empathy and problem-solving;

- all of the teachers are designers;
- playing, designing and researching are key factors for innovation.

In *Game-Based Learning*, games are understood as: "carefully designed and student-driven systems, based on narration, they are structured, interactive and immersive". The games ask us to collaborate and learn by doing, they tell us if we are playing well or badly, they allow us to try again after a mistake, considered a necessary and integral part of the game, and we perceive learning as a playful activity (q2l.org/about).

In the classroom, this can be stated in various ways. For example, in the biology course of the first year of high school, students become scientists of a bio-tech company where they clone dinosaurs and create ecosystems suited to their survival by learning notions of genetics, biology and ecology. Or they use a game called *Storyweaver*, a collaborative role-playing game of *storytelling*. In the first year of junior high school, students play the role of Dr. Smallz – a miniature doctor introduced into a human body who, having lost his or her orientation, asks students how to get to the sick organ – by becoming designers, scientists, doctors and investigators as they discover cell biology and the human body. All this allows teachers to evaluate them at the same time and to provide immediate feedback. There are seven principles of *Game-Based Learning* which are described below:

1) Everyone is a participant: all of the students contribute with different personal contributions.
2) There is a constant challenge: every student is encouraged to know, to solve problems whose solutions are out of their reach.
3) One learns by doing: students learn by proposing, testing and playing with theories.
4) There is immediate and continuous feedback: students constantly know how they are progressing along the route.
5) Failure is part of the route: both students and teachers are given the opportunity to learn through mistakes.
6) Everything is connected: skills and knowledge can be shared through networks, groups and communities.
7) It seems like you are playing: the learning experience is engaging, it revolves around the student and supports research and creativity.

Every *Quest* teacher works in a group with a game designer and a study designer every quarter. Together they create curricula based on New York State standards and relevant to the lives of today's youth. They also use games to direct them toward specific learning and assessment objectives, focusing on areas where students normally struggle (q2l.org/about).

In particular, the *Quest to Learn* in Chicago, a junior and senior high school of about 680 students of various ethnic groups, welcomes all students, without entry tests, mainly in economically and culturally disadvantaged

conditions. Despite this, in the last year of junior high school students manage to get better results than those in other schools around the city, especially in mathematics, English and art. Beyond the standard tests, according to the *Connecting Youth: Digital Learning Research Project*, students get better results especially in critical thinking, problem-solving, analysis and written communication (Nassr, 2016).

The secrets of effective learning through play, according to the director of this school, Nancy Nassr, are:

- choosing games based not only on their effectiveness but also on their ability to involve;
- mixing digital and non-digital games;
- fitting the game into the specific class of reference;
- searching for valid collaborators to design.

The School of One *Project in New York (Since 2009)*

The *School of One* (SO1) is an individualized educational program for teaching mathematics in junior high schools through the high availability of technologies. The classrooms are transformed into laboratories in which students learn the basic concepts of mathematics in different ways. The basic idea is that when students arrive at junior high school they bring with them different bits of knowledge and skills that do not coincide with the starting levels and that therefore, teaching should be individualized. It is a matter of taking the students where they are, starting from the competences acquired up to that moment, and creating routes to make sure they have the mathematical basis to continue their studies.

SO1 originates in the School District of the City of New York and in *New Classroom Innovation Partners*, a non-profit organization for the implementation of new models of effective teaching, and initially it was applied to three pilot schools in New York, chosen for the availability of technological infrastructures, as a summer program in 2009, then offered as an afterschool program and finally integrated into the daily curriculum. During the 2014–2015 school year, SO1 operated in five schools in Brooklyn, Manhattan and Staten Island, which differ in size, social background of the students and academic history. The program was offered to eleven schools outside of New York and, in the 2015–2016 school year, the number of classes was twice the number of schools that adopted the program.

The program uses the rotational Blended Learning method developed by the Clayton Christensen institute, that is a course or subject in which the students rotate according to a precise timetable, or at the discretion of the teacher, among different learning modes of which at least one is online. Other modalities include small group lessons, class lessons, group projects, individual tutoring and homework (izonenyc.org, School of One in New York City, An Implementation Guide, 6). After a diagnostic test on math skills given at the

beginning of the year, gaps, strengths and weaknesses are identified, and an individualized learning plan is created that specifies what abilities each student needs to focus on. The student will, however, be supported whatever the level of his/her skills, first or fifth grade of primary school. The learning methods are varied: students are grouped into small or large groups with a teacher, in groups for collaborative work, in virtual environments with software or interaction, in individual self-study and individual student–teacher tutoring, depending on the needs. Students also participate in multi-day group activities in which they engage in the skills they have learned.

The school year is divided into "shifts" of three weeks during each of which the students try all or almost all the modes of learning. At the end of each lesson the students take a quiz, the results of which serve to guide the next day's activities. Every day the student enters school and on the screen he will find the route to follow during the day. The teacher does not prepare learning units for an entire class, but individual lessons: every day, from 4 to 9 pm, the teachers receive an email with the "tasks" to do as suggested by the system, based on the quizzes the students took; the skills the student has to reinforce are indicated in the email. Consequently, the teachers prepare the lesson adapting it to specific needs; each teacher is responsible only for the skills he teaches in the various courses during the year.

The typical classroom is much larger than a traditional classroom, and that is the reason it is called a walls-down classroom; the classroom has separate sections divided by blackboards, bookcases and closets, it contains from 40 to 50 students at a time and students learn in different ways and class times of two lessons (from 42 to 48 minutes each), at the end of which they take the quiz. The teachers, who remain in the classroom while the students change classrooms, follow the students during the activities, moving to each of the various positions up to three times during the two-lesson period of time.

At the end of the courses the students have to prepare for the state exam and in order to do so, the SO1 schools use three strategies:

a) they dedicate the fifth day of the week to preparation only;
b) the school closes a month before the exam and uses that time for preparation;
c) the hours of interval between lesson blocks are used.

The framework used by the school (Figure 2.11) focuses on the student's success, which is achieved through:

- collaborative work with one's peers (supportive environment);
- the best material classified by concepts (virtual or paper) that already exist or that are created by the teachers, to whom information is provided on the individual children's skills that are most incomplete and who then see to the delivery of the appropriate material (rigorous instruction);

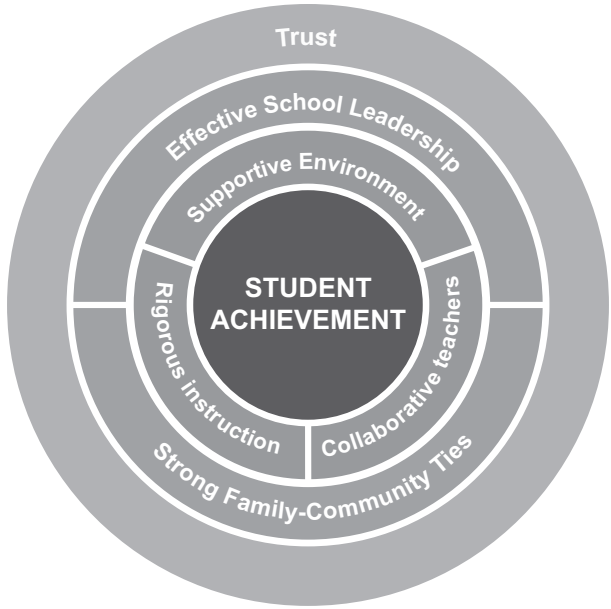

Figure 2.11 The Framework of the School of One
(Source: infohub.nyced.org © Nyc Department of Education)

- the community of teachers which shares space and often meets to plan (collaborative teachers), and as one teacher states:

  It is a continuous focus group. . . . The timetable was set up to include lots of meetings, there is continuous improvement in learning and evaluation strategies, and thought-provoking discussions improve the teaching strategies; it is a dynamic group of experts that improves education throughout the year.

  (izonenyc.org, School of One in New York City, An Implementation Guide, 8)

- this is made possible by leadership that strongly promotes objectives and guides teachers (effective leadership); by strong relationships with the family, which can monitor the progress of their children through the portal; by shared reporting and a sense of what is being done (trust).

The research team compared the results with cohorts of students from the same school before the implementation of the project and with different schools without the SO1 project. The results suggest that students in SO1 schools improve their performance in mathematics on state exams (izonenyc.org, July 2016) and those who enter with low levels obtain a greater

advantage (Cole *et al.*, 2012; Levine, 2012). However, current research does not attribute to SO1 the sole cause of improvements. It is considered that the effectiveness of the project can only be evaluated in the long run.

2.18 The Construction of a Framework for Measuring the Innovativeness of Learning Environments

From the analysis of the international literature and case studies, it has been possible to identify the key variables necessary to build innovative learning environments: The authors have identified 22 subdivided into four categories: actors, organization, learning and tools (see Table 2.3(a) and 2.3(b)).

Among the contributions that identify more variables we point out:

- the international *homeschooling* movement (line no. 16): 17 variables;
- the OECD (line no. 13): 16 variables;

Table 2.3 (a) Classification of the learning process by variables

			ACTORS							
		Contributions	*1.*	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*	*8.*
LITERATURE	1	Milrad (2002)		●						
	2	Boyd and Jackson (2004)		●				●		
	3	Ramboll Management (2004)	●	●	●	●		●		
	4	Koper *et al.* (2005)		●		●				
	5	Mitra (2005), Mitra and Dangwal (2010)		●				●	●	
	6	Louys *et al.* (2009)	●	●						
	7	Scott *et al.* (2009)	●	●				●		
	8	Westera *et al.* (2009)			●			●		
	9	Chang and Lee (2010)								
	10	Williams *et al.* (2011)	●	●		●	●			
	11	Casey and Evans (2011)	●	●						
	12	Laferrière *et al.* (2012)	●	●	●	●				
	13	OECD (2013)	●	●	●	●		●	●	●
	14	Creative Classrooms of Bocconi *et al.* (2014)		●	●			●	●	●
	15	Boersma *et al.* (2016)		●			●			●
CASES	16	International Homeschooling Movement	●					●	●	●
	17	The Self-managed High School in Paris		●		●		●		
	18	Blended Learning, San Francisco				●		●		
	19	Institute of Play and Quest to Learn in New York and Chicago	●	●		●	●			
	20	School of One, New York		●	●	●		●		
		Total Contributions	9	16	6	9	3	11	4	4

1. Students 2. Student groups 3. Teachers 4. Teacher groups 5. Practice community 6. Tutor/coach 7. Parents and grandparents 8. Local community 9. Learning time 10. Class 11. Learning space 12. Teaching 13. Curriculum and educational offer 14. Involvement of students or parents in the organization of the school 15. Object of learning 16. Method of learning 17. Personalization of learning 18. Formalization of learning 19. School autonomy in the planning of learning 20. Involvement of students in the learning process 21. ICTs for teaching 22. Teaching equipment

Table 2.3 (b) Continuation

		ORGANIZATION						*LEARNING*						*TOOLS*		*Total Variables*
		9.	*10.*	*11.*	*12.*	*13.*	*14.*	*15.*	*16.*	*17.*	*18.*	*19.*	*20.*	*21.*	*22.*	
LITERATURE	1							●	●					●		4
	2	●				●		●	●	●				●		8
	3	●	●	●				●	●	●				●		12
	4			●							●		●	●		6
	5		●	●							●	●	●	●		9
	6	●						●		●			●	●		7
	7			●							●		●	●		7
	8			●									●	●		5
	9			●						●				●		3
	10			●		●				●		●	●	●		10
	11	●	●	●							●	●	●	●		9
	12	●		●		●						●	●	●		10
	13	●	●	●	●			●	●	●	●			●		16
	14	●		●				●	●	●	●		●			12
	15						●				●					5
CASES	16	●	●	●	●	●	●	●	●	●	●	●	●	●		17
	17	●	●	●	●	●	●	●	●	●	●	●	●			15
	18	●		●					●	●			●	●		8
	19								●		●	●	●	●	●	9
	20	●	●	●	●	●			●	●				●	●	12
		11	7	15	4	6	3	8	10	11	10	7	13	17	2	

1. Students 2. Student groups 3. Teachers 4. Teacher groups 5. Community of practice 6. Tutor/coach 7. Parents and grandparents 8. Local community 9. Learning time 10. Class 11. Learning space 12. Teaching 13. Curriculum and educational offer 14. Involvement of students or parents in the organization of the school 15. Object of learning 16. Method of learning 17. Personalization of learning 18. Formalization of learning 19. School autonomy in the planning of learning 20. Involvement of students in the learning process 21. ICTs for teaching 22. Teaching equipment

- the Self-managed High School in Paris (line no. 17): 15 variables;
- *School of One* (line no. 20): 13 variables;
- Ramboll Management (line no. 3) and the *Creative Classroom* (line no.14): 12 variables.

The variables that seem to be the most common are:

- use of ICTs (column 21): 17 environments;
- students working in groups (column 2): 16 environments;
- flexible use of different spaces (column 11): 15 environments;
- involvement of students in the learning process (column 20): 13 environments;
- tutoring (column 6): 11 environments;
- learning time (column 9): 11 environments;
- personalization of learning (column 17): 11 environments;

The 22 variables identified and divided into the four categories proposed (actors, organization, learning and tools) represent the framework that the authors propose to measure the degree of innovation of the learning environments (see Figure 2.12).

The value assumed by the 22 variables is determined with a score from 1 to 5 in one of the following two ways:

- 13 variables are measured using a Likert scale, typical of quality assessment tools, with scores of the type: null = 1, low = 2, medium = 3, high = 4, very high = 5.
- 9 variables are measured by the number of items that describe the object of analysis; item to choose from within a list, for example: 0 items = 1, up to 2 items = 2, up to 4 items = 3, up to 6 items = 4, 8 or more items = 5.

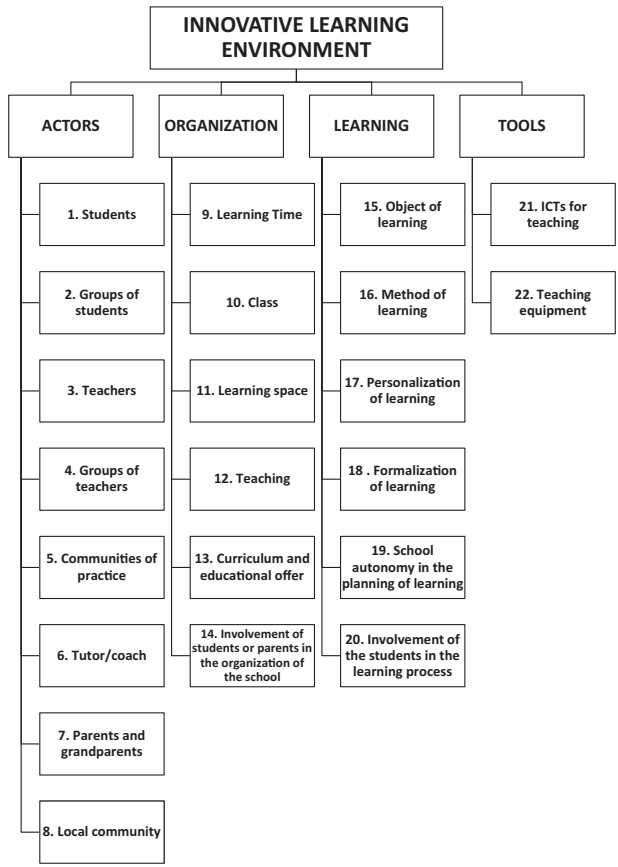

Figure 2.12 The Framework Proposed for Measuring the Innovativeness of Learning Environments

In Appendix B, the 22 variables are described in a specific way, organized into the four categories (actors, organization, learning and tools) and the ways in which they are measured.

A Focus on Learning and Teaching

To achieve the operationalization of three variables found in the literature – that is no. 17. Personalization of learning, no. 18. Formalization of learning and no. 19. School autonomy in the planning of learning – it was necessary to introduce an identification, respectively, of the classes of personalization of learning, those of the formalization of learning and of the characteristics of learning.

As regards the personalization of learning, it is possible to distinguish (see Figure 2.13) three categories: so-called "standard" learning (based on equal cognitive objectives and equal teaching methods), "individualized" learning (based on equal cognitive objectives and different methods of teaching), and "personalized" learning (based on different cognitive goals and different teaching methods).

Examples in this sense are the *Home School* (personalized learning), *Blended Learning* (personalized learning), the *Institute of Play* and the *Quest to Learn* (individualized learning) and the *School of One* (individualized learning).

In a hypothetical input–output model, teaching can be considered an input variable (input), while learning can be considered an output variable (output). Actually, teaching and learning do not establish a simple relationship of cause (teaching) and effect (learning), but a relationship of virtuous self-reinforcing circularity according to the model of figure 2.14.

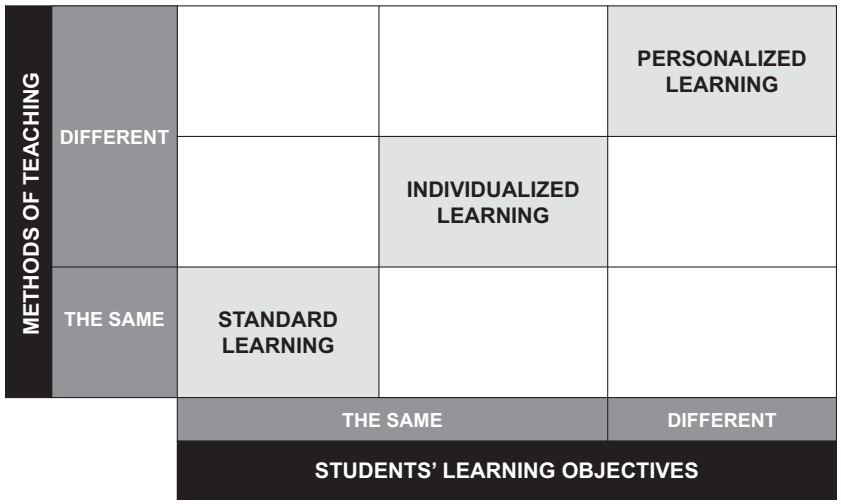

Figure 2.13 Categories of the personalization of learning

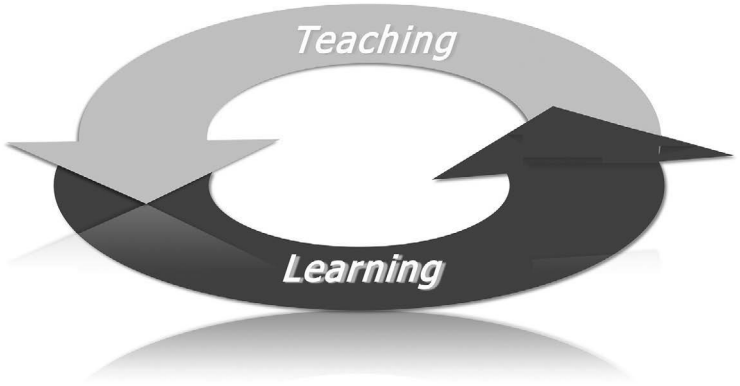

Figure 2.14 Virtuous circle of teaching and learning

As for the classic distinction among formal, non-formal and informal learning (see Appendix B), it is the result of the crossing of two key variables: structured or non-structured organization of the learning environment and the presence or absence of the intentional objectives of the learners, as represented in Figure 2.15.

With reference to school autonomy, in the planning of learning (variable no. 19), in Figure 2.14 we have clarified how teaching and learning are two sides of the same coin, that of education.

The four key characteristics (objectives, levers, actions and processes) of learning and teaching are represented in Figure 2.16. For a discussion of the concepts of knowledge creation/sharing and internalization/externalization of knowledge (implicit/explicit knowledge) see the Nonaka model of organizational creation of knowledge reported in Appendix C.

An Example of the Application of the Framework

If one wanted to exemplify the application of the framework – simulating having detected in a case study, using the methodology illustrated in Appendix B and with the questionnaire in Appendix D, the values of the variables identified as in Figure 2.17 – we would obtain the following result: the learning environment, on the whole, is partially innovative: the average of the values is 2.70 compared to the average value of 3.

We note slightly higher values in the categories or macro-variables "organization" and "tools". In particular, the environment is particularly innovative (score of 4) in relations with the local community (variable 8), in the organization of the learning space (variable 11), in the curriculum and educational offer (variable 13) and in the availability of ICTs for teaching (variable 21).

The framework described will be used in the 14 case studies analyzed.

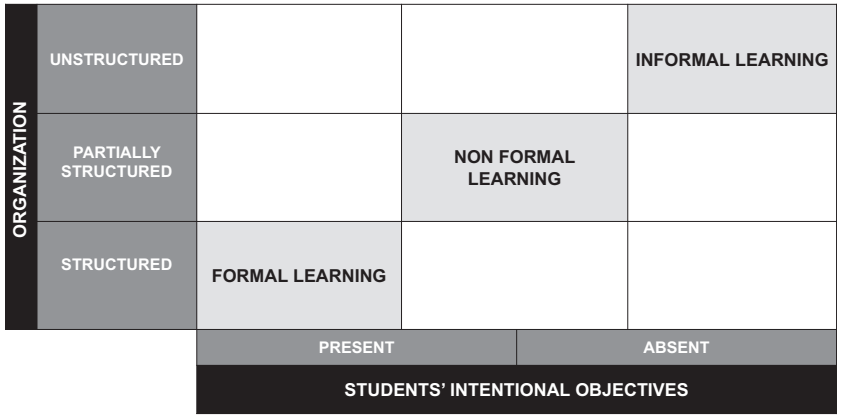

Figure 2.15 Categories of the formalization of learning

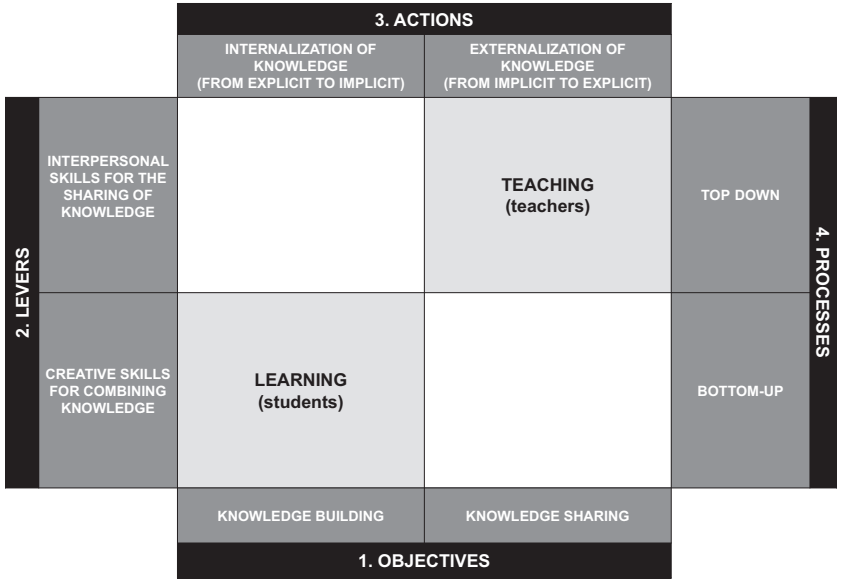

Figure 2.16 Characteristics of learning and teaching

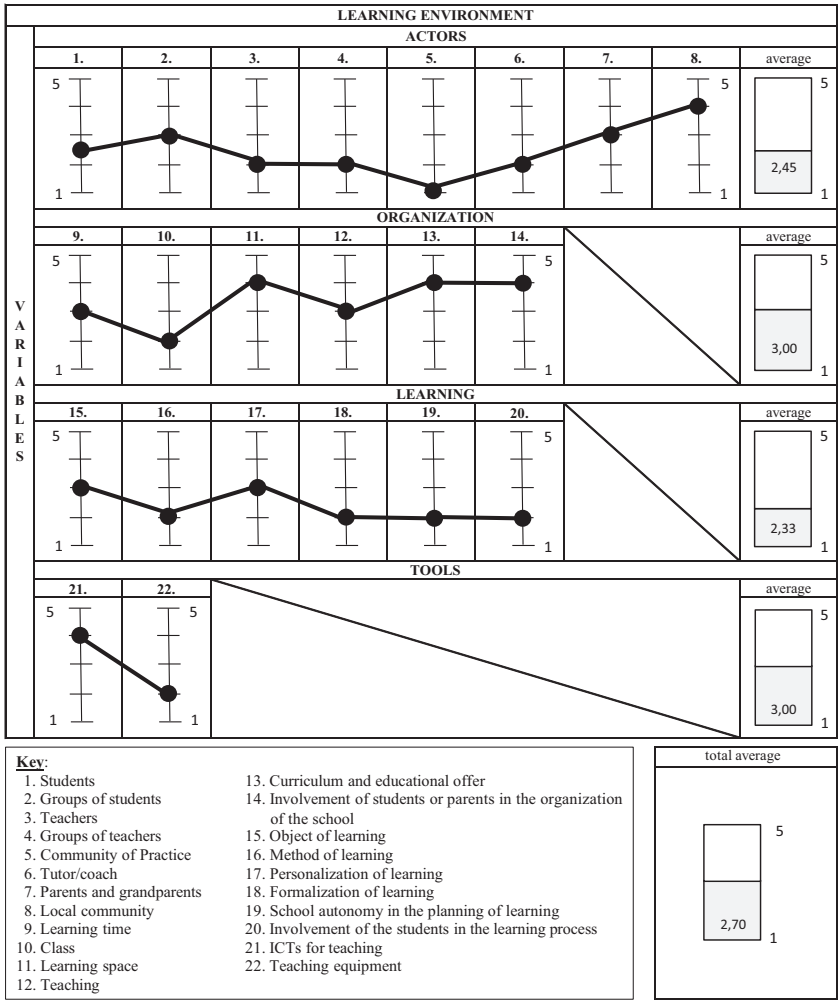

Figure 2.17 Example of the application of the proposed framework

Concluding Remarks

From the analysis of fifteen contributions by significant authors and from the study of five international cases (see Appendix A) it was possible to identify 22 key variables of innovative learning environments, divided into four categories: actors (eight variables: students, groups of students, teachers, groups of teachers, practice community, tutor/coach, parents and grandparents, local community), organization (six variables: learning time, class, learning space, teaching, curriculum and educational offer,

involvement of students or parents in the school organization), learning (six variables: object of learning, method of learning, personalization of learning, formalization of learning, school autonomy in the planning of learning, student involvement in the learning process) and tools (two variables: ICTs for teaching, teaching equipment).

The 22 variables (each with its own structure and relative measure) represent the basis for the construction of the framework proposed to measure the degree of innovation of learning environments (see Appendix B). The framework is accompanied by a questionnaire for the measurement of the same (see Appendix D).

The challenge is therefore the construction of learning environments that involve a multiplicity of actors, based on a flexible organization, designed on the key variables of learning and characterized by a high profile of technologies and equipment.

Note

1. In principle, the *framework* is valid for any learning environment, traditional or innovative. The difference is made by the seven principles (mentioned at the beginning of Chapter 1) of a previous study (OECD, 2010a), which make the environment effective and innovative.

Part Two

Self-Organization in Schools

3 School

Scenarios, Complexity and Change

3.1 The Future Scenarios of Schools

What will the school of the future be like? That is the question that OECD-CERI put in the *Schooling for Tomorrow* program in 2000, imagining it 20 years later (OECD, 2001).

The aim of research was to reflect on long-term educational policies. The center developed six possible scenarios for the school, from nursery school to secondary school: robust bureaucratic school systems, an extension of the market model, schools as the main social centers, schools as organizations focused on learning, networks of learners and societies of network, exodus of teachers and the scenario of failure.

The first two scenarios represent the *extrapolated status quo*, the second two portray the strengthening of schools (the so-called *re-schooling*) – and the last two foreshadow the decline of the school (the so-called *de-schooling*) (ibid: 77–79).

The first pair of scenarios: the extrapolated status quo. The two scenarios develop within the existing models.

1. Robust bureaucratic school systems. This scenario imagines schools inserted in bureaucratic systems that are strong and hostile to change. Schools continue to "do as they have always done", organized as isolated elements (schools, classes, teachers) within hierarchical administrations. The system adapts little to the environment by operating according to established routines and standards.
2. Extension of the market model. This scenario imagines the extension of the market approach to all those who teach, decide and administer resources. In this scenario, governments no longer manage the school, given the users' dissatisfaction. This hypothesis brings with it not only innovation and dynamism but also exclusion and inequity.

   The second pair of scenarios: re-schooling or strengthening of schools. The two scenarios represent strong and dynamic schools in a culture based on equity and a consensus of the value of the school, following systemic reforms, both upstream and downstream.

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3. Schools as the main social centers. In this scenario, the walls of the schools literally "come down", opening up and sharing responsibilities with the community, for example with social services and health care services, while maintaining their own identity. Great importance is given to non-formal learning, community activities and learning among generations. The school enjoys community support and this ensures quality environments and esteem for teachers.
4. Schools as organizations focused on learning. In this scenario, the school renews its knowledge agenda in a culture of experimentation, diversity and innovation. The system thrives on important investments, especially those aimed at helping disadvantaged communities and at guaranteeing teachers high-level working conditions.

   The third pair of scenarios: de-schooling. In these two scenarios, there is a significant decline in the school.
5. Networks of learners and network companies. In this scenario, we are witnessing the disappearance of the school, replaced by learning networks that develop in the context of a well-developed "networked society". The networks – based on different cultural, religious and community interests – integrate formal, non-formal and informal learning environments using the potential of ICTs.
6. Exodus of teachers and scenario of failure. This scenario foreshadows the failure of the school system because of a lack of teachers due to retirements, unsatisfactory working conditions, etc.

(OECD, 2001, 2008).

These scenarios have been presented and discussed in numerous national and international conferences. In one of these, (*Schooling for Tomorrow*) in Rotterdam in 2000, the participants expressed their opinions about probability and desirability:

Extrapolated status quo

1. Robust bureaucratic school systems: probability (56%), desirability (27%)
2. Extension of the market model: probability (47%), desirability (21%)

Re-schooling or the strengthening of the schools

3. Schools as the principal social centers: probability (59%), desirability (82%)
4. Schools as organizations focused on learning: probability (63%), desirability (85%)

De-schooling

5. Networks of learners and network companies: probability (47%), desirability (52%)
6. Exodus of teachers and scenario of failure: (not tested)

In summary, the interviewees:

- do not want schools, even if public, to remain as they are: scenario no. 1 (desirability 27%);
- do not want an extension of the privatization of schools: scenario no. 2 (desirability 21%);
- are divided regarding the question of de-institutionalization: scenario no. 5 (desirability 52%);
- do not express themselves regarding the failure: scenario no. 6 (untested desirability);
- want schools to be strengthened as social centers: scenario no. 3 (desirability 82%);
- they want schools to be strengthened even more as organizations focused on learning: scenario no. 4 (desirability 85%).

There is a clear preference (over 80%) for scenarios 3 and 4 of *Re-schooling* which represent the wishes of the interviewees. In summary, the interviewees want schools to remain public, with the relevant state funding – to guarantee everyone access to knowledge, as a collective good – but with a reduced role of government and educational policies, or with Government functions limited to setting medium-term goals and providing guidelines.

Re-schooling gives more importance to individual schools and their role in the local community; it wants them to be more autonomous and responsible for the results, more open and connected to the external environment. Each school would "re-organize" itself to achieve the goals set by the government and to be different from the others.

Norberto Bottani (1940), researcher in the field of education, ex-director of the educational research of the OECD, in a 2009 article titled "The Difficult Relationship Between Politics and Scientific Research on School Systems" written for the Giovanni Agnelli Foundation, presented a series of studies on the prospects for the future of the school. According to these works,

> it is the future of mass education, according to traditional canons, which is in crisis and is still far from coming about. School systems no longer hold the monopoly of education. A lot of learning takes place outside of schools and in a non-scholastic manner. . . . We need systems that are able to connect students with a wide range of tools and information accessible at any time, from any place. These reform strategies, to a large extent are still in need of being invented, are those that gather the majority of learning resources around the student and are not those that aim at safeguarding the current educational institutions.
>
> (Bottani, 2009, 25–27)

In 2002, the National College for School Leadership – the English National Institute for the Education of School Leaders – asked two well-known

educational scholars, Riel Miller and Tom Bentley, to write a report on the future of schooling. In this report, titled *Possible Futures: Four Scenarios for Schooling in 2030* (Miller and Bentley, 2003), the authors argue that by 2030 the state school systems will have to give up most of the functions they had exercised so far – custody, teaching of correct behavior, cognitive function, their function of screening or selection, that of socialization – and will be called upon to operate as a consulting service in the learning sector. This is because we are moving from an era characterized by mass production to one, completely opposite, characterized by unique creations, tailored. And the schools have the task of stimulating and supporting students in the construction of a "society of creativity". The authors propose four scenarios:

1. *Diversification in the provision of education*: schools will maintain their current functions, but will lose their monopoly on education with the advent of new providers of educational services.
2. *Modernization of the school*: schools will be able to maintain both their functions and their monopoly, because they will become capable of providing individualized teaching.
3. *The benchmark school*: schools will lose their monopoly in favor of other agencies, but they will take on a new function, that of benchmark for all other providers of educational services.
4. *The school as a mediator of learning*: schools will only maintain their function of screening. The classroom will disappear and schools will be entrusted with the sole task of validating students' learning and acting as regulators and sources of information for new providers of educational services.

In 2008, the *Teacher Leaders Network*, a virtual community of American teachers and school administrators, organized a forum on the perspectives of education induced by the spread of new technologies.[1] Some particularly significant elements emerged from this discussion:

- The diffusion of new technologies will create a new scholastic geography, freeing individuals from their enslavement to places and times specifically dedicated to teaching/learning, which will result in a different organization of spaces, a different territorial distribution of schools, a wealth of access to the tools of knowledge.
- The new technologies would make the problem of competition between public and private in the choice of the educational institution obsolete even if the question of evaluation, certification and recognition of the knowledge and competences acquired outside the school systems would remain unresolved.
- If the network allows students, alone or in groups, to build their own customized paths at home or in any other place, it is likely that the teaching profession will suffer significant reductions; not only this, a market of teachers will be born in which teachers on the net, as

individuals or in groups, will try to boast their own merits to attract students.
- The network will allow the establishment of virtual learning communities by means of social, religious or ethnic class affinities and therefore, this will mean the end of the mixing among students, that has so far been guaranteed by state schools.
- The weakening of socialization, or according to these teachers, the most important part of school life, has nothing to do with the learning of disciplinary contents. In school, above all non-cognitive skills are developed – such as interaction with peers, the development of a personal identity in comparison with others, the ability to assert one's opinions in a group, teamwork, respect for deadlines, the sense of responsibility, ethical behavior, etc. – which one learns and cultivates face-to-face, so one wonders if these skills can be learned outside of schools. In theory, there should be no contradiction between socialization within the walls of a school and on the Net, but for now we know very little about how socialization takes place on the Net, with what consequences and according to what rules.

What should be done to plan comprehensive school reforms? Or rather, can we still conceive of and implement a reform of the entire school system? The issue was the focus of a seminar sponsored by the *Atlantic Philanthropies* foundation and held in Dublin in July 2006 (Sugrue, 2008), which was attended by some of the promoters of the most well-known scholastic reforms carried out in the Anglo-Saxon world in the last quarter of a century.

The theme of the seminar was precisely the future of scholastic change, but rather than outlining a possible scenario, the conditions that make scholastic changes possible in the current socio-economic and cultural context were discussed.

Different answers were provided: the most optimistic (among which there were those of Jeannie Oakes, Professor Emeritus in *Educational Equity* at the *Graduate School of Education and Information Studies* at the University of California, Los Angeles, and member of the *National Board for Education Sciences* of the United States and of Andy Hargreaves, president of *Thomas More Brennan* at the *Lynch School of Education* at Boston College) think that the future of change can only come from the grassroots: all of the successful experiences prove this. Others are skeptical about the possibilities of bottom-up scenarios, but they also highlight the inconsistencies and disasters caused by decisions made from above. Everyone agrees that in order to face the challenges posed to school systems, it is essential that the actors operating in the school systems are adequately prepared.

In conclusion, we seem confident in summarizing the aforementioned contents:

- The 2001 *Re-Schooling* for 2020 (OECD) hopes for a role of determination of guidelines and medium-term objectives for the Ministry and

for schools a role characterized by autonomy, distinctiveness, responsibility for results, openness and connection to the local community.
- The 2003 study for 2030 (the *National College for School Leadership*) identifies the Modernization of the School as a scenario where schools will be able to maintain both their functions and their monopoly, provided they become capable of giving individualized lessons.
- The 2008 research project (*Teacher Leaders Network*) stresses the ongoing digital revolution and its impact on the teaching and learning process. However, it also emphasizes the irreplaceable role of a school where learners are in attendance, as the only way to develop non-cognitive skills such as interaction with peers, the development of a personal identity in comparison with others, the ability to assert one's own opinions in a group, teamwork, respect for deadlines, a sense of responsibility and ethical behavior.
- The 2008 seminar promoted by the *Atlantic Philanthropies* foundation, regarding the change in the system of education, has shown that the future of change can only come from below, as all successful experiences have proven; the inconsistencies and disasters are caused by decisions made from above.

In other words, the studies cited on the evolution of school systems highlight how:

- the future of the school is based on its responsible autonomy and its ability to interact with communities near and far;
- the future of the school is based on the personalization of learning;
- the digital revolution – which allows cognitive learning at a distance – does not question the role of the school as a physical place for the acquisition of transversal non-cognitive skills;
- successful changes in the school system emerge from the grassroots.

These theses supported by authoritative international studies go in the same direction as that indicated by the authors: the school of the future is a self-organized school, capable of real changes from the grassroots, with the Ministry supporting public funding, defining guidelines and setting goals in the medium term. A self-organized school that in Italy invents its autonomy which is not yet fully deployed.

3.2 The School as a Complex System

Karl E. Weick – authoritative American professor of psychology and organizational behavior – in his famous article "Educational Organizations as Loosely Coupled Systems" (1976) places schools within organizations characterized by weak ties.

In an organization characterized by weak ties, the elements that constitute it – people, organizational units, external actors, resources, events, activities,

etc. – interact, but each one maintains its own identity and independence, its physical or logical separation. The bond that unites them is occasional, circumscribed, of little relevance, with little reciprocal effects and/or it is slow in connecting them.

For example, March and Olsen (1975) use the elements of intention and action to argue that intentions are an insufficient guide to actions. Intentions would follow rather than precede the action. Intentions and actions would be weakly linked. Given the weak link between the intentions and the actions of the members of the organization, it should therefore not be surprising if principals and teachers feel frustrated when things do not go as expected.

Examples of weak ties at school are the links between teachers and students, teachers and parents, teachers and principals, teachers and teachers, students and students, teachers and administrative staff, teachers and material resources, means and ends, decisions and plans, intentions and actions, procedures and results, yesterday and tomorrow, etc.

In the article quoted, Weick argues that weak ties are typical of school organizations. He proposes a metaphor from sports by comparing a school activity with football: students are the players, teachers are the coaches, the principal is the referee and the parents are the spectators. In a provocative way the author claims that the situation could become paradoxical:

> Imagine being a referee, a coach, a player or a spectator of a unique football match: the field is circular; there are more than two goals and they are scattered disorderly along the edges of the field; participants can enter and exit the field as they wish: they can say "I have scored a goal" as much as they want, at any time and for as many times as they want: the whole game takes place on a sloping terrain and is played as if it made sense. . . . The charm of this description lies in the fact that it captures within the educational organizations a nucleus of different realities from those that can be highlighted in the same organizations by the classic positions of bureaucratic theory.
>
> (Weick, 1976, 355)

Weak bonds are typical of complex systems. According to Mario Comoglio – Professor of The Psychology of Education at the Faculty of Education at the Salesian Pontifical University – the complexity of the school is given by a series of intrinsically connected factors, such as (Comoglio, 2002, VIII):

- the nature and quality of the content to be learned;
- the heterogeneity of the people (defined by their levels of responsibility, motivation, commitment and morality) who take part in the process;
- the historical time and also the physical, social and cultural contexts within which this process develops;
- the non-linearity of teaching and learning processes.

It follows that there is no interdependence among programming, curricula, teaching processes and final outcomes. The nature and number of the variables are difficult to identify, and the diagnoses are uncertain.

The school is a dynamic and adaptive reality which, according to Comoglio:

> lives on the limits between order and disorder in continuous change. It is visible as a whole as well as in each of its parts. It has a large amount of resources that make many ambitious goals possible and close at hand, even if it is not able to achieve them all. The connections among the members are quite numerous and capable of producing great results. In it, more than linear dynamics of cause and effect, circular relationships are realized with effects that retroact on the causes. In the condition of having to face problems and find solutions, it cannot rely on certainties or experience, but seeks solutions by trial and error.
>
> (Comoglio, 2010, VIII)

An authoritative contribution in considering schools as complex realities that live on the brink of chaos between order and disorder (too much order: death by fossilization, too much disorder: death by disintegration) is that of Thomas J. Sergiovanni (1937–2013), American scholar famous for his ideas and theories on educational leadership that have helped improve the understanding of how educational leaders can guide schools more effectively.

According to Sergiovanni (2001), in the school, there is a co-existence of the professional community of teachers, students, parents, management, with sometimes univocal, sometimes divergent objectives; the life and development of the school are not guaranteed by laws, by tasks and roles, by hierarchical relationships, by compliance with the regulations nor by the quality of the principal.

The search for simple answers does not seem adequate to the school but derives from a rationalistic composition of the school that unjustifiably postulates the linearity and predictability of the world with consequent theories of management and leadership that are captivating on paper but not suitable for the reality of the school: "A disorderly world needs disorderly theories" (Sergiovanni, 2001, preface). Since the school environment is turbulent and indeterminate in practice, for most problems there are no pre-packaged technical and rational solutions.

Within a reflection on the limits of the traditional theory of management, Sergiovanni traces three "mental horizons" of the practice of the principal: that of the *Mystic*, of the *Orderly* and of the *Disorderly* (Sergiovanni, 2001). They have very different conceptions of the nature of the practice and the relationships between that same practice and the knowledge that comes from the theory and research in the educational field. For the Mystics there is no relationship; for the Orderly, theoretical knowledge is superordinate to practice and for the Disorderly, finally, knowledge is subordinated to practice. Their respective positions can be summarized as follows:

- *Mystics* believe that management resembles a *non-science*; in this way the principles gathered by theory and research have little practical relevance. Theoretical principles and practice are not related. On the contrary, practice is guided by the tacit knowledge of the manager, by an intuitive feeling regarding the situations, by the sixth sense and by other more abstract factors.
- The *Orderly* argue that management resembles an applied science, within which theory and research are directly and linearly linked to practice. The former always determine the latter and consequently knowledge is superordinate to the principal and aimed at prescribing the practice.
- The *Disorderly* are convinced that management is similar to a science that can be considered on the border with art, within which practice is characterized by the interaction between reflection and events. Theory and research are only a source of knowledge, they are subordinate to the principal and aimed at informing, but not prescribing the practice. Tacit knowledge and intuition develop and become stronger when they are informed by theory, research, experience and the masterly knowledge of others.

Leaving aside the mystics, although we can feel at ease in considering management as a logical process of solving problems through the application of standard techniques to predictable situations (the orderly ones), a more realistic perspective makes us think rather of a process of management of chaos (the disorderly) (Schön, 1983, 14–16).

The paradigm within which the disorderly operate is reflective practice, an interesting concept developed by Professor Donald A. Schön (1930–1997) of MIT, in his seminal book *The Reflective Practitioner* of 1983, which is of interest to the training of all professionals: engineers, architects, doctors, lawyers, accountants, teachers, school principals, etc.

Reflective practice is based on the reality that professional knowledge is different from scientific knowledge. Professional knowledge is created through use as professionals dealing with ill-defined, unique and continuously changing problems decide their course of action.

Ralph W. Tyler (1902–1994), an American educator, claims that researchers and many scholars do not understand educational practices. The practice of each professional evolves informally, and the professional procedures do not derive from the results of research. Professional practice has mostly developed through trial-and-error and intuitive efforts. The professional practice of teaching is, above all, the product of the experience of professionals, especially those who are more creative, inventive and capable of observing than the average.

Scientific studies are important for the various professions. But science, according to Tyler, explains the phenomena, does not produce the practice. Professionals rely fundamentally on informed intuition as they create knowledge in use. Intuition is informed on the one hand by theoretical knowledge and on the other by interaction with the context of practice. When they use informed

intuition, teachers are engaging in reflective practice. When school principals use informed intuition, they too are engaged in reflective practice. Knowledge is in the action itself and reflective professionals become students of their practice. They investigate the context and test out different courses of action.

Schön (1983) suggests:

> Can they ask themselves, for example, what features do I know when I recognize this thing? What are the criteria by which I express this opinion? What procedures do I put into action when I carry out this activity? How do I contextualize the problem I'm trying to solve?

Usually, the reflection on knowing in an action goes together with the reflection on the "things" that are at hand. There is a phenomenon that is in some ways problematic or interesting that the individual is trying to deal with. While trying to make sense of it, he also reflects on the understandings that are implicit in his action, understandings that he brings out, criticizes, restructures and incorporates into the next action. It is this overall process of reflection in the action that is central to art through which professionals sometimes face situations characterized by uncertainty, variability, uniqueness and conflicts of values.

According to Schön, the reflection in the course of the action implies: "bringing out at the moment, criticizing, restructuring and evaluating the intuitive understandings about the experienced phenomena; often, it takes the form of a reflective conversation with the situation".

The key to reflective practice can be found in William James's message to teachers in Cambridge, Massachusetts, in 1892. He emphasized the importance of "an inventive mind of mediation" in making a practical application of scientific knowledge. According to his words:

> The science of logic has never succeeded in making a man think correctly and the science of ethics . . . has never succeeded in making a man act correctly. These sciences can only help to stop and to repent, if you start to reason or behave in a wrong way; and to criticize yourself in a more articulate way after mistakes have been made. A science simply sets the boundaries within which the rules of the art must fall, rules that the follower of the art must not transgress; however, that particular thing that he will do in a positive way, within these boundaries, is left exclusively to his genius.

3.3 School Organization as an Engine of Change

According to the OECD (2013), the two key variables in obtaining innovative learning environments are organization and pedagogy, as represented in the *framework* of Figure 2.5 of Chapter 2. In other words, school organization is considered – together with the pedagogical processes – central

in linking the four fundamental elements of the teaching/learning process: learners, teachers, contents, and resources.

The role of school organization as a determinant variable in the functioning of the school is the subject of many studies within the framework of different fields of research. Among the latter we can mention two, which are among the most important: *School Effectiveness Research* and research on *School Improvement*. The focus of the first line of studies is on the school (and its organization), while the focus of the second strand is on teachers.

In a broader sense, the focus of the first current of thought is on effective schools, on the relationships between school and school performance, on the relationship between the organizational and managerial processes of the school and the learners' learning.

In a broader sense, the focus of the second current of thought is on teachers, on improvement processes (it focuses on culture, climate and working conditions), on change, on leadership, on learning communities, on networks and on international *benchmarking*.

In a research project promoted by the *Invalsi* (the National Institute for the Evaluation of the System of Education and Training in Italy) of December 2007 and edited by Angelo Paletta – titled *Prime riflessioni sugli aspetti organizzativi della scuola* italiana (*First Reflections on the Organizational Aspects of Italian Schools*) – a wide-ranged comparison was made between the two different currents of thought (see Table 3.1).

The international movement of the *School Effectiveness Research* (Reynolds and Stoll, 1996; Edmonds, 1979; Mortimore, 1998; Sammons, 1999; Scheerens and Bosker, 1997; Teddlie *et al.*, 2000) – which developed in the United States, the United Kingdom, Holland, Sweden and Norway – through a quantitative approach, empirically evaluates the effect of school management and organization on students' learning (cognitive in the basic disciplines of reading, mathematics, science), as the title of one of these research projects recites emblematically: "Schools Can Make the Difference" (Brookover *et al.*, 1979).

In summary, according to the research of this current, it emerges that the correlations between learning and input variables (e.g., expenditure per student, ratio of students per teacher, condition of entry of students) are modest, while those between learning and educational processes in the classroom count more; however, since management and leadership create the contextual conditions of the processes in the classroom, these indirectly take on a great relevance (Creemers, 1996). So, the more consistent and cohesive the class and school variables are, the higher the learning results will be.

However, according to various authors (Reynolds and Stoll, 1996), the research of this current of studies presents some problems:

- there is no sharing of the factors of effectiveness, on the definition and measurement of the same;
- there is little research on case studies that demonstrate the interrelations among the variables;

Table 3.1 Comparison between the *School effectiveness* and *School Improvement* curricula

School Effectiveness	*School Improvement*
• Focus on schools	• Focus on the teachers
• Data-driven approach with emphasis on outcomes	• Rare empirical evaluation of the effects of change
• Restriction of the concept of outcomes to cognitive aspects	• Extent of the concept of cognitive and non-cognitive outcomes
• Most interested in the changes in school performance	• Most interested in school improvement processes
• Lack of knowledge on how to implement the strategies of change	• Interested in how change can actually be achieved in schools
• Interested in schools that are effective	• Interested in how schools can become effective
• The aims and objectives of the school are given	• The aims and objectives of the school are problematic
• Quantitative research methods	• Qualitative research methods
• Static approach (school as it is) based on the manipulation of large databases often related to entire educational systems	• Dynamic approach, interested in the processes of change within the school (school as it has been or might be)
• Passive involvement of school staff	• Active involvement of staff (action research)
• Weak regulatory information on how to improve schools	• Strong indications for the development of scholastic strategies

(Source: Invalsi, 2007, 7 © Paletta)

- the results are not sufficiently detailed to establish improvement programs because relations with the context are not studied.

Other critical points in the literature are:

- the lack of interest in managerial implications of the information emerging from the statistical models: No attention is paid to the improvement of the school, of educational processes, of teachers, all of which are considered marginal aspects (Molino, 2011);
- the methods of the implementation of the strategies of change lack an in-depth study (Invalsi, 2007);
- the term effectiveness is reductive to the measurable aspects of the practices and results; the term school assumes that all learning must take place in educational institutions called schools when, more and more frequently, these provide only a portion of the learning needs of young people (OECD, 2013).

The current of School Improvement (Hopkins *et al.*, 1997; Teddlie and Stringfield, 1993) is made up of studies that – through a qualitative approach – underline the importance of teachers and leadership able to propose strategies for improvement.

Emphasis is placed on climate and working conditions, but the impact of the improvement of the programs regarding performance has rarely been measured. More recently, the focus has been on the learning context, for example on the background of the students, the families they belong to, the territorial location.

The limits of these studies as highlighted in the literature are:

- they do not pay attention to the organization and results;
- they do not measure the impact of improvement programs on performance (Invalsi, 2007);
- the term improvement refers to the improvement of something known and understood and therefore based on well-defined parameters: when the objective is the innovation of learning environments, the term might not be relevant (OECD, 2013).

3.4 The Autonomy of Schools Within the Italian School System as a Premise for Change: The Legislative Stages

The process of autonomization of the scholastic institutions has lasted more than 20 years, divided into six stages going from 1993 until 2015. Appendix E contains the key contents of the laws that have marked them.

First stage (1993): Law no. 537 of December 24, 1993 – with Carlo Azeglio Ciampi as Prime Minister (April 28, 1993–May 10, 1994) and Rosa Russo Iervolino as the Minister of Education – attributed a judicial identity to all schools of every order and level giving them autonomy regarding organization, finances, teaching, research and development. The law was never applied as it delegated the implementation of autonomy to legislative decrees. This delegation was canceled by the subsequent Government headed by Silvio Berlusconi (May 10, 1994–January 17, 1995) with Francesco D'Onofrio as the Minister of Education.

Second stage (1997): Law no. 59 of March 15, 1997 (the so-called first Bassanini law) with Romano Prodi as Prime Minister (May 17, 1996–October 21, 1998) and Luigi Berlinguer as the Minister of Education. The core of this law, represented by Article 21, provided for the confirmation of the attribution of a legal identity to all those educational institutions that had certain minimum requirements regarding size (paragraph 4). The transition to the new regime of autonomy was accompanied by initiatives for the training of staff, an analysis of territorial and social realities, and it was carried out according to criteria of graduality in order to enhance the individual educational institutions' capacities for establishing initiatives. There was organizational autonomy (paragraph 8) and educational autonomy (paragraph 9), while financial autonomy disappeared and a less demanding "financial

endowment" appeared, made up of the assignment of administrative and didactic functions by the State (paragraph 5). In practice, the idea of 1993, which was never implemented, of giving schools a real financial autonomy with an ordinary financing fund with which to pay staff like the Universities was abandoned. Schools remained organs of the state with organizational and teaching autonomy.

Third stage (1999): Presidential Decree no. 275 of March 8, 1999, with Massimo D'Alema as Prime Minister (October 21, 1998–December 22, 1999) and Luigi Berlinguer as the Minister of Education. In fulfillment of the aforementioned principles, the Regulation containing rules regarding the autonomy of educational institutions pursuant to Article 21 of Law no. 59 of March 15, 1997, was issued. The Regulation defined the organizational and educational autonomy of schools as a guarantee of freedom of education and cultural pluralism and provided for the design and implementation of education, training and educational interventions according to the different contexts, to the questions from families and to the specific characteristics of the subjects involved, consistent with the aims of the national system of education. To this end, each educational institution would prepare a Plan of Formative Offer (POF, Piano dell'Offerta Formativa), or the basic document constituting the cultural identity and the plan of schools in which it expressed the curricular, extracurricular, educational and organizational plans that each single school would adopt within the scope of its autonomy.

Fourth stage (2001): Constitutional Law no. 3 of October 18, 2001, with Silvio Berlusconi as Prime Minister (June 11, 2001–April 23, 2005) and Letizia Moratti as the Minister of Education. Autonomization was perfected with the constitutional reform of Title V of Part II of the Constitution which legitimized, at a constitutional level, the recognition of autonomy to schools (article 117). From this moment on, the regulatory framework underlying autonomy provided for by the previous regulations became the starting point for any further development.

Fifth stage (2012): Law no. 35 of April 4, 2012, with Mario Monti as Prime Minister (November 16, 2011–April 27, 2013) and Francesco Profumo as the Minister of Education. In Article 50, in order to consolidate and develop the autonomy of educational institutions by enhancing managerial autonomy according to criteria of flexibility and enhancing the responsibility and professionalism of school staff, guidelines were adopted in order to:

a) strengthen the autonomy of educational institutions, also through the eventual redefinition of the aspects connected to the transfer of resources, upon the beginning of a specific experimental project;
b) define, for each educational institution, a staff of autonomy, functional to the ordinary didactic, educational, administrative,

technical and auxiliary activities, to the needs of the development of excellence, of scholastic improvement, integration and support for pupils with special educational needs and of a plan for the needs of school staff, also for the purpose of extending school time;

c) establish territorial networks among educational institutions, in order to achieve the optimal management of human, instrumental and financial resources;
d) set up a system of the stability of staff that should last for at least three years.

Sixth stage (2015): Law no. 107 of July 13, 2015, the so-called "Good School", with Matteo Renzi as Prime Minister (February 21, 2014–December 12, 2016) and Stefania Giannini as Minister of Education. Autonomy was recognized and extended further. In order to fully implement autonomization, the staff of autonomy was confirmed, in function of the educational, organizational and planning needs of the educational institutions as would emerge from the Three-Year Plan of the Formative Offer (Three-Year *POF*) which replaced the previous Plan of the Formative Offer (*POF*). Teachers within the staff of autonomy contributed to the implementation of the three-year plan by means of their activities of teaching, empowerment, support, organization, planning and coordination.

3.5 School Autonomy: As Imagined and as Achieved

The analysis of the legislative stages of the automatization of schools that has been achieved in Italy is not enough to thoroughly understand the theme of school autonomy in our country.

The first law, that of 1993, was the result of a path that started with the National Conference on Schools of 1990 (January 30–February 3) held in Rome, with Giulio Andreotti as Prime Minister for the 6th time (July 22, 1989–April 13, 1991), Sergio Mattarella, our current President of the Republic, as Minister of Education, and Alessandro Pajno, today President of the Council of State, as the Parliamentary Private Secretary of Education.

The Chamber of Deputies asked for the National Conference on Schools as a moment of general consultation of all the members of the civil and scholastic society with the aim of identifying the directions and priorities of an extraordinary plan for schools. The topic of the autonomy of educational institutions was addressed for the first time during this Conference.

Sabino Cassese – today judge emeritus of the Constitutional Court – opened the conference, in which Giuseppe De Rita also participated as President of the CNEL – National Council on Economy and Labor. Cassese acknowledged that education, as a public collective service, can be provided by autonomous institutions, giving schools not only didactic, organizational

and administrative autonomy but also that of accounting and management of personnel; by stripping the central apparatus of managerial tasks, assigning it functions of determining standards and guidelines and assessing and auditing functions; suppressing the provincial offices (the then *Provveditorati agli Studi* – the Local Educational Authorities) and replacing them with institutions acting as relays among the schools. According to Cassese: "With the changing relationship between state and society and between school and state, we have been slowly realizing that the State cannot be responsible for education. It is the school, as an institution endowed with autonomy". And again: "Not school autonomy, but autonomy of the schools".

Law no. 537 of December 24, 1993, incorporated this approach and implied not only the strengthening of the government of the single schools but, more incisively, the abandonment of the previous ministerial model of organization, of a vertical type, which saw the schools as deputy institutions that were to implement the policies of the Central Administration within the territory, even if they were endowed with a particular managerial autonomy. In this way, resuming in essence the ministerial approach of the delegated decrees of May 31, 1974 (in particular 416, 417 and 419), outlined by the Minister of Education of Mariano Rumor's 5th government, Franco Maria Malfatti.

According to the new approach instead, announced in the aforementioned law of 1993, strongly supported by the then Minister Rosa Russo Iervolino and by the then Parliamentary private secretary, Alessandro Pajno, the schools – preferably connected via a network, according to their types or their specific purposes – were to have taken on a truly autonomous and central role with respect to other institutional subjects, as providers of a technical service, teaching, and not an administrative and managerial one.

In this perspective, the State, the Regions and local authorities would only have the task of ensuring the operational conditions of the technical service provided by the schools – in the context of their autonomy regarding teaching, research and organizational planning – and that is, the task of:

- defining the structure of the studies, in terms not only of rigid programs but of cultural, educational and professional profiles, as well as learning objectives and expected results;
- regulating the legal status of school personnel;
- promoting the territorial planning of the schools, the related personnel, the offices and the instrumental resources.

In this perspective, financial autonomy was envisaged (art. 4, paragraphs 6 and 7 letter g) similar to that of the universities, with operational financing included in the State budget, defined according to predetermined criteria and therefore programmable by the schools, instead of entrusting them to discretionary decisions and to the timing of ministerial disbursements, obviously linked to policies unlike those of the individual schools.

This innovation, inserted in a more comprehensive framework of reform in the horizontal sense of the organizational model of school autonomy, understood as an autonomous educating community, was however entrusted, in its concrete implementation, to the approval of specific delegated decrees, to be implemented within six months from the enactment of law 537/1993, a term that the subsequent government headed by Berlusconi (Minister D'Onofrio), which had in the meantime taken over, let expire.

Article 21 of law no. 59 of March 15, 1997, which concretely established school autonomy (Minister Berlinguer), was, instead, inserted in a different general framework (Bassanini law), essentially centered on the Reform of the State in all its articulations, through the "Delegation to the Government for the conferment of functions and tasks for the regions and local authorities, for the Reform of the Public Administration and for administrative simplification".

Not therefore an enhancement of the educating communities (in a vision typical of a Catholic culture) against the interference of the State in educational matters, but efficiency and flexibility of state structures in a broad sense (in a vision that is typical of a secular culture), with responsibility for results and related assessments.

In our opinion, school autonomy is still today inadequate with respect to the objective of promoting the identity of paths of scholastic formation, albeit in a national framework defined by the learning objectives of the educational systems of each type of institution.

Designing and implementing a curriculum with flexibility, according to the concrete and diversified questions of the users of each school (think of the non-EU citizens today), would in fact require a great deal of didactic planning and intermediate checks, for which an articulation of the teachers' roles (new careers), more funding to pay for non-traditional (lecture-type) educational activities, financial autonomy for credible multi-year programs, choice of teachers according to each one's professional profile, to be linked to the specific type of formation of the schools. However, it would be necessary to start again from the 1993 approach.

In summary, Italian legislation recognizes that schools have a true organizational and teaching autonomy, but not a true financial autonomy such as that attributed to universities.

In this context of partial autonomy, however, processes of change from the grassroots can be activated, as argued in the aforementioned *Atlantic Philanthropies* study. These processes of change from the grassroots are attributable to the bottom-up emergency processes that are typical of the self-organization of complex systems.

Autonomy is the normative condition within which self-organization can take place. And we will see how, in various schools, these spaces of autonomy have in fact become the cradles of self-organization, which will be the topic of the following Chapters 4 and 5.

Concluding Remarks

The studies cited on the evolution of school systems highlight how:

- the future of the school is based on its responsible autonomy and its ability to interact with communities near and far (OECD, 2001);
- the future of the school is based on the personalization of learning (Miller and Bentley, 2003);
- the digital revolution, which allows cognitive learning at a distance, does not question the role of the school as a physical place for the acquisition of transversal non-cognitive skills (*Teacher Leaders Network*, 2008);
- the successful changes in the school system emerge from the grassroots: all of the successful experiences prove this (*Atlantic Philanthropies*, 2008).

In 1976 Weick had already stated that school is a complex system. If scholastic practice is characterized by variety, variability, uncertainty, and indecisiveness, or rather that it is complex, the search for simple answers is not adequate for the school. For most of the problems there are no pre-packaged technical and rational solutions.

The American scholar Sergiovanni traced three "mental horizons" of the practice of the principal: that of the Mystic, of the Orderly and of the Disorderly. They have very different conceptions of the nature, practice and of the relationships between that same practice and the knowledge that comes from theory and research in the field of education. For the Mystics there is no relationship; for the Orderly the theoretical knowledge is superordinate to practice and for the Disorderly, finally, knowledge is subordinate to practice. The latter is more realistic, which makes it similar to a process of the management of chaos.

That the organization of schools is the key to change is highlighted in many studies. It is considered – together with the pedagogical processes – central in linking the four fundamental elements of the teaching/learning process: learners, teachers, contents and resources.

Autonomy is the normative condition within which the processes of change from below can be activated, emergency processes that give rise to self-organization. Italian legislation gives partial space to school autonomy, giving schools autonomy in teaching and organization, but not a true financial autonomy like that which universities enjoy. It is in this limited space of autonomy that school self-organization can still become one of the key drivers of innovation.

Note

1. The report of the discussion was published on July 24, 2008, in the supplement "*Teacher Magazine*" to the American weekly "*Education Week*".

4 Self-Organization

The Most Fascinating Future of Organizations

4.1 Introduction

This chapter introduces the reader to the theory of self-organization in organizations, its characteristics, the perspectives and the possible questions it may imply. Intentionally, it does not refer to the peculiarity of schools, to which the next chapter is dedicated. In particular, here we examine the great importance that self-organization plays in the processes of change in organizations. Two relevant experiences are analyzed: Jesuit self-leadership and self-activation in Toyota. Later we focus on the organizational capabilities that allow self-organization: interconnection, redundancy, sharing, restructuring. We, therefore, answer questions such as: is hierarchy inevitable? Can focused organizations be self-organizations? Can self-organization be planned? We conclude by asserting that hierarchy and self-organization are not antithetical, but coexist in the time and space of organizations.

4.2 Self-Organization

Change is probably the central topic in the strategy and management of organizations. *Panta rei*, everything flows. Everything changes also in the school: students, professors, technicians, principals, professions, goals, school supply and demand, technologies, etc. And strategies, organizations, management techniques, learning and teaching methods, etc. also change.

But how should change be dealt with and realized? This is the decisive question that all of us ask ourselves, and the answers, both in literature and in people's experiences, are the most diversified.

There are two key variables of change: process (continuous and discontinuous) and path (planned and emergent), variables that, if they intersect, identify two polar models of change:

1. *Turnaround* (discontinuous process and planned path);
2. *Continuous and fluid transformation* (continuous process and emerging path).

(Rebora, 2016)

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In this chapter, we maintain the thesis that in organizational change, self-leadership is a key element both in the *turnaround* model and in that of *transformation*, that is both in changes characterized by a clear turnaround, and in those attributable to a real metamorphosis.

Self-leadership involves self-organization understood as the result of a dynamic process of emergence coming from below, based on local interactions among the constituent parts and without centralized control, through which a complex system reorganizes its basic components to form a new configuration equipped with different properties with respect to its elementary components. In short, the whole is greater than the sum of its parts.

The bottom-up process of emergence that generates self-organization is evident in the physical world (the laser is synchronized light), in the biological world (the harmonious deploy of a flock of birds is generated by each member's application of a few micro-individual rules), in the social world (industrial districts are born from below through social, cultural and economic interactions). Natural sciences, life sciences and social sciences describe how in many physical, biological and social phenomena respectively, the organization is not imposed from above but emerges from below, thus becoming self-organizing (De Toni *et al.*, 2011).

The Nobel Prize-winning physicist Philip Warren Anderson (1923) stated that "Emergence, in all its infinite variety, is the most fascinating mystery of science". We, paraphrasing him, maintain that "self-organization, in all its infinite variety, is the most fascinating future for organizations".

4.3 The Experience of the "Heroic" Self-leadership of the Jesuits

In this section, we propose a perspective on the theme of leadership based on the contribution of Chris Lowney, author, in 2003, of an original book titled *Heroic Leadership*. The text tells the story of the Jesuits, with particular attention to the themes of leadership and organization. The Society of Jesus – founded by Ignazio di Loyola in 1543 – is one of the organizations that more than others has been able to transform itself over time, taking advantage of the signs of change.

Emerging Bottom-Up Strategy

One of the first principles to which young Jesuits are educated is that "the whole world will be your home" (O'Malley, 1984, 7). The phrase must be understood literally and aims to push young Jesuits to be quick and mobile and to react promptly. However, those words were also meant to describe the particular mental attitude that every Jesuit was called on to cultivate (Lowney, 2003, 32).

They must be "indifferent", because indifference leads the human being to eradicate any provincialism, any fear of the unknown, any attachment

to social status or its properties, any prejudice or aversion toward risk, and above all that kind of thinking which adheres to the idea that "for time immemorial, it has always been that way". By getting rid of any immoderate attachment that might prevent him from taking risks and accepting innovations, man finds the right balance to turn his imagination to new opportunities and solutions, the number of which increases considerably if we are able to look to the future with optimism. This is what Loyola called "living with your foot always in March" (ibid: 292–293).

The spirit of initiative finds its foundation in the conviction that all problems mostly have their solution and that it will not be difficult to find it thanks to imagination, perseverance and open-mindedness (ibid: 171).

Initially born with the generic purpose of "bringing relief to souls", the society subsequently focused on a specific direction: school education. The change was very strong and, as the author explains, it was not planned but it was the result of the path taken: "we could pretend that, on a distant afternoon in 1543, a task force with a master plan to dominate the market of world education was emerging in some meeting room. Things, however, did not go exactly that way: everything simply happened almost by accident, and the truth is that the great corporate successes that happened almost by accident are many more than what the business strategy experts would like to admit" (ibid: 215–216).

What happened was a classic case of displacement of the field of action, as the Jesuit teams that had received the precise mandate to instruct new recruits gradually realized that their mission yielded excellent results. Boarding schools were opened around the University of Paris, Leuven, Cologne and other cities for young trainees. The Jesuit managers acted as supervisors to the spiritual development of the novices while the best European universities provided them with excellent academic training. For the Jesuit managers, not even the quality of teaching of the most renowned European universities seemed adequate to the "very apt", so much so that it soon appeared absolutely logical to combine university studies with courses in which the Jesuits themselves would teach. Structures born as boarding schools for young Jesuits, in which the teaching activity was not carried out, turned into real colleges with teaching and administrative staff trained by Jesuits, but also addressed to lay students. The field of action had shifted. The objective had not emerged from a brainstorming session in some strategic planning office (of which the order had none): everything had happened almost by accident. Suddenly almost three-quarters of the Jesuit human resources were channeled into an activity that had not been contemplated at the time of the founding of the Society of Jesus (ibid: 217–218).

The school network was built from the bottom up and not imagined from the top down. If there was any vision of the order at the top, it limited itself to specifying with great determination a single detail: *magistri sint insignes*, that is "the teachers must be excellent" (ibid: 224).

Vision and Example

According to Lowney, a leader's greatest strength lies in his personal vision, which he transmits to others with the example of his personal life:

> If you want your team to have a heroic performance, be a hero yourself. If you want your employees to help each other, help them yourself with encouragement, loyalty and an honest kind of *coaching*: that is all that is needed for them to be able to proceed fast to perfection.
>
> (ibid: 19)

Leadership has no instrument as useful as the example offered by the leader's life (ibid: 296).

Saint Ignatius of Loyola did not leave all minor affairs to the Jesuit brothers, but all affairs. In fact, after imparting his instructions, Loyola added: "By finding yourself directly in the field, you will be able to see much better than me what is necessary to do" (De Guibert, 1964 in Lowney, 166). "I leave everything to your personal discernment and every decision will be considered by me to be the best" (Young, 1959, in Lowney, 166).

Loyola firmly believed in delegating, and repeatedly proved it with facts. With regard to this, we can cite the example of the Jesuit Olivier Mannaerts, who ended up making wrong decisions. When he confessed the mess he had made to Loyola, he received no reproach, but rather the decisive encouragement to get back in the saddle immediately: "In the future, I want you to act as your judgment suggests, without too many scruples, and despite any rules and orders" (De Guibert, 1964). Having insisted on Mannaerts' abilities paid off: in charge of guiding Jesuit activity in the Netherlands and Belgium, he was able to transform a devastated region into a country where 700 Jesuits ran nearly 30 colleges (Lowney, 166–167).

We now know with certainty that innovation and creativity are realized when the individual has a solid anchorage and the managerial support necessary to take risks and try to experiment (ibid: 167).

Self-Leadership

Lowney urges the reader to remove those blinders that lead people to consider leaders only those who have leadership as the Jesuits forced their novices to exercise leadership (ibid: 16).

Every leadership is first of all a self-leadership that comes from personal beliefs and attitudes (ibid: 22). The Jesuits created a type of society in which each subordinate was a leader (ibid: 91). Every moment, and not just the decisive one, represents an opportunity to make an impact on reality, to build a life impregnated with leadership. We are all leaders, and we can all be a leader at any time (ibid: 91).

The particular charm of Loyola – the founder of the Jesuit order – was not in his characteristics of a leader, but in the fact that he knew how to open up in others the potential talent for leadership (ibid: 45).

Three great Jesuits such as Benedetto de Goes, Matteo Ricci and Christopher Clavius represent three decidedly unusual models of leadership. All three found themselves to be the guide of a small group of people, indeed, for most of their active life each of them was simply his own guide. We have thus reached the crux of the question: they were leaders of themselves (ibid: 88).

Practicing leadership does not simply mean that some work gets done. For every leader – including Goes, Ricci and Clavius – this means exerting influence, having a clear vision, being persevering, energizing others, being open to innovations and offering your own teachings (ibid: 89).

A leader has an inspired image of the future and struggles to give it a concrete shape, rather than just looking passively at what is happening around him. Heroes know how to get gold from every opportunity they come across, rather than waiting for someone else to offer them golden opportunities.

Saint Ignatius once encouraged a group of Jesuits who were in Ferrara by telling them that they should strive to "conceive great decisions and spur equally great desires", pursuing heroic goals.

The Jesuits were also driven by an inexhaustible energy that seemed to be enclosed in a simple word that became the motto of their society: *magis*, that is, always something more, something greater (ibid: 34).

Young people accepted that invitation and, all over the world, some Jesuits driven by the *magis* impulse began to believe and act as if everything they were doing was somehow the greatest enterprise of today's world. They knew how to put energy, imagination, ambition and motivation into their work (ibid: 291).

The heroism inspired by *magis* pushes men to aim high and keeps them focused on achieving something more, something bigger. Loyola reminded young Portuguese Jesuit novices that "no trivial result will fulfill the sublime obligation you have to always excel". They were never to say they were satisfied with a job half done. The Jesuits were to forge "noble and brilliant men who . . . would scatter among peoples and realms as sparkling precious stones" (Gortan, 1999 in Lowney, 290).

The heroic leaders do not wait for the great opportunity in order to act; they seize every opportunity that occurs and get as much as possible from it. The heroism of a man lies in his noble gesture of devoting himself entirely to a lifestyle that focuses on goals greater than himself (*ibid*: 291).

For successful leadership IQ and technical skills are much less fundamental than a mature self-awareness (ibid: 29).

Invariance to Personal Results

Another important aspect of the leadership model proposed by the Jesuits concerns the relationship of the self-leader with defeat or failure. The latter are in fact re-read in light of the usefulness of the actions of the individual for the community, for the group, even first of all, for the individual himself: his failure could in fact be the basis for the success of others who will come after him. Success and failure are also irrelevant in determining the heroic character of a self-leader's actions.

A person does not need to achieve a great victory, clearly visible to all and self-celebrating: sometimes success comes in the form of a contribution that helps the team win. In the case of Goes, leadership found the nucleus of strength in an action so little noteworthy – and yet so arduous – as the exploration of a blind alley (ibid: 72). The personal greatness of those daring travellers [like Benedetto de Goes] does not lie in what they discovered at the end of the expedition, but in the character of their personality that led them to attempt it: strength of imagination and will, perseverance, courage, exuberance of personal resources and complete willingness to run the risk of failure (ibid: 71).

Motivation as Self-motivation

Lowney stresses that the real motivation is self-motivation: whether a large company or a one-man company, the mission will motivate people only if it personal (ibid: 253). And surely, the mission will turn on the people who are involved in its process of elaboration. Leaders thus should make the motivation become personal also for the colleagues or employees, which is the key to creating self-motivation (ibid: 297).

Let us not forget that the Jesuit brothers who assigned spiritual exercises to young novices were reminded to find themselves their way: they have learned from experience that everyone finds more pleasures and stimulus by what he can discover by himself. What is therefore needed is to indicate, as with a finger, the field and to leave everyone dig by himself (Meissner, 1992, 335).

In conclusion, true motivation is self-motivation and true self-motivation is the result of a shared vision. In the processes of change, which are the leitmotif of the management of the organizations, and therefore of schools, strong visions are needed that can orient the group, activate its self-motivation and free its creative energies.

The Construction of Self-leadership

The Jesuits essentially offer us a model of leadership perfectly suited to the real life that most of us live (Lowney, 90–91):

- we all face the challenge of being able to motivate ourselves;
- life rarely takes place with the predictability of a strategic plan; leadership often means improvisation. The challenges of life mostly emerge in completely unexpected moments and in ways that cannot be foreseen.

There are circumstances that do not appear in any leadership manual nor do they correspond to well-planned existential strategies; on the contrary, we must rely solely on our intelligence and wisdom that we have accumulated over the years;

- our decisive moment corresponds rather to a model that slowly comes to be imprinted in our behavior during a lifetime;
- we must derive our personal gratification not from immediately manifest results, but from the profound conviction in the value of our actions, decisions and choices.

The highly expert youths that the Jesuits sought were spiritually committed novices, profoundly dedicated to a mission, intellectually superior (1% of the European elite), able to discuss theological topics in Latin with the major theologians of the Protestant world and at the same time able to explain the same concepts to the peasant children in the various vernacular languages; novices ready to leave with only two days' notice on a journey that would take them to the other end of the world; able to feel at ease both in a university lecture hall and in hospitals full of plague victims; willing to obey orders but also to design personal strategies. Only certain candidates could be the very apt, the best ever, so much so that the slogan followed in the recruitment operations immediately became "*quam plurimi et quam aptissimi*", that is "as many as possible among the best ever" (ibid: 216).

If the reader will allow us an extreme synthesis, every "very apt one" can become a leader, the leader is first of all a self-leader, and a heroic leader "spurs great desires". To be heroic is not the work done, but the attitude one has toward it.

If every man finds greater pleasure and greater stimulus in what he can discover within himself, then it is certain that at the basis of the construction of a self-leader there is self-motivation. The first step that the novice, even if "very apt", must make is to acquire a full awareness of himself and find his own incentives to motivate himself in order to reach the goal. The second step that leads the novice to becoming a self-leader is the acquisition of a sufficiently good spirit of initiative (and skills) capable of making him completely self-sufficient. In Figure 4.1 we have outlined the path of a novice who, once self-motivated and self-sufficient, becomes a self-leader.

Figure 4.2 summarizes the path of a novice who, once he has become a self-leader (ordained), can become a hero if he knows how to devote himself entirely to a lifestyle that focuses on goals greater than himself, that is he pursues goals that are "almost" impossible.

The path of each individual within the organizations therefore involves three stages: the novice, the self-leader and finally the hero. There is no shortage of examples in economic, social, educational and religious structures. The church includes novices, the ordained (priests, bishops, etc.) and saints or the blessed. Another example is the army where we can find newly enrolled conscripts, soldiers without distinction of rank or force and finally war heroes. In universities the first step of entry is the Ph.D., the next is

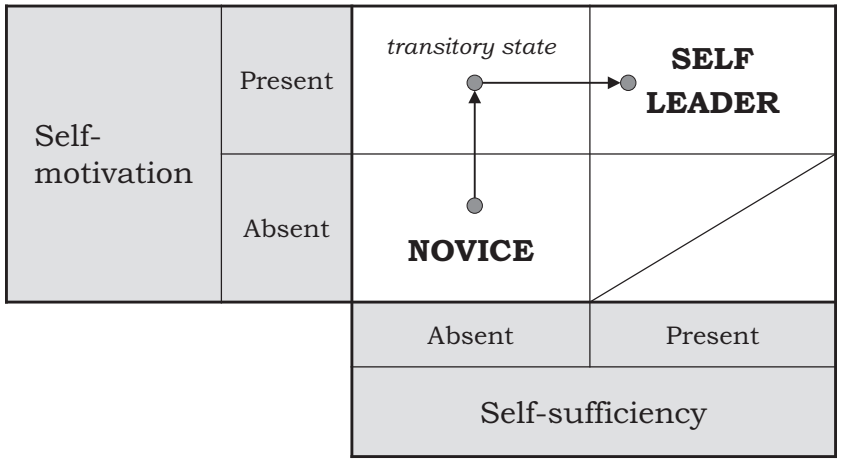

Figure 4.1 Matrix of self-leadership
(Source: De Toni and Barbaro, 2010 © De Toni, Barbaro)

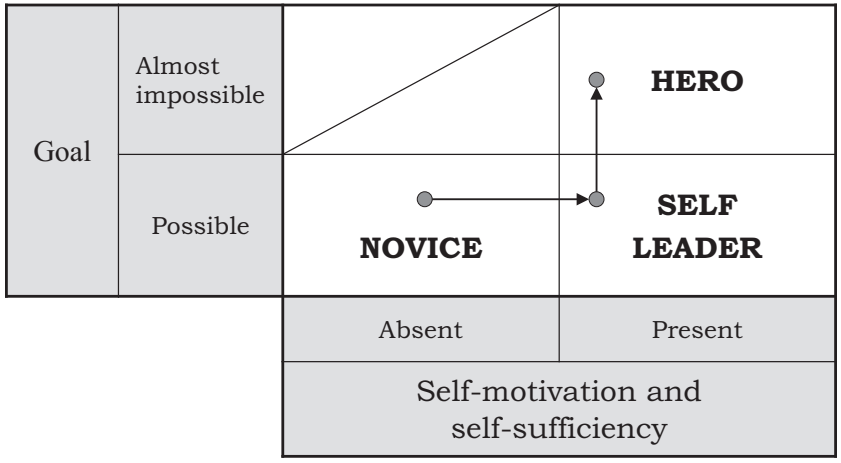

Figure 4.2 Matrix of heroic leadership
(Source: De Toni, Barbaro, 2010 © De Toni, Barbaro)

that of professor at different levels and finally the last, the most prestigious, is represented by the award of the Nobel prize. In companies, the first stage corresponds to newly hired employees, the second consists of intra-entrepreneurs (if managers) or entrepreneurs (if owners or partners) and finally the third is represented by the "legends".

The challenge of becoming a self-leader is therefore issued to everyone. The "training" path is fundamental, but not only that. Not everyone is able to achieve it. To be sure that all the novices were capable of becoming self-leaders,

the Jesuits had a very simple method: they recruited only the "very apt". In other words, the selection at the entrance was very strict. To be sure of the success of this process of growth, the Jesuits focused only on the "very apt", also because their aspiration was to turn them into potential heroes.

As Lowney explains, the founders of the Society of Jesus possessed something infinitely more precious than a product to sell, a capital to invest and an action plan to be undertaken (all things of which the Jesuits were remarkably lacking): they possessed a commitment, which did not accept compromises, toward a unique way of working and living, toward a life in which self-awareness, the spirit of initiative, love and heroism, that is to say the four principles of leadership, were perfectly integrated (*ibid*: 289).

Loyola had managed to attract the best talents in Europe with no action plan. His magnetic charm was born from his skill of knowing how to help others become leaders. Loyola's approach as a mentor to the co-founders of the Society of Jesus would become the model of every Jesuit: "we all possess the potential of a leader, and a true leader knows how to reveal these potentials in others" (ibid: 290).

4.4 The Experience of Self-Leadership as Applied in Toyota

A second historical experience of self-leadership very close to us in time, in the field of industrial application, is that represented by Toyota. The great transformation of the industrial processes of the last 50 years – which saw the passage from the Ford-type model to the one known as "lean production" – is based precisely on the principle of "self-activation" of the workers introduced first by Taichi Ohno in Toyota in the 1970s.

The greater complexity of the markets, which implies a greater complexity of the products, which in turn implies a greater complexity of the productive organization, can be tackled inside the factory not so much by those approaches of Fordism that are even more centralized made possible by integrated computers (according to a pan-technological vision of hyper-Fordism, with the computer replacing the techno-structure), but by means of a decentralized approach that restores decision-making subjectivity to "self-activated" workers, as motivated by new professional meanings and made self-sufficient by appropriate training courses on the one hand (to become "little scientists") and by appropriate decision-making proxies on the other hand. Toyota's "self-activated" workers are nothing more than self-leaders. Probably not all "very apt", as the Jesuits would have liked.

From Fordism to Toyotism: Evolution of the Principles of Industrial Organization

The first school of managerial thought can be considered the *Scientific Management* of Frederick W. Taylor (1856–1915). In his 1911 book titled

The Principles of Scientific Management, the author condenses the experience gained in the field of industrial organization. The essence of Taylor's thinking is that, as they exist in nature, scientific laws also exist in the workplace: these laws govern productivity.

In addition to developing a philosophy of management by defining a series of principles of management, Taylor also proposed some tools for its implementation, such as time-tracking techniques, methods for the definition of tasks, management systems for exceptions, systems for the survey of costs and other tools for planning and control. Taylor focused on issues such as the rationalization of work methods, the selection and training of personnel, the use of economic incentives (piece rate), the functional division of tasks.

Division of work, interchangeable parts, standards, tolerance, times and methods, piece rate, synchronization, assembly line, mass production, economy of scale, physical concentration of activities: these are the key words of the production paradigm known as Fordism or better Taylorism-Fordism that has replaced the previous paradigm of artisanal production since the beginning of the 1900s.

The questioning of the fundamental principles of Taylorism-Fordism takes place in the mid-1970s at Toyota by Taiichi Ohno who can be considered the "father" of the "Toyota production system". Ohno was born in 1912 in Japan, he graduated in 1932 in mechanical engineering, was hired by Toyota as a product manager, and over time he held positions of increasing responsibility, until in 1975 he became executive vice-president of the company. In 1978 – when he left office – he summarized his productive experiences in the book *Toyota Production System*, which became a classic of production management. The logics developed during decades at the Japanese car company are described in his book, and they can be traced back to four principles: totally synchronic production, adaptive synchronism, continuous improvement, self-activation (De Toni *et al*., 2013). We will focus on the fourth and last principle of self-activation, which can be traced back to self-organization.

The Involvement of the Workforce Versus Antagonism: The Principle of Self-activation

From its traditional role as "antagonist", the workforce becomes a "resource". In addition to adaptive synchronism, this is a break with Taylorism-Fordism.

Adaptive synchronism implies – requires the participation of the entire workforce in order to continually "synchronize" demand and production. As Bonazzi summarizes well in his 1993 book *The Crystal Tube*, the enterprise must be like a tube where the material flows rapidly, but it is as fragile as a crystal: the elimination of the intermediate lungs and of every other slack in resources removes its defenses and makes it vulnerable.

Like adaptive synchronism, continuous improvement is also achieved with the involvement of workers at all levels, especially direct operators. The concept of workforce involvement was borrowed from the self-activated frame

invented by Sakichi Toyoda, whose family worked in the textile sector before entering the automotive business. The machine developed by Sakichi was equipped with a device that immediately blocked it in case of breaking or jamming of the weft. In other words, the machine was able to stop if the operations did not take place normally. At Toyota, this concept was extended to the production lines. This meant that if a worker found an anomaly he had to stop the line, preventing the production of defective products and making it possible to identify all of the problems that occurred on the production line.

In the logic of Toyota production, the traditional imperative of the continuity of the flow fails: The operator has the right to interrupt the flow if faced with problems of quality. Furthermore, quality is not controlled downstream, but it is generated upstream, preventing the defective product from absorbing work and resources even after the defect has been created.

Some authors such as Mariotti (1994) put forward the idea of a change in the nature of work as a commodity:

> Workers are no longer suppliers of work time, always equal to itself, but of a piece of work (in this respect the categories proposed by Arendt [1958] are followed, according to which work never designates the finished product, the result of the activity of work, while the product is invariably derived from the word indicating the work)

that is, a product-service in which a contribution to improvement and intervention on production processes is incorporated. In Figure 4.3, Fordism and Toyotism are reread through the prevailing coordination and internal relations.

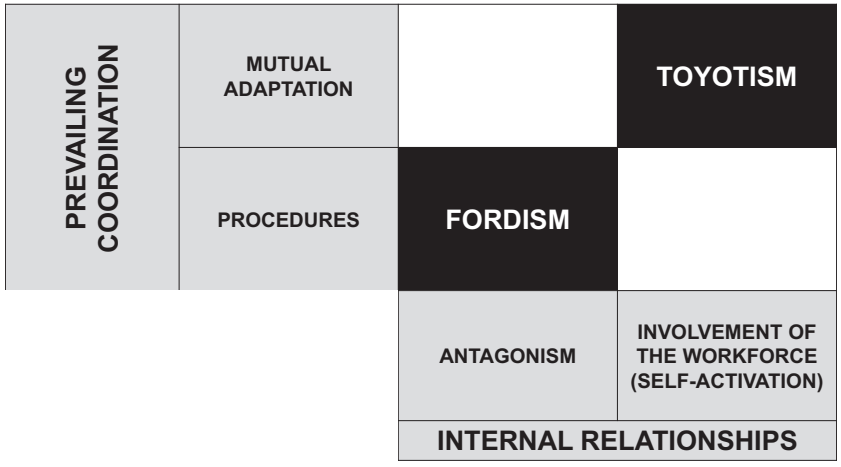

Figure 4.3 Self-activation in the Toyota Production System
(Source: De Toni *et al.*, 2013 © ISEDI)

4.5 Styles of Leadership

Self-leadership is a rare style of leadership, sometimes unconsciously present in traditional organizations. It is much more common to observe other styles of leadership, such as those represented in Figure 4.4: *laissez-faire*, command, conduction, construction. The different styles are identified by the intersection of four variables: the role of the leader (active or passive); effectiveness of leadership (present or absent); style of government (absent government, control, supervision); organization (one mind or multiple minds). Based on the values assumed by these four variables, it is possible to identify four styles of leadership as described in the following:

1. *Laissez-faire*: the boss is passive, disinterested, does not stimulate, does not cooperate, does not assume responsibility, does not make decisions, does not provide feedback. Employees do not recognize him as a leader; in other words, leadership is an election – it is not a nomination! The group does not cooperate and is not very cohesive. Control is absent and leadership is not effective. The organization can be traced back to one mind: that of the boss.
2. Command: the boss is managerial, he likes to command, he imposes himself, sometimes he is self-centered. The employees feel they are subordinates. Leadership is only partially effective. The organization is by one mind only and ensures partial control.

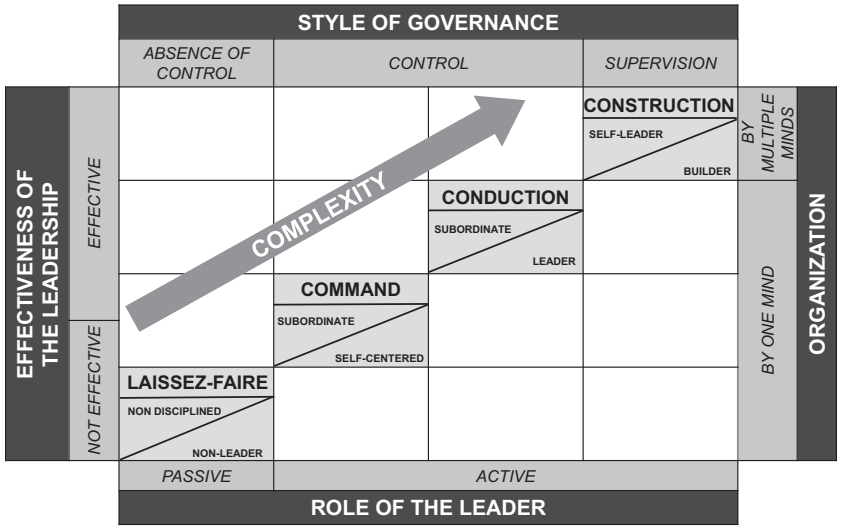

Figure 4.4 Styles of leadership
(Source: De Toni and De Zan, 2015)

3. Conduction: the boss is an enlightened person; he is active and leads his employees to their destination. "Leader" means precisely "conductor": It derives from the verb *to lead*. The leadership is effective; the control is complete, even if the organization is still by one mind only.
4. Construction: the boss works so that all his staff members become self-leaders. He builds a context of shared values, outlines a vision around which he can mobilize the efforts of all, he provides the energy for change, transfers the contents of professional techniques, gives the example. In turn, the employees develop not only skills but also self-motivation, which is the basis of bottom-up processes of emergence that realize self-organization. The leader is no longer the one who leads his employees to their destination: everyone finds his own way in a logic of self-leadership. The leader becomes a constructor of contexts where each one of them becomes a leader of himself. Control is no longer central, by the boss, but it is operated in the periphery by the employees themselves. The transition from "control" to "supervision" is achieved for the leader. The organization is no longer by one mind alone, but by multiple minds: the minds of all the collaborators. The effectiveness of leadership is due not only to the manager, but to the whole group. This is the case of the Jesuits that was described previously.

The *laissez-faire* (negative) is rarely encountered in our organizations; the most common styles are command (negative) and management (positive). The best style of leadership – that of construction – is rare and typical of organizations called on to operate in greatly complex situations, to which one responds not with hierarchical models, but with self-organized models.

In an organization that promotes self-organization, the manager moves from a reductionistic role to a complex one, from the "planning and control" of the activities to the "creation and protection" of the context. A context where the real motivation is self-motivation, the result of a shared vision, obtained with the example of the leader who provides the energy for change. In order to manage the growing complexity, it is advisable to focus on participation and the assumption of responsibility by everyone in a logic of intra-entrepreneurship. Distributed, inter-connected, self-motivated and self-activated intelligence is needed. It is not resolved in the center. The future is in the periphery.

4.6 What Self-Organization Is Not

Self-organization does not mean (see Figure 4.5):

- anarchy: even in physical and biological systems, self-organized systems are organized and characterized by a global and emerging order;

- *laissez-faire*: the components are not completely free, but are subjected to constraints, in particular the feedback that is created in the complex network of relations among the elements of the system;
- loss of control: centralized management is not the only form of governance of a system. Control mechanisms can be implemented even without real units or control functions, exploiting the interconnections and the organization of the system itself and by means of a strong sharing of values;
- simple self-management: self-management and self-organization are not synonyms; self-organization, in fact, is a different logic from organization, which can only be realized in the presence of well-defined conditions, whose research and creation is the task of the leaders of tomorrow's organizations.

The concept that self-organization needs energy is also fundamental. And it is the boss who must supply it. Anderson (1999) argues that management must provide the external energy necessary for complex adaptive systems to be able to self-organize: "Self-organization does not take place unless there is a continuous flow of energy within the system". And this flow is guaranteed by delegation, by entrepreneurship, by protection. The organization must be a continuous bubbling of ideas and innovation, of energy that is at the base of the processes of continuous improvement.

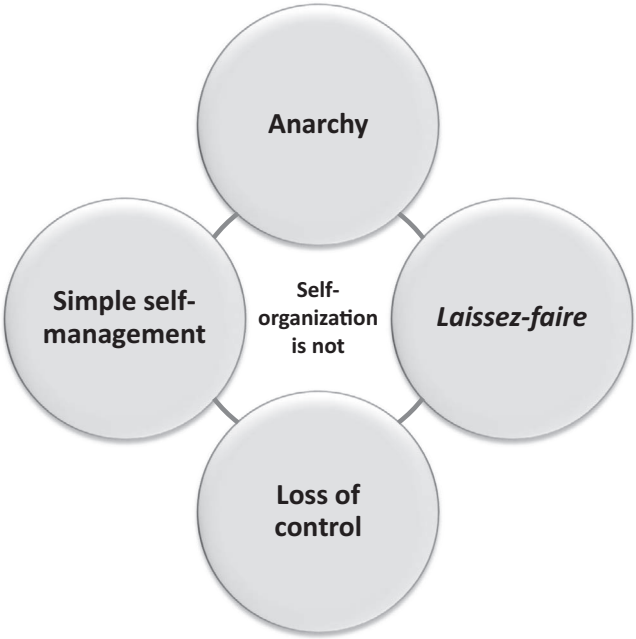

Figure 4.5 What self-organization is not

In this perspective, the simple rules take on meaning, which require empowerment, whose essence is the management of systems by "multiple minds".

We are used to a leadership that controls. But this reduces the leader to a mere controller. And as Mario Andretti, a historic Ferrari driver, reminds us: "If everything is under control, you're going too slowly".

4.7 Organizational Capabilities for Self-Organization

We have argued that self-leadership recalls self-organization, which requires and involves the transformation of the role of the leader from the classic one of conductor to the innovative one of context constructor. However, compared to traditional organizational models such as functional, divisional, project-based and matrix-like ones, how does a "self-organized" model fit in?

In our opinion, all traditional models can open up to self-organization to the extent that they introduce organizational capabilities and managerial practices typical of self-organization. By studying organizational literature, retracing the theories and models from the origin of the discipline to the present, and at the same time exploring the less theoretical and more recent contributions, such as case studies and managerial experiences, we have identified four models that we believe are, for organizational capabilities and managerial practices, related to self-organization. They are: the circular model, the holographic one, the cellular one and that of holonic circulation (De Toni *et al.*, 2011). These models require-involve the organizational capabilities of interconnection, redundancy, sharing and restructuring respectively.

The first capability, derived from circular organization (Mintzberg, 1995; Ackoff, 1989), is interconnection. Self-organizations are like social networks that exploit the small worlds effect: they have nodes that are strongly connected to each other, connected to other networks through what are called hubs, that is people who have a high number of external contacts. From what is described, it is possible to see the local interactions of physical and biological systems working in a structuralization which realizes that negentropical opening that brings life through exchanges: opening up toward the outside and among the internal units.

The second capability, derived from holographic organization (Morgan, 1986), is redundancy. The subdivision into autonomous units allows the self-organizations to obtain a functional excess of resources: within certain limits "everyone learns to do everything" and, if the need arises, it is possible to move people with specific skills to different tasks and duties. There is a greater degree of "interchangeability". The higher cost in the short term is rewarded by long-term advantages.

The third capability, derived from cellular or spherical organization (Miles and Snow, 1995; Miles *et al.*, 1997), is sharing. The autonomous units that make up self-organizations are effective only if they act in a coordinated

manner, if they preserve organizational closure by selecting the input that does not jeopardize the identity through strong mechanisms of internal sharing, first of all a cultural system founded on common values.

The fourth capability, derived from the holonic organization (McHugh *et al.*, 1995), is restructuring. The autonomous units are called on to always seek new users/clients and new partners, adapting to environmental changes and creating them in turn, thus co-evolving with the environment. The value chain is not fixed but changeable, the partners can change; the skills that today constitute the heart of added value can serve tomorrow as a simple *commodity*. Restructuring is typical in the networks of companies which, from time to time on common projects, play different roles in the construction of the value.

These four capabilities are the fundamental levers of action within the typical areas of organizational planning identified by Mintzberg in his fundamental article published in *Management Science* (1980). Restructuring determines the ability to evolve from a mechanical structure to an organic one, redundancy facilitates the integration of skills, interconnection allows the decentralization of decision-making, sharing allows coordination based on mutual adaptation rather than on procedures (see Figure 4.6).

These capabilities are accompanied by managerial practices, starting from those that are central to self-organization and which are the delegation of power and authority, job enrichment and deregulation. These are followed, starting from the capability of interconnection, by the practices of participatory decision-making and double-linking and the consequent streamlining of the organizational structure. Redundancy is the basis of double-loop

ORGANIZATIONAL MODELS	ORGANIZATIONAL AREAS	ORGANIZATIONAL CAPABILITIES		
Holonic	Structure planning	MECHANICAL STRUCTURE	RESTRUCTURING	ORGANIC STRUCTURE
Holographic	Coordination of work	DIFFERENTIATION OF COMPETENCES	REDUNDANCY	INTEGRATION OF COMPETENCES
Circular	Decision-making processes	CENTRALIZATION	INTERCONNECTION	DECENTRALIZATION
Cellular	Control systems	STANDARDIZATION (procedures)	SHARING	MUTUAL ADAPTATION (values)

Figure 4.6 The organizational capabilities of self-organization
(Source: De Toni *et al.*, 2011)

learning, job rotation, job enlargement and management of diversity. The capability of sharing supports the asset/profit-sharing practices and the distributed management of knowledge and, finally, the capability of restructuring is at the basis of practices related to market and technology monitoring, networking and partnerships.

4.8 Self-Organization as a Continuum of Solutions

We can consider self-organization as a general framework, which does not necessarily materialize completely and with all its dimensions in the reality of individual organizations. In practice, there will therefore be a continuum of solutions, in which the capabilities of self-organization can be present to a greater or lesser extent.

Self-organization is part of a current of organizational studies characterized by different names and based on different assumptions. Only by way of example does it range from the post-bureaucratic and postmodern organization to the adaptive enterprise, from the company without borders to the virtual company, from the fractal organization to the "*spaghetti organization*", which identifies the organizational model introduced in the early nineties at Oticon, a Danish hearing aid company (Bartezzaghi, 2010).

Already in 1993, faced with a first substantial flow of contributions on the organizational changes connected with the passage from Taylorism-Fordism to Ohnism-Toyotism, Daft and Lewin asked the question: "Where are the theories for new organizational forms?", thus questioning the effectiveness of the plurality of contributions made so far in clearly identifying a new organizational paradigm.

Despite the subsequent multiplication of studies and contributions, which led Child and McGrath (2001) to speak of a plethora of new proposals, the situation has not changed much and the question posed by Daft and Lewin has remained at least partially dissatisfied, even if it is true that the need for greater clarity and comparability among the various proposals of organizational models has been emphasized (Whittington *et al.*, 1999; Palmer *et al.*, 2007).

In this debate, the proposed perspective of self-organization is promising in that, not aiming to define in its entirety an organizational model of general value, it seeks to identify the capabilities and practices that characterize and share the different models that emerge from the experiences of companies that have experimented forms that are different from the traditional hierarchical ones.

4.9 Is Hierarchy Inevitable?

An inevitable question concerns the possibility of overcoming the hierarchical model. There are numerous supporters of the inevitability of hierarchy.

One of the most controversial and provocative interventions is that of Leavitt, in his 2004 book with the very explanatory title *Top-down. Why*

Hierarchies are Necessary and How to Make Them Better. According to Leavitt, every large human organization was and is hierarchical. Hierarchies are, as it has been for centuries, common and prevalent everywhere. Although many authors have foreseen the overcoming of hierarchical structures, they remain the prominent structural configurations of large organizations.

Leavitt acknowledges the fact that changes have occurred (horizontal communication channels, emphasis on collaborative teams and small groups, development of alliances and inter-organizational connections), but all this has only softened the hierarchies and has not replaced the top-down structures.

Leavitt, who is well aware of the negative aspects of hierarchy, fundamentally authoritarian and oppressive, stresses that it favors the growth of forms of child-like dependence that generate distrust, conflict, adulation, attachment to the territory, betrayal, distorted communication, and many other ingredients that end up poisoning every large organization. However, being irreplaceable, the only possible solution is to reduce its negative effects, improving it and humanizing it.

According to the author, the reasons behind these theses are both psychological and practical. Hierarchy offers social identity cards that help us maintain the illusion of being safe and of having a specific role in an increasingly insecure and uncertain world and they provide the opportunity to gain power, status and well-being. On a practical level then, according to the author, hierarchy helps deal with the complexity, with the growth of the organization and its aging, as it makes it possible to make things simpler, to keep costs low and to raise the level of order.

On this point of complexity, the answer Leavitt talks about is based on a reductionist approach. It is not true that hierarchies are the only tool that man has invented to solve complex problems; self-organization, on the contrary, is much more effective.

On the other hand, behavioral argumentations are more difficult to counter. If it is true that there are many cases in which the hierarchical model has been questioned at its foundations, it is also true that there are many cases in which the new organizational model, which has seen the role of hierarchy reduced, fails to stabilize over time and returns to configurations that are closer to the traditional setting.

As Bartezzaghi (2011) reminds us: a very well-known example in the literature is that of the Danish company Oticon. At the beginning of the nineties, to overcome the phase of stagnation that the company was going through, the new CEO, Lars Kolind, radically redesigned the organization, focusing on the interaction, collaboration and connectivity of staff and customers and of suppliers. It was a new, expressly knowledge-based organizational form, based on knowledge centers connected by a multitude of links in a non-hierarchical structure, which Kolind defined as "a spaghetti organization of rich strands in a chaotic network". The new organization was based on strong staff empowerment, and the staff were free to choose which projects to participate in.

The number of hierarchical levels was reduced to two, and Kolin and ten other managers made up the management team, while the rest of the staff was organized among the projects. The reorganization allowed the company to overcome the crisis phase, obtaining excellent results. However, years later, the company appeared as a traditional matrix organization to external analysts.

Various interpretations have been proposed for this regression, as for example: the need to cope with the needs deriving from the process of professionalization and the that of a career both in the project area and in that of the functional experts; the difficulty of allocating skills; the problems of coordination and the sharing of skills; the motivation problems deriving from the increasingly frequent interventions of management in team decisions. As Foss (2003) points out, Oticon's official rhetoric, which emphasized bottom-up processes, in what was essentially self-organization with a management team that acted as a facilitator, fell into contradiction with the increasingly frequent interventions from above by the management team itself. In short, hierarchy took its revenge.

The question that arises is whether the hierarchical model resists because it still has some advantages in terms of effectiveness and efficiency, or if cultural and behavioral factors work as a support to it. In field experiences there are conflicting indications: while in the initial phases of change in which it is necessary to mobilize energies as much as possible, self-organization shows its superiority in terms of performance, in the following phase of stabilization of the organization the typical behaviors that accompany the hierarchy appear again. Probably, the stable success of self-organization requires a wider change in cultural and social order.

4.10 Can Targeted Organizations Be Self-Organizations?

In accordance with the classical texts, finalized organizations are organizations that have their own purposes, which do not necessarily coincide with the objectives of the people participating in the organization itself. In the case of companies, the goals are set by the shareholders and the fundamental tool, even if not unique, which allows the realization of these purposes is the transmission of legitimate power through the hierarchical scale, starting from top management. The general objectives are articulated in specific objectives and sub-objectives (hierarchy of objectives) and these are assigned to the different hierarchical levels. In this sense, finalized organization implies hierarchical organization.

However, in a more modern view, there are two fundamental objections to this conclusion. First, it is necessary to distinguish between hierarchy of objectives and organizational hierarchy, understood as a chain of command. Even an organization without hierarchical levels, such as an autonomous team, can have a hierarchy of objectives, as it operates on the basis of higher-level objectives decomposed into sub-objectives that are functional to the former.

Second, the organization must respond to a plurality of internal stakeholders (including managers and workers) and external stakeholders, each of whom has his own goals. This requires a negotiation process, also based on the formation of alliances and coalitions, which leads to defining a given balance among the contributions that each stakeholder provides to the organization and the incentives he receives. The management of this balancing and the allocation of rewards to the different groups of stakeholders generate a hierarchy of objectives. The presence of this hierarchy of objectives does not necessarily require a hierarchical structure. In theory, therefore, self-organization is compatible with the fact of being a finalized organization.

The social systems, and in particular the organizational ones, have, unlike the physical and biological ones, a decisive characteristic due to the fact that there is a purpose that guides the actions of the components of the system. They are teleological systems. This peculiarity leads to greater variety within the system, but the general characteristics of the self-organization may still remain. Indeed, it may be that self-organization constitutes a powerful tool for the implementation of strategies of sustainability, based on balancing the economic, social and environmental dimensions, the so-called triple bottom line. In theory, in fact, its properties could improve the trade-offs among the different types of objectives better than other organizational solutions. It is an important topic for research, also considering the fact that studies on the organizational implications of sustainability-oriented strategies are rather lacking. Only recently have contributions emerged that seek to explore practices and organizational models aligned with this strategy (see, e.g., Docherty *et al.*, 2008).

4.11 Can Self-Organization Be Planned?

There is a fundamental difference between the study of self-organization in the physical world and in that of the biological world with respect to the world of organizations. In the first two cases, self-organization represents a new theory that allows a better understanding of physical and biological phenomena existing in nature, which previous theories are not able to interpret.

The world of organizations is by definition artificial, because they are, in any case, the result of a planning intent: it follows that self-organization, more than a theory to explain the existing, becomes an important reference for building new organizations.

The idea of designing self-organizations may seem like an oxymoron, because, in nature, what is self-organized is not designed. However, the transposition from the physical and biological worlds to the social world does not take place by homology, but by analogy. Therefore, designing self-organization is not a contradiction in terms, although it requires a different approach with respect to the established ways of designing organizations.

It is not a matter of making a detailed definition of the structure and characteristics of the parts of the organization, but of creating the contextual

conditions that allow the emergence and operation of self-organization based on the capabilities of interconnection, redundancy, sharing and restructuring; and these allow for the explication of the aforementioned managerial practices.

4.12 Resistance to Self-Organization

Resistance to self-organization comes from both the top and the bottom of the organizational pyramid. The former are summarized by Morgan in his beautiful book, *Images of Organizations* (1986):

> Every step that takes us away from the bureaucratic model to get closer to self-organization has a whole series of significant implications on the distribution of organizational power and control; in fact, the increase in autonomy that must be guaranteed to self-organizing units is undermining the ability of the company's top management to keep daily activities and developments under strict control. Furthermore, the learning process requires a level of openness and a capacity for self-criticism unknown to traditional models of management. The principles of necessary variety and minimum critical specification clash with the tendencies of managers who love secrecy and confidentiality; such leaders also love to be absolute despots in their own kingdom. These attitudes emphasize the presence of forces – not to be underestimated – that will work against innovative processes and that can prevent the realization of organizational models capable of learning and self-organizing.

Reading these lines, one might think that in such a context the leadership of the manager or the entrepreneur is less important, but that is not true. On the contrary, in a logic of self-organization, according to Vicari (1998), the functions of the leader increase, they do not diminish. In fact, physics teaches us that self-organization can also occur spontaneously, but always under certain conditions. The task of management is therefore to create those conditions. And the conditions are created by supplying energy.

The management is therefore called on primarily to provide the external energy necessary for complex adaptive systems to self-organize, as claimed by the aforementioned Nobel Prize Winner Anderson in his well-known 1999 article on complexity and organizational sciences:

> Self-organization does not take place if there is not a continuous flow of energy within the system. Despite this, studies on how managers bring energy to the organization have been separated from studies on how structures emerge and evolve. The level of effort of the organizations changes if the managers push them towards new activities, bring new challenges and objectives to the attention of the members, form and break connections inside and outside, modify the systems of reward.

The fundamental conceptual step to overcoming the resistance from above is to understand that self-organization does not imply a loss of power, as the systemist Gharajedaghi (1999, 71) explains well: "Power is like knowledge. It can be duplicated. The conceptualization of power as a non-zero-sum entity is the critical step toward understanding the essence of empowerment and the management of systems of "multiple minds". Empowerment is therefore not an abdication of power, nor a sharing of power. It is the duplication of power".

However, resistance also comes from those who are below. Hierarchy, the illusion of order, control, predictability are much more reassuring. People in an organization expect stability, they expect the helmsmen (entrepreneurs, executives, managers) to know exactly where to go, like on a smooth board, not on a sea where conditions can suddenly change and lull becomes a storm. They still expect that those who are at the top always know more than those who are at the bottom. If the person who is at the top does not command, does not impose, does not bestow security, he is often considered a weak-hearted person, an insecure person, or, at least, one who is not doing what he should be doing.

Resistance from below will never be overcome if the organization lacks a soul, a common inspiration, a dream, a passion that involves all the collaborators in the taste of discovery, of research, in the construction of the new, in the satisfaction of creating something of their own, distinctive, in giving meaning to their own history, to their life project, to a more just and supportive project for the society. Martin Luther King said: "I have a dream" and not, instead, "I have a five-year plan": Obviously men need to share a dream in order to give the best of themselves.

4.13 The Coexistence of Hierarchical Models and Models of Self-Organization

Studies on the life cycle of organizations, one for all is Greiner (1972), indicate that in the development of organizations the pendulum continues to oscillate between centralization and decision-making delegation, between an increase in rules and de-bureaucratization, between centralized control and decentralized control. While self-organization is a peculiar feature of the initial phase, in the later stages it fails, even if at intervals it is necessary to reintroduce some elements of self-organization. In this way, large organizations try to get over the diseases typical of hierarchy and centralization, and acquire the necessary levels of flexibility.

Hierarchy and self-organization therefore seem to coexist according to two dimensions:

- that of time, that is, hierarchy and self-organization alternate – as Greiner indicates – with self-organization, which becomes a key element in moments of change and hierarchy that emerges in periods of stability;

- that of space, that is within the organization, multiple units coexist where – to deal with situations of greater complexity – capabilities and practices typical of self-organization prevail, while in other units traditional hierarchical models prevail.

Similarly, at least two models of leadership coexist within the organization:

- that of conduction (to the goal), or a traditional, hierarchical model where the leader, according to the traditional hierarchical model, directs the people of the group toward the expected results, respecting the aptitudes of people for whom self-leadership (which requires/implies full accountability) generates anxiety and concern and ultimately the worst possible working conditions and performances;
- that of the construction of contexts, or a model where, when fully implemented, all of the people become self-leaders and the boss creates a system of values, favors the sharing of a vision, gives the example, accompanies learning and execution. In short, a model where the boss does not disappear but changes his role from that of manager to that of constructor; a builder along the lines of the Jesuit master of novices.

During the life of organizations and people, a dynamic balance must therefore always be sought over time and space among:

- traditional organizational models based on hierarchy and innovative models based on self- organization;
- "leadership" models of management and leadership models of construction, to which subordinate behaviors and self-leadership behaviors correspond respectively.

Hierarchical organizational models, "conduction" styles of leadership and subordinate behavior work well in contexts that have a low degree of complexity and with people who have a low intra-entrepreneurial aptitude; vice versa, models of self-organization, "construction" styles of leadership and self-leader behavior work well in highly complex contexts and with people who have a high intra-entrepreneurial aptitude (see Table 4.1).

The two models are therefore not alternative in the time and space of the organization, but they coexist. And if self-organization does not prevail in

Table 4.1 Organizational models and styles of leadership

Organizational models	*Styles of leadership*	*People*	*Aptitudes*	*Context*
Hierarchy	Management	Subordinates	Executive	Simple
Self-organization	Construction	Self-leader	Intra-entrepreneurial	Complex

a widespread manner in space and in a stable manner over time, the reason is that it requires particular aptitudes and involves profound changes in the behavior of all the people in the organization, down to the most peripheral ones.

The Jesuits who set almost impossible goals to their brothers had understood all this: The choice to admit to the order only the "very apt" was functional to the need to have, in order to operate in complex environments, only people with an intra-entrepreneurial spirit and capable of self-leadership. That is to say, to have people, in a word, ready for *magis*!

Concluding Remarks

For situations of great complexity, you need to introduce self-organized models based on "management by multiple minds". Traditional hierarchical models can open up to self-organization to the extent that they introduce organizational capabilities (interconnection, redundancy, sharing and restructuring) and managerial practices typical of self-organization.

Hierarchy and self-organization are not alternatives, but coexist in the time and space of the organizations. Hierarchical organizational models, "management" styles of leadership and subordinate behavior work well in contexts with a low degree of complexity and with people who have a low intra-entrepreneurial aptitude. Vice versa, models of self-organization, "construction" styles of leadership and self-leader behavior work well in highly complex contexts and with people who have a high intra-entrepreneurial aptitude.

The Jesuits who set almost impossible goals to their brothers had understood all this: the choice to admit to the order only the "very apt" was functional to the need to have, in order to operate in complex environments, only people with an intra-entrepreneurial spirit and capable of self-leadership. That is to say, to have people, in a word, ready for *magis*! It is no coincidence that Loyola told the young Portuguese Jesuit novices: "No trivial result will fulfill the excellent obligation you have to excel always".

5 The Self-Organized School

An Organization With Multiple Minds

5.1 Introduction

In the previous chapter, we described how – in religious organizations such as the Jesuits and in industrial organizations such as Toyota – self-organization is the most effective response in organizational terms to the complexity of the context in which organizations operate.

In this chapter, we will explore the topic of self-organization in schools. First, we will present ideas on this topic by two education scholars, David F. Bower and Alan Bain. Later we will focus on how the self-organization capabilities – described in the previous chapter – are set out in the school context. Then we will present a framework for the assessment of those same capabilities in a school context and we will show an application. Finally, we will focus on who the actors of self-organization are and what the styles of leadership are in self-organized schools.

5.2 The Self-Organized School According to Bower

David F. Bower is a scholar of educational systems at the University of New Mexico (USA). Among his most interesting works on the subject of school self-organization, we recall his contribution of 2007*, Leadership and the Self-organizing School* which appeared in a book dedicated to leadership in education. The paper describes the study that took place between 2000 and 2002 in the middle school where the author was the principal, the *Roosevelt Middle School* in Albuquerque (New Mexico).

According to Bower, the reforms imposed on schools in the form of syllabus, policies and regulations by governors and legislators do not really innovate the system because they do not take into account the history, structures and dynamics within the school. They continue to address the reform with a top-down approach, without paying attention to the context.

Bower's theory is that an improvement to the school which lasts is an emerging and self-organized phenomenon and not imposed from above. School reform is an improvement that lasts over time that emerges from the school and is based on the needs that the school has identified from internal

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and external feedback (Bower, 2006, 64). The elements of the proposed model are those of Figure 5.1 (*ibid*: 64–65):

a. The *focus* of the organization, with the principles, philosophy and values that guide the school. The *focus* influences the next level of interaction.
b. The level of *interaction*, such as relationships, dialogue, sense-making, communication and feedback; these processes in turn interact with the next level of emergence.
c. The level of *emergence*, which is expressed through ownership, engagement, a safe and trusting working environment, creativity, self-organization and renewal.

The author – in presenting his own model – cites a series of scholars such as McMaster (1996, 48) who argues that "a relatively small set of principles or attractors is enough to create the elements through which a system self-organizes".

Bower also argues that school freedom is one of the key conditions that favor emergence and self-organization: freedom "sets the tone in the school and sets the stage for making a difference, engaging and taking risks.

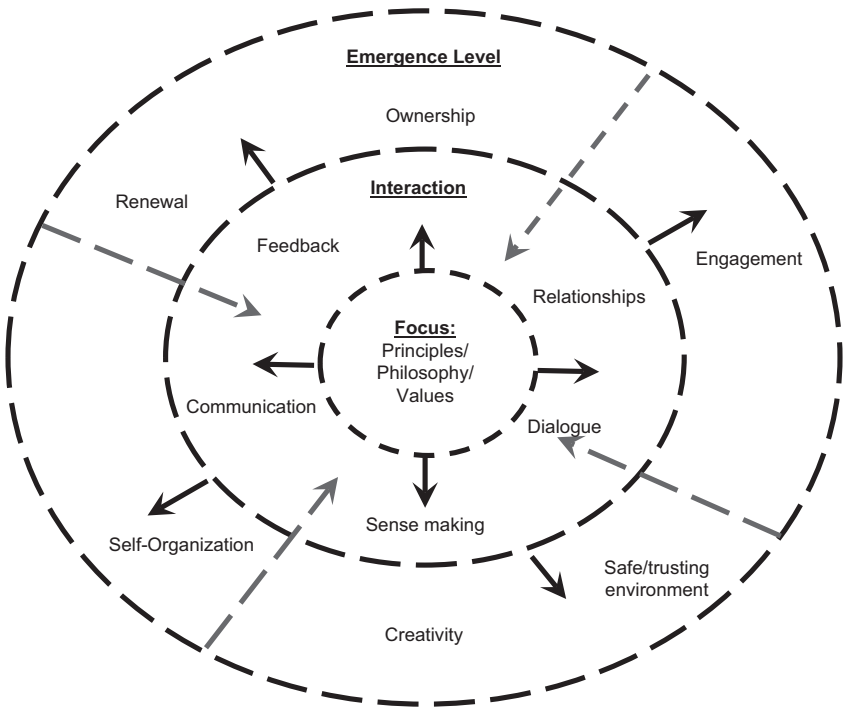

Figure 5.1 The self-organized school
(Source: Bower, 2006, 64 © Complicity)

Freedom allows teachers to create their own work, developing a sense of belonging" (Bower, 2006, 65).

Great attention is paid to the topic of leadership, which must favor the dynamics of self-organization. Among the abilities of the principal there must be that of listening. The principal must give space and time to the teachers, protecting them from the urgent demands of the school offices and the Ministry: This allows them to be more effective. If the school principal focuses on processes (relationships, dialogue, conferring of meaning, communication and feedback) the school can move from leadership by an individual to a collective type of leadership.

In a school that wants to develop self-organizing "qualities", leadership must be distributed throughout the school. A key feature of management is the involvement of others in the co-planning of activities.

At *Roosevelt Middle School* in Albuquerque the organizational climate is good: The problems are solved together, the teachers feel protected in taking risks ("people know that they are not alone and that together they can manage change"; *ibid*: 67), collective leadership is also expressed in the rotation of group leaders and committees that change every year.

5.3 The Self-Organized School According to Bain

The research and studies of Alan Bain, a luminary in the field of *Education* at Western Australia University, focused on the challenge undertaken by many schools and universities in improving learning and teaching.

One of his important contributions is the book published in 2007 titled *The Self-Organizing School: Next-Generation Comprehensive School Reforms*. The volume describes the results of a longitudinal study – which lasted 11 years (from 1992 to 2003) – carried out in a US secondary school, the *Brewster Academy* in Wolfeboro, New Hampshire (United States).

The author explains how the application of the principles of school self-organization improves the processes of learning. The ambition is to "scale up" the factors that improve students' learning in the classroom, that is to ensure that a successful practice carried out in a small unit – a single classroom or school – is translated into the practice of a plurality of units, that is, many classrooms or schools.

According to Bain, school self-organization is

> the way in which schools or any other system can be designed for change and constant and dynamic adaptation through bottom-up solutions to their needs, driving factors. . . . Individuals in self-organized systems generate bottom-up collaborative solutions by pooling their collective intelligence, and by doing so, they go beyond their individual abilities. Furthermore, they adapt to the demands of the environment and increase the probabilities of growth.
>
> (Bain, 2007, 42)

In an article titled "Self-organization and Capacity-building: Sustaining the Change", which appeared in 2011 in the *Journal of Educational Administration*, Bain – together with two other co-authors, Walker and Chan – describes how the principles of self-organization were applied in a secondary school in Hong Kong in 2009, in order to improve the ability of school principals and teachers to respond to the changing learning needs of students.

The study was carried out starting from the observation that very often resistance to change makes top-down hierarchical approaches ineffective. The research focused on the self-organized school systems in order to understand the principles and on how to create the conditions for their application so as to improve and maintain educational practices over time.

The construction of the self-organizational skills of principals and teachers consists of a coherent and intentional series of strategies, implemented at the school level, to positively influence the knowledge, skills and priorities of individuals and the entire school in implementing change. The strategies are modeled and implemented through structural, cultural and relational routes and built with the aim of improving students' learning (Bain *et al.*, 2011, 701).

According to the authors, there are five principles of school self-organization (see Figure 5.2).

1. **Simple rules**: "The self-organized schools have simple rules that guide the configuration and functioning of the school"

(Bain, 2007, 48)

The rules are simple and few; they guide the functioning of the school and are used in everyday practice: for example, teaching is cooperative, decisions are collaborative, practice is research, etc. The definition of the rules is the point

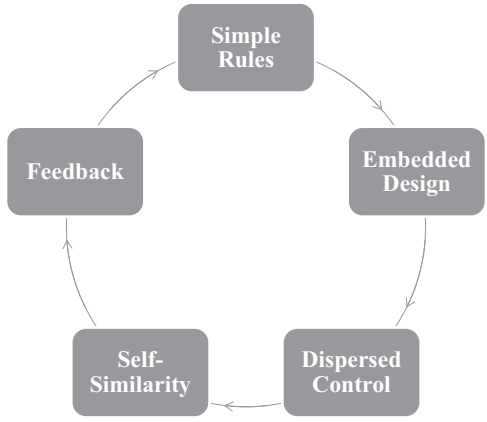

Figure 5.2 The principles of self-organized schools
(Source: Bain *et al.*, 2011, 714 © Emerald Publishing Limited. Reuse not permitted)

of arrival of a route that starts from a process of strategic planning, first by the school board and then by the whole school community (teachers, students and parents). The process to arrive at an agreement on the rules – coordinated by a task force – starts with an examination of the external context, it continues with the identification of the strengths and weaknesses of the school, and it matches up to the existing innovative practices. The aims of the process consist of creating an awareness of the current context, activating thoughtful meditation from the bottom, orienting toward the future, obtaining consent for pilot projects. In the end, the rules are formalized by the school principal, who negotiates commitments with the various players (teachers, students and parents) in line with the rules agreed upon during the process.

2. **Embedded design**: "Self-organized schools incorporate their beliefs, their values and their actions regarding learning and teaching in every part of the organization's design"

(ibid: 49)

The school vision is established in the definition of the roles, in the practices of the classrooms, in the articulation of the rules and in the identification of the sources of feedback. The implementation of simple rules (or commitments) is carried out by means of a series of activities, for example: a collaborative way of running the group meetings, peer observation, video recording of lessons made available to other (new) teachers, systems of rewards for transforming educational innovation into school routines, involving students in the evaluation of teachers, etc.

3. **Dispersed control**: "Self-organized schools use networks and collaboration to enable a rapid flow of feedback at all levels of the organization"

(*ibid*: 55)

Dispersed control takes place thanks to the involvement and the empowerment of the school board first and of the department heads next, and progressively – through feedback among peers – of all the teachers and students. Dispersed control also takes place by means of a bottom-up system of assessment that starts with the teachers and students.

4. **Self-similarity**: "Self-organized schools are characterized by a similarity at all levels that make them systems similar to themselves"

(*ibid*: 52)

Self-similarity applied to schools implies that the rules are repeated at all levels of the organization (principals, teachers, students) in the way of solving problems, in shaping educational activities, in giving feedback, etc. For example, a group of students in the classroom works in a way similar to a group of teachers, the school board, etc.

5. **Feedback**: "Self-organized schools have systems of feedback that are used to decide about what to do next"

(ibid: 53)

There is an emerging system of feedback, which is constant and shared by the entire school community of teachers and students, obtained through formal procedures, also at the departmental level, thanks to peer observation and feedback from teachers and students. It is the "mountainside", which serves to "support the mountain", that is: knowing how the school implements the process of learning and teaching, deciding what to do, letting everyone know what to do in order to fully assume his/her role, distributing control to teachers and students, amplifying successful activities and dampening failures, and empowering all players in view of the positive outcome of the system.

The combination of the five principles leads to a "shared cognitive scheme" of the school, a scheme understood as a set of "interpretations, beliefs, actions regarding teaching-learning", shared by the school community (school principals, teachers and students) both at a formal level and at an informal one.

In the experimentation in the Hong Kong secondary school (with over 100 teachers) the initiative started from the school principal who proposed the project and the objectives to the school board. This latter body then analyzed the strengths and weaknesses of the school, the needs in the field of teaching and learning and set four strategic objectives:

a. integrate the five principles into the school's vision and objectives;
b. apply the principles to the improvement of the professional capacity regarding mastery teaching, cooperative learning, differentiated education and the didactic use of technology;
c. build a database with teaching units to facilitate teachers;
d. create a system of recognition and rewards.

The school was in the (cyclical) phase of reviewing and certifying its programs by the local university. In order to avoid an excessive workload for teachers, it was decided to start with a small group of teachers, department heads and the school board, and in the first two years, four training periods of four days each were carried out. This made it possible to obtain a broader involvement and support of the teachers and to get the commitment of the principals in the improvement of the practices and to act as a model for the others.

At the same time, during the two-year period, the principal was able to:

- formalize the project to extend it to everyone, rethinking the role of management, teachers and students, planning methods of feedback, etc.
- rethink the policies regarding the management of the personnel with a group of teachers;

- introduce a review and discussion of new teaching approaches in departmental meetings;
- develop a series of tools to keep track of the experiments, constituting a sort of archives of the learning units.

During this process, the teachers were able to personally experience the new teaching methods, be assessed by their peers and also involve the students. Principals and teachers were responsible for implementation and feedback from the start, implementing dispersed control within the school. Not only that, the participants in the first training cycle taught new participants during the second cycle. To accompany the course, a forum was also created for telematic discussions of the new approaches, as a basis for the subsequent face-to-face meetings of the department. At the same time, the principal – to support the change – re-examined the policies regarding the personnel, including the criteria for incentives and promotions.

The school's self-organizing capacity did not emerge spontaneously. The principal had the burden and the honor of creating the conditions for them to emerge with the self-activation of teachers and students. The firm commitment on the part of the principal, not only at the beginning but throughout the process, was recognized by all the players of the school as an *incipit* of the process of self-organization.

5.4 The Capabilities of Self-Organization

Bower's framework and Bain's principles on self-organized schools – despite their conceptual usefulness – do not provide useful elements for achieving an assessment of the degree of self-organization of a school.

To aim at assessing school self-organization and relate it to the degree of innovation of their learning environments, we will refer to the concepts of interconnection, redundancy, sharing and restructuring, as they were developed in the 2011 text – *Self-Organizations. The Mystery of Bottom-up Emergence in Physical, Biological and Social Systems* by three authors (De Toni, Comello and Ioan). These concepts were taken up again and understood as organizational macro-capabilities in a subsequent book of 2015: *The Dilemma of Complexity* by De Toni and De Zan. The text explains how the degree of self-organization of any organization (companies, public bodies, schools, associations, etc.) can be considered proportional to the intensity with which the typical capabilities of self-organization are developed.

But what are organizational capabilities? There are dozens of definitions given in the literature. An interesting model is the one proposed in 2004 by Dave Ulrich, of the *Ross School of Business* of the University of Michigan, and by Norm Smallwood, co-founder of the *Results-Based Leadership* consultancy firm. According to the authors, organizational capabilities are the intangible assets of each organization, that is the product of the social capabilities of the entire organization.

		The Player Involved	
		The Individual	**The Organization**
Typologies	**Technical**	Individual Functional Competence	Organizational Core Competences
	Social	Individual Leadership Skill	Organizational Capabilities

Figure 5.3 Competences, skills and capabilities
(Source: Adapted from Ulrich and Smallwood, 2004, 120)

As shown in Figure 5.3, Ulrich and Smallwood distinguish technical capabilities from social capabilities, the single individual from the organization as a whole. Crossing these four dimensions, four quadrants are obtained. In the first quadrant, we have the individual functional competences which represent – in the school – technical disciplinary expertise. In the second quadrant, there are the individual leadership skills that is, the capabilities of the individual to motivate people, define the guidelines, communicate vision, etc. In the third quadrant, we have the organizational core competences consisting of the key technical skills of an organization, and finally, in the fourth quadrant, there are the organizational capabilities, the DNA underlying the organization, its culture and its uniqueness (Ulrich and Smallwood, 2004, 120).

Once they reaffirmed the concept of "sociality" of the organizational capabilities, Ulrich and Smallwood identified eleven key capabilities of the organizations. In the literature, there are at least three other interesting models related to the capabilities that identify different numbers and types of organizational capabilities: Kaplan and Norton (2004) outline four, Teece (1997) proposes three and finally Doz and Kosonen (2010) propose three, set down in 15 micro-capabilities, the latter being intended as sub-dimensions of the first. A shared model is missing.

For this research it was decided to use, as a starting point, the result of a previous study of ours conducted on the subject of self-organization capabilities (De Toni and De Zan, 2015) which led to the identification of four organizational macro-capabilities (interconnection, redundancy, sharing, restructuring) expressed in 24 meso-capabilities, which in turn involve 251 micro-capabilities (see Table 5.1).

5.5 The Proposed Framework of Self-Organizational Capabilities in Schools

The authors, starting from the model of Table 5.1, in order to adapt it to the school context, propose a model consisting of the same four macro-capabilities listed in 19 meso-capabilities as defined here:

Table 5.1 Organizational capabilities, expressed in macro, meso and micro

Organizational macro-capabilities	*No.*	*Organizational meso-capabilities*	*Organizational micro-capabilities*
1. Interconnection	1	1.1 Opening	5
	2	1.2 Networking	11
	3	1.3 Cooperation	13
	4	1.4 Integration	17
	5	1.5 Orientation to the users/stakeholders	9
		Subtotal	*55*
2. Redundancy	6	2.1 Information redundancy	9
	7	2.2 Relational redundancy	6
	8	2.3 Cognitive redundancy	6
	9	2.4 Functional redundancy	14
	10	2.5 Learning	18
		Subtotal	*53*
3. Sharing	11	3.1 Sharing of values	12
	12	3.2 Strategic sharing	6
	13	3.3 Organizational sharing	16
	14	3.4 Sharing of knowledge	12
	15	3.5 Trust	8
	16	3.6 Organizational leadership	5
		Subtotal	*59*
4. Restructuring	17	4.1 Innovation	28
	18	4.2 Speed	2
	19	4.3 Operational flexibility	9
	20	4.4 Strategic flexibility	19
	21	4.5 Recombination of knowledge	6
	22	4.6 Reading the environment	14
	23	4.7 Entrepreneurship	3
	24	4.8 Co-evolution	3
		Subtotal	*84*
Total			*251*

(Source De Toni and De Zan, 2015, 143).

Organizational Macro-capabilities (De Toni and De Zan, 2015, 144–162)

a. *Interconnection*: ability to create open networks that exploit the small world effect in order to favor cooperation and integration with internal and external subjects, developing trust and reputation based on a dialectical and systemic approach.
b. *Redundancy*: surplus of intangible resources of an informational, relational, cognitive and functional nature, resources built up, thanks to continuous learning.
c. *Sharing*: ability to share values, vision, strategy, organizational processes and knowledge, thanks to the development of relationships of trust, and thanks to the incorporation and enhancement of leaders at all levels.
d. *Restructuring:* ability to read the context by capturing weak signals and trends, to promptly recognize opportunities and threats, to innovate with strategic and operational flexibility in co-evolution with the environment, thanks to an entrepreneurial culture aimed at the continuous recombination of knowledge.

Organizational Meso-capabilities (*ibid*: 278–279)

A. Interconnection

1. *Distributed leadership*: the principal's ability to delegate to teachers, collaborators, project managers, those people with instrumental functions, head office representatives, etc. and the ability/willingness of the latter to take on responsibility.
2. *Internal Networking*: ability to create and orchestrate networks of relationships that are not only formal but also informal (based on trust) with internal subjects by exploiting the small world effect, in order to facilitate communication and interaction among players according to a systemic approach.
3. *Cooperation*: ability to achieve efficiency and effectiveness through collaboration, alliances and partnerships aimed at the co-creation of value, based on cooperative synergies of resources, skills and knowledge.
4. *Integration*: ability to align and coordinate objectives, resources, skills, knowledge and activities of the various stakeholders based on a dialectical approach.
5. *Orientation to the users*: ability to direct the organization's activities to the external environment, building with users (students, parents and stakeholders) connections and relationships aimed at identifying and co-developing the value offer, through an approach that is able to customize the offer to the actual needs of the users and aimed at consolidating reputation and trust.

B. Redundancy

6. *Functional redundancy*: ability to carry out functions superior in quantity and quality to those that are strictly necessary.

7. *Cognitive redundancy:* ability to acquire and develop knowledge in quantities and qualities superior to those strictly necessary.
8. *Information redundancy:* ability to acquire, assimilate, develop and maintain information in quantity and quality superior to those strictly necessary.
9. *Relational redundancy*: ability to create and maintain relationships in quantities and qualities superior to those strictly necessary.

C. Sharing

10. *Sharing of values:* ability to share rituals, meanings, symbols and myths typical of the identity, culture and history of the organization, fixing them in the awareness of the members and in the spirit of the organization itself.
11. *Strategic sharing:* ability to articulate and spread a common strategic vision to all organizational levels.
12. *Organizational sharing:* ability to share working methods and align processes, thanks to cohesion, collaboration, coordination and teamwork.
13. *Trust:* ability to create and maintain relationships based on dialogue, transparency and loyalty that over time increase reputation and credibility.

D. Restructuring

14. *Innovation*: ability to change at every organizational level generating value, thanks to exploration, creativity, open-mindedness, disobedience to the schemes, courage, experimentation and continuous improvement.
15. *Speed*: ability to identify threats and opportunities in advance and to act quickly, recognizing time as a decisive variable.
16. *External Networking/Openness*: ability to remain open to new ideas, stimuli and collaboration, strengthened by a great open-mindedness and a continuous and vigilant monitoring of relations with the environment in a logic of *open innovation*.
17. *Reading of the environment*: ability to read the external environment, interpret the meanings of phenomena and discern risks and opportunities.
18. *Operational flexibility*: ability to change resources, the internal processes and the external dynamics quickly and at no cost.
19. *Strategic flexibility*: ability to rapidly change priorities, models and educational environments.

This structure proposed for the school context allows us to incorporate the concepts proposed by Bower and Bain as described in Table 5.2.

In short, the proposed framework of self-organization is based on the activation of four macro capabilities expressed in 19 meso-capabilities: interconnection (five meso-capabilities: distributed leadership, internal networking, cooperation, integration, user orientation), redundancy (four meso-capabilities: functional, cognitive, informative, relational), sharing (four meso-capabilities: values, strategic, organizational, trust) and restructuring

Table 5.2 Bower and Bain's contributions incorporated into the model of organizational capabilities

			Organizational Capabilities (De Toni and De Zan, 2015)																		
			Interconnection					*Redundancy*				*Sharing*				*Restructuring*					
			1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
Bower (2006)	Focus	Principles, philosophy, values										●									
	Interaction	Relationships		●																	
		Dialogue													●						
		Sense-making										●		●							
		Communication		●																	
		Feedback				●															
	Emergence	Ownership										●			●						
		Engagement										●									
		Safe, trusting environment													●						
		Creativity														●					
		Self-Organization	outcome																		
		Renewal														●					
Bain (2007), Bain *et al.* (2011	Simple Rules											●		●							
	Embedded Design					●								●		●					
	Distributed control		●																		
	Self-similarity							●				●	●	●							
	Feedback			●		●															
	TOTAL		1	3	0	3	0	1	0	0	0	6	1	4	3	3	0	0	0	0	0

1. Distributed leadership 2. Internal networking 3. Cooperation 4. Integration 5. Orientation to the user 6. Functional redundancy 7. Cognitive redundancy 8. Information redundancy 9. Relational redundancy 10. Value sharing 11. Strategic sharing 12. Organizational sharing 13 Trust 14. Innovation 15. Speed 16. External Networking/Openness 17. Reading the Environment 18. Operational Flexibility 19. Strategic Flexibility.

(six meso-capabilities: innovation, speed, external networking/openness, reading of the environment, operational flexibility, strategic flexibility).

In order to achieve the assessment of the four organizational macro-capabilities, a specific questionnaire of 40 questions was designed regarding the 19 meso-capabilities as in appendix F.

In conclusion, the framework of the proposed self-organized school divided into four organizational macro-capabilities, in turn divided into 19 meso-capabilities and assessed with 40 questions, is summarized in Table 5.3.

With reference to a simulated generic case, the assessed values of the macro- and meso-capabilities are shown in Figure 5.4. The result is that the

Table 5.3 The proposed framework of the self-organized school

Organizational macro-capabilities	*No.*	*Organizational meso-capabilities*	*Questions in the questionnaire*
A. Interconnection	1	Distributed leadership	2
	2	Internal networking	2
	3	Cooperation	2
	4	Integration	2
	5	Orientation to the user/stakeholder	2
		Subtotal	*10*
B. Redundancy	6	Functional redundancy	3
	7	Cognitive redundancy	3
	8	Information redundancy	2
	9	Relational redundancy	2
		Subtotal	*10*
C. Sharing	10	Value sharing	2
	11	Strategic sharing	3
	12	Organizational sharing	3
	13	Trust	2
		Subtotal	*10*
D. Restructuring	14	Innovation	2
	15	Speed	1
	16	External networking/ Openness	2
	17	Reading the environment	2
	18	Operational flexibility	1
	19	Strategic flexibility	2
		Subtotal	*10*
Total questions			*40*

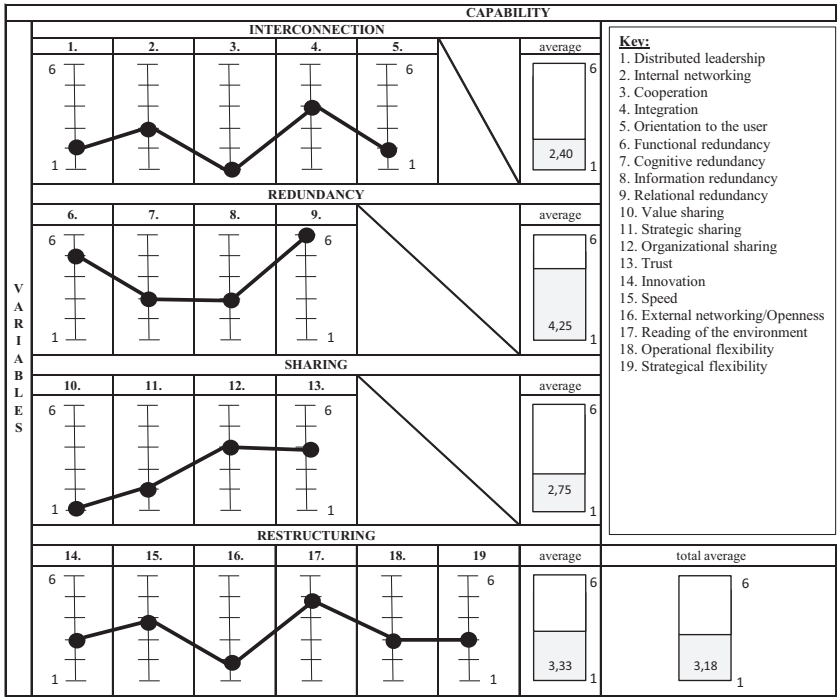

Figure 5.4 Example of the application of the framework on capabilities

school is, on the whole, partially self-organizing: The average of the values is 3.18 out of 6. The highest values are noted in redundancy (4.25) and the lowest values are noted in interconnection (2.40). Regarding the meso-capabilities, one of the best practices is relational redundancy (variable 9) with a value of 6 out of 6, while the worst are cooperation (variable 3) and value sharing (variable 10) with values 1 out of 6.

5.6 The Capabilities of Self-Organization in School Literature

In the literature, the references to capabilities are numerous and can be grouped according to the proposed outline of the four macro-capabilities: interconnection, redundancy, sharing and restructuring.

Interconnection

Ramboll Management (2004) – distinguishing among bureaucratic school organizational models, social models and community models – emphasizes the importance, in the latter two, of interaction, teamwork at all levels,

feedback, delegation and sharing of responsibility, for a school that is open to change and proactive.

Bower (2006) highlights the importance of processes such as feedback, communication, dialogue, relationships and relations that give rise to a sense of belonging, renewal, creativity, commitment and self-organization. Furthermore, he argues that you need a collective/shared leadership to achieve emerging qualities and this is based on good relationships, on shared interactions in meetings or on boards, which are the ones that produce the best results. These relationships are at the basis of the sense of belonging. It is from collective leadership that distributed intelligence can emerge. And this also means that it is not the leader that designs alone, but, in a complex and adaptive organization, he must involve others in co-designing. In a self-organized school, the role of feedback helps the school adapt and respond to solicitations and needs.

Sergiovanni (2001) states that the challenge of leadership is a different, lighter leadership, which aims at creating "leadership substitutes": these encourage both teachers and students to manage themselves. The principal's task is to create new connections among people, and between people and the ideal design: a followership, something for which it is worthwhile to engage oneself morally. The source of authority must not be the role, but the vision of the design and the moral commitment.

Paletta (2011), in his survey on the budget and on social reporting, highlights the importance of the involvement of stakeholders – from examining needs and expectations, to the creation of consensus and to the communication of the added value of school – and the responsibility toward them. Stakeholders are all those people who have an interest in the school, be they students, families, collaborators, people in charge, those with instrumental functions, teachers, non-teaching staff and the community to which they belong, for example, the Municipality, local businesses, cultural associations or voluntary organizations.

Bain (2007), dealing with decentralization, emphasizes the independence of working groups – within the framework of shared common goals – so that there is self-organization. Also important is the internal and external connection, collegiality and teacher–student cooperation. Bain argues that feedback is "the side of the mountain" that supports learning. Feedback is necessary for:

- knowing what the school thinks about learning and teaching;
- letting everyone know what one expects from his role;
- making sure that control is distributed among teachers and students;
- making sure that one's own contribution is a contribution to a community in the process of learning;
- amplifying successful actions and dampening down unproductive actions;
- driving continuous change.

In order to obtain a continuous flow of feedback at all levels, you need networks and collaboration: networks make internal collaboration possible. The relationships in self-organized systems tend to be short in the sense that information is exchanged among neighbors and often the relationships are non-linear and linked to the "small worlds" phenomenon, where friends are friends of friends (Barabasi, 2002).

Redundancy

According to Bain *et al*. (2011) distributed control does not mean the absence of hierarchy or roles, but sharing, empowerment and enrichment of one's own role. In addition to the teaching role, a number of organizational roles emerge. Examples are the management of classes (coordinators), curriculum departments, national or European projects, self-assessment, student tutoring, educational and organizational innovation (of schedules, classes, spaces), non-formal learning (alternating school and work), extracurricular activities, mentoring of new teachers, relations with stakeholders, school networks, international relations, relations with the University and Research Centers, technologies of learning, *Content and Language Integrated Learning* (CLIL), etc.

Sharing

Since school is a complex system that lives between order and disorder, between what is realizable and what is not realizable, between the probable and the unpredictable, between everything and a part, between inertia and innovation (Comoglio, 2010, 8), many have wondered what the conditions might be that can guide it.

According to DuFour and Eaker (1998; DuFour *et al*., 2006) and Wald and Castleberry (2000) a community-that-is-learning school is based on the sharing of four pillars:

1. the Mission, that is, why we exist and what we believe in;
2. the Vision, that is, what we must become to achieve the Mission;
3. the Values, that is, how we should behave, what guides us; and
4. the Goals, that is, what I have to do to contribute, what commitments I take.

Wald & Castleberry believe that there must be sharing regarding Vision, commitment and collaboration, sharing in the sense of unity and inclusion of all. A community-that-is-learning school is a caring community that seeks continuous improvement, which is based on continuous support by the leadership. And it is within such a community that members are "free to organize themselves around topics that are of interest to them and, yet, they are guided by the central ideological core of the community. The result is a professional community that is learning, connected by shared values and vision" (*ibid*: 36).

The metaphor of school as a community and not as an organization is taken up by Sergiovanni (2001), who even goes so far as to affirm that in this new perspective, organizational structure, teacher motivation, power, authority, curriculum, supervision and assessment no longer make sense: the vital world becomes central, that is the values, traditions, meanings, aims of the school, as they are embodied in the rituals and norms that characterize the culture of the school.

In the school community, as interpreted by Ramboll Management, the focus is on the construction of common and shared values (Ramboll Management, 2004, 35): the transformation of school culture is one of the priorities to focus on in the case studies investigated in his report.

According to Bain, beliefs, assumptions, the vision about teaching and learning constitute the "outline", the common "language" of the self-organizing schools (Bain, 2007, 44–48), and these must be embodied at every level of the organization: all this makes the system similar to itself, which is a characteristic of self-organizing systems (Gleick, 1997; Merry and Kassavin, 1995). This means, for example, that the way (the method, the tools) with which one works in the classroom is similar to the way one works among teachers and the way one works in leadership (Bain, 2007).

Butera *et al*. (2002) – in the book "*Organizzare le scuole nella società della conoscenza*" (2002) (*Organizing Schools in the Society of Knowledge*) – among the operating principles of the organizations of knowledge, in which they include the school, speak of shared knowledge as aimed at generating, using and promoting knowledge of a wide variety of content (scientific, educational, organizational, management, performance, etc.) and formats (embrained, embodied, encultured, encoded knowledge). Knowledge sharing strongly contributes to making the institution effective and vital. The new institutes will develop and give value to:

- all types of knowledge – data, information, experience, skills, values, vision, etc. – both explicit and implicit coming from practice;
- all the processes of sharing, acquiring, distributing, finding and valorization of knowledge;
- the reconciliation between explicit knowledge (codified in texts, in software, etc.) and expert knowledge (in people's heads);
- the passage from knowledge to knowing (Butera *et al*., 2002, 28, 60).

Restructuring

Dialogue and internal and external feedback allow the self-organized school to renew itself continuously (Bower, 2006) and therefore to adapt to the external environment. The self-organized school engages, through the teaching community, in projects aimed at learning new technological skills and new teaching tools (stored in a material and virtual warehouse), which from time to time allow for a review of the lesson design and the implicit pedagogy.

The ability to innovate is also the result of networks that are created among teachers inside the school, among teachers outside the school [the communities of practice (Wenger, 1998)], among schools, among students and among parents (OECD, 2013). To restructure itself, that is co-evolve with the environment, the school creates and develops:

- local partnerships with territorial bodies (municipalities, provinces, regions), economic categories (industrialists, artisans, etc.), educational institutions (universities, conservatories, etc.), promotion and development bodies, etc.
- national partnerships with ministries, research centers, agencies for the innovation of teaching or for assessment, etc.
- international partnerships with other bodies for student and teacher exchanges, dual diplomas, teaching innovations, the development of different projects, etc.

5.7 The Actors in Self-Organized Schools

Within the school the actors of self-organization are potentially four (school principals, teachers and technicians, students and parents); the areas of self-organization are two (intra-scholastic and extra-scholastic), the objects of self-organization are many: educational and professional guidance, learning, teaching, organization, curricular activities (assemblies, projects, days, peer teaching), extracurricular activities (yearbook, parties, management of spaces), external relations, search for funding, etc.

Self-organization gives life to groups of students, parents' associations, groups of teachers and technicians engaged in projects or regarding departments, teachers and technicians, networks, networks of school principals, networks of schools, etc.

Figure 5.5 shows the relationships among actors, area, object of self-organization and self-organized groups.

5.8 Styles of Leadership in Self-Organized Schools

In the previous Section 4.5, we highlighted four categories of styles of leadership: *laissez-faire*, command, conduction, construction. By applying these four classes to schools, it is possible to identify four categories: *laissez-faire* schools, hierarchical authoritarian schools, enlightened hierarchical schools and self-organized schools.

The four categories are obtained in Figure 5.6 by crossing four variables:

- the role of the school principal (passive, active in negative, active in positive);

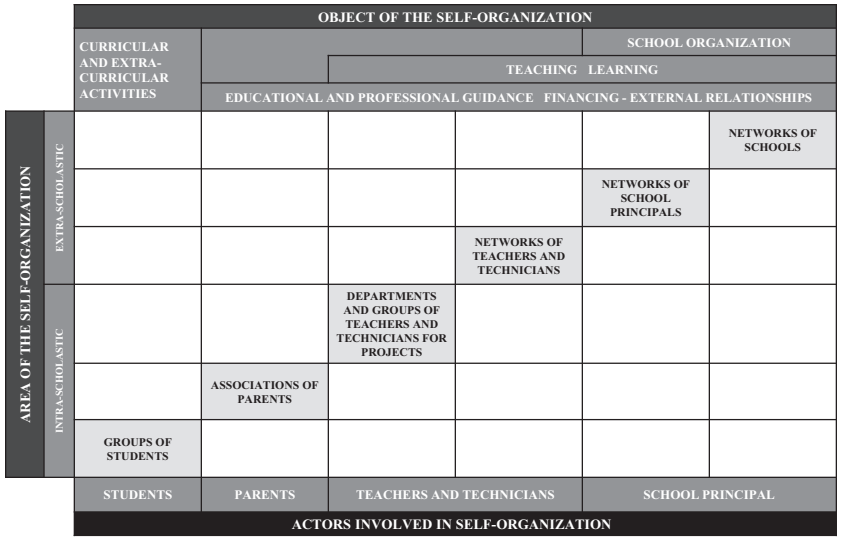

Figure 5.5 Actors, areas and object of self-organization

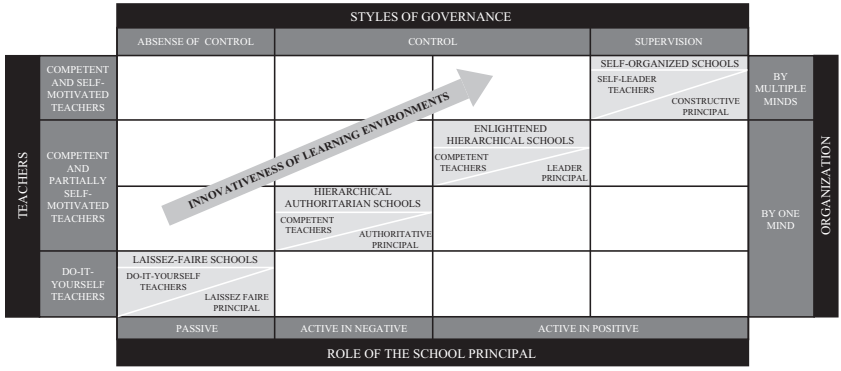

Figure 5.6 Styles of leadership in self-organized schools

- the background and self-motivation of teachers (do-it-yourself, competent and not self-motivated, competent and self-motivated);
- the style of governance (absence of control, control, supervision);
- the organization of the school (by one mind, by multiple minds).

Laissez-faire schools. The school principal obtained his position "by chance" through an exam. He has no charisma; he is not recognized as a leader. He is not proactive; he merely applies rules and ministerial regulations. He delays decisions as long as he can, he delegates responsibilities to others, he cannot seriously evaluate the activities of teachers and collaborators, nor can he make suggestions. The teachers have to look after themselves, becoming authentic "do-it-yourself" teachers. Over time an adverse selection is created: The best teachers try to move away, mostly incompetent and/or non-self-motivated teachers remain. Under these conditions, there is no possibility of creating qualified and cohesive groups of teachers and when this does happen, it is only to oppose the principal. A season of internal conflicts begins, with damage to the students as well. The organization can be traced back to one mind only: that of the "*laissez-faire*" school principal. Control is absent and leadership is disastrous.

Hierarchical authoritarian schools. The school principal obtained his position deservingly because he was competent. However, he has a problem: He is temperamental. In other words: His is a typical case of "unresolved childhood". He has an inclination to command, he does not know how to listen, he simplifies complex situations because one mind alone, even if it is outstanding, cannot be enough to manage a large and articulated organization like a school. Relations with teachers are difficult. The best teachers are competent, but over time they lose their self-motivation. Ultimately, control is partial, because it does not make use of the distributed intelligence of all the teachers. The school is hierarchical and authoritarian, in the sense that the school principal wants to command, choosing to do so without the precious contribution of his teachers and collaborators.

Enlightened hierarchical schools. This time the school principal is not only competent but also balanced and enlightened. He is active in a positive way, and not in a negative way like the previous principal. He proposes, suggests, stimulates, seeks the collaboration of teachers and students. The response of the teachers is partial: Some of them self-activate and take the vision and the actions of the principal to heart, others do not feel like involving themselves as deeply as the principal would like. The result is that the direction of the school is not by multiple minds: those of all the teachers and other players as well. The leadership is recognized and exercised effectively, but the self-motivation of all teachers is not yet a reality.

Self-organized schools. In this case, the situation is ideal: the principal is competent, relational and visionary and the teachers are not only competent but also self-motivated. In a word, teachers are self-leaders. They are in a position to work independently and it does not take long for the results to arrive: Students learn effectively. On the basis of a shared set of values, the school principal, the teachers and technicians, students and parents mobilize around a vision of a community that is learning. The school principal takes on the role not of a conductor (to the goal), but that of a constructor of a context where, in full operation, all the teachers (and students) become

self-leaders and find their way to self-realization. An organization by many minds is created and the system of governance moves from that of control to that of supervision. At the center, the school principal gives the example, provides the energy for change, he is concerned with overseeing the context and outlines new routes, while control is exercised by the teachers and students in the periphery.

These four categories – *laissez-faire* schools, hierarchical authoritarian schools, enlightened hierarchical schools and self-organized schools – are ideal types. Each school finds itself in intermediate and contingent situations. But the categories are useful for identifying an evolutionary direction, which all the players of the school are invited to meditate on and to head for.

Innovative learning environments do not arise if only norms and economic resources are present: The latter in fact exist for all four categories of schools indicated. To build up and create innovative learning environments that are effective, it is necessary to obtain the participation of school principals, teachers and technicians, students and parents, in a logic of intra-entrepreneurship. The Ministry does not have anything to do with it. The Ministry is necessary, but not enough. The distributed intelligence of all those involved is needed, and they must be interconnected, self-motivated and self-activated. Within the Ministry – in the center – nothing is solved. The future is in the periphery, within self-organized schools, capable of promoting fruitful interconnected networks of students and parents, teachers and technicians, principals and schools. In conclusion: Self-organization is the most fascinating future for schools.

Concluding Remarks

One contribution regarding self-organization in schools is that of Bower who distinguishes three levels of self-organization: the core level, the process level and the emergence level. The author claims that freedom is one of the conditions that favor emergence and self-organization.

The second contribution regarding self-organization is provided by Bain who identifies five key principles: simple rules, built-in design, distributed control, self-similarity, feedback. The combination of the five principles leads to a cognitive scheme shared by the school community (interpretations, beliefs, actions on teaching-learning) both on a formal and an informal level.

The proposed framework of self-organization is based on the activation of four macro capabilities expressed in 19 meso-capabilities: interconnection (five meso-capabilities: distributed leadership, internal networking, cooperation, integration, orientation to

the user), redundancy (four meso-capabilities: functional, cognitive, informative, relational), sharing (four meso-capabilities: values, strategic, organizational, trust) and restructuring (six meso-capabilities: innovation, speed, external networking/openness, reading of the environment, operational flexibility, strategic flexibility). The variables contributed by Bower and Bain have been absorbed into the proposed framework. This latter is accompanied by a questionnaire for the measurement of capabilities (see Appendix F).

The importance and expression of the four macro-capabilities on which the framework of the self-organized school is built are described in numerous contributions of scholastic articles and books.

There are four actors in self-organization: school principals, teachers and technicians, students, parents. They give life to groups of students, parents' associations, groups of teachers and technicians, networks of teachers and technicians, networks of school principals and networks of schools.

The four categories of styles of leadership – *laissez-faire*, command, conduction, construction – correspond to four categories of schools: *laissez-faire* schools, hierarchical authoritarian schools, enlightened hierarchical schools and self-organized schools.

To build self-organized schools you need the distributed intelligence of principals, teachers and technicians, students and parents, in turn interconnected, self-motivated and self-activated. Within the Ministry – in the center – nothing is solved. The future is in the periphery, within self-organized schools, capable of promoting fruitful interconnected networks of all the actors and of the schools.

Part Three

Field Research

6 Learning Environments and Self-Organization

Results of the Research

6.1 Introduction

This chapter presents a comparison between:

- the empirical evidence collected and organized in the dimensions that represent the constitutive elements of an innovative learning environment (actors, organization, learning and tools), in accordance with the assessment tool proposed in Chapter 2; and
- the typical capabilities of the self-organized school (interconnection, redundancy, sharing and restructuring) in accordance with the framework proposed in Chapter 5.

The research is guided by three research questions:

1. How can the levels of innovation in learning environments be measured?
2. How can the typical capabilities of self-organized schools be measured?
3. Does a high degree of self-organizational capabilities favor the development of innovative learning environments?

The sample examined (14 institutes) represents all of the types of schools, except vocational schools, for a total of 26 schools (see Table 6.1): nursery schools (6), primary schools (6), junior high schools (5), high schools (5), technical institutes (3), international schools (1). The realities studied are mainly from Northern Italy (10), Central Italy (2) and Southern Italy (2). Two associations are also described, both from Southern Italy.

For further information on the scientific motivations of the research questions and on the criteria for the choice of case studies, refer to Appendix G.

The case studies are briefly presented and described with the help of the variables of the proposed frameworks. The order of presentation considers high schools first and then junior high schools, according to the best results obtained for the innovation of the learning environments as per Table 6.2. The assessments of learning environments and capabilities of each of the 14

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Table 6.1 Profiles of the case studies examined

No.	*Name*	*Nursery School*	*Primary School*	*Secondary school (7)*				*H. S.***	*C. S.****	*State school*	*Private recognized school*	*Association*****	*Northern Italy*	*Central Italy*	*Southern Italy*
				Junior high school	*High school*										
					Technical school	*Lyceum*	*I.B.**								
1	"Lena Perpenti" in Sondrio					●		●		●			●		
2	"Gioia" in Piacenza					●				●			●		
3	"Russell" in Cles (TN)					●				●			●		
4	"Majorana" in Brindisi				●	●		●		●					●
5	"Fermi" in Mantua				●	●		●		●			●		
6	"Barsanti" in Castelfranco Veneto (TV)				●					●			●		
7	"Collegio del Mondo Unito" in Duino (TS)						●			●			●		
8	"Marconi" in Modena			●						●			●		
9	"Ristori" in Naples	●	●	●					●	●					●
10	I.C. in Montespertoli (FI)	●	●	●					●	●				●	
11	"eSpazia" in Monterotondo (RM)	●	●	●					●	●				●	
12	"Giovanni XXIII" in Tricesimo (UD)	●	●	●					●	●			●		
13	"Randi" in Ravenna	●	●							●			●		
14	"C.E.I.S." in Rimini.	●	●								●		●		
15	"Quartieri Spagnoli" in Naples											●			●
16	"Maestri di Strada" in Naples											●			●
	TOTAL	6	6	5	3	5	1	3	4	13	1	2	10	2	4

* International Baccalaureate

** High school includes the vocational school and/or the technical school and/or the lyceum.

*** The comprehensive school includes the nursery school and/or the primary school and/or the junior high school.

**** Designed outside the school (project for inclusion) for students who have not finished their studies.

Table 6.2 Results regarding learning environments and capabilities in the 14 case studies

	Case studies	*Innovativeness of learning environments (values from 1 to 5)*	*Self-organizational capability (values from 1 to 6)*
	High schools		
I	"Majorana" State High School in Brindisi	3.54	5.44
II	"Fermi" State High School in Mantua	3.42	4.69
III	"Gioia" State High School in Piacenza	2.65	4.49
IV	Collegio del Mondo Unito (United World College) in Duino (province of Trieste)	2.64	4.39
V	"Russel" State High School in Cles (province of Trento)	1.98	4.42
VI	"Piazzi Lena Perpenti" State High School in Sondrio	1.75	4.29
VII	"Barsanti" State Technological Institute in Castelfranco Veneto (province of Treviso)	1.58	3.72
	Junior high schools		
VIII	"Randi" Comprehensive Institute in Ravenna	2.81	4.75
IX	Comprehensive Institute in Montespertoli (province of Florence)	2.77	4.55
X	Italian-Swiss Education Center in Rimini	2.56	5.07
XI	"eSpazia" Comprehensive Institute in Monterotondo (Rome)	2.52	5.65
XII	"Marconi" Junior High School in Modena	2.43	4.66
XIII	"Giovanni XXIII" Comprehensive Institute in Tricesimo (province of Udine)	2.10	4.62
XIV	"Ristori" Comprehensive Institute in Naples	1.92	4.90

schools can be found in Appendix H. As an example, we will present the assessment of the first case study, the "Majorana" school in Brindisi.

6.2 The "Majorana" State High School in Brindisi

This school is a state high school and includes a technical school and a scientific high school with a specialization in applied sciences. There are 110 teachers and 1,060 students: 800 students in the technical school and 260 in the scientific high school. It is considered educationally avant-garde by *Indire* (a research institution of the Ministry of Education), and it is very popular among the mass media (TG Dossier, Quark, *La Repubblica*).

Learning Environment

The learning environment (Figure 6.1) presents the best results of the 14 cases with an average of 3.54 out of 5, structured as follows: actors (2.38 out of 5), organization (3.27 out of 5), learning (3.50 out of 5), tools (5 out of 5).

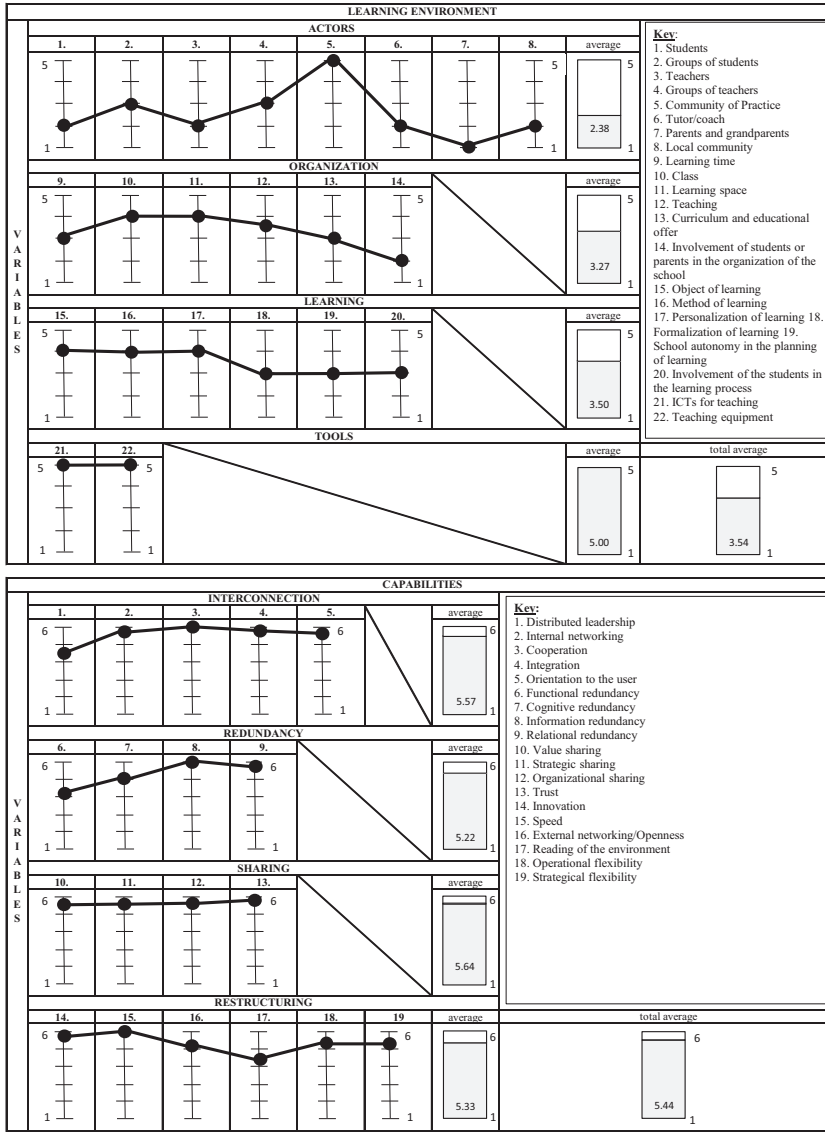


Figure 6.1 Learning environment and capabilities – "Majorana" school in Brindisi (case study no. 4)

Actors

The actors are not the strong point of the "Majorana" school: the values are on the whole medium-low (2.38).

Regarding the groups of students (variable 2), the value is equal to 3 because they work in groups for most of the school time even through the so-called "imploded class", in which the class is divided into groups by personal interests and resources and then reunited in the final work (like in the "energy production from gas" project), or in the "classroom of the future", a classroom (today there are many) with high availability of ICTs and teaching equipment (desks and flexible chairs) which makes a part of the group work possible.

As far as teachers are concerned (variable 3), the value reached is medium-low (2), despite the fact that the students play the role of teachers as they help their peers who are in difficulty (*peer teaching*).

Participation in communities of practice (variable 5) has a very high value (5): the school is known above all for its *Book in Progress* project, which had begun in 2008 and was based on the idea of the new principal, Salvatore Giuliano, who proposed replacing the textbooks with texts built up by teachers based on the school's own needs ("tailor-made"). The texts are available to students in paper and virtual versions and are used in class by the teachers thus substituting published textbooks. Today, the project has become a network at the national level: every school can enroll and contribute, and groups of teachers (teaching the same subject) meet periodically to discuss ways and methods for the continuation of the work. The project was then proposed to parents to finance the school's technologies: the sum of money corresponding to the cost of purchasing the textbooks was made available to buy netbooks for students to use in the classroom, Interactive Whiteboards (IWBs) and tablets.

In the wake of the "*Book in Progress*", some *Objects of Learning* were created, that is, learning units that are self-consistent and reusable for e-learning, consisting of the essential concepts of the module or the theme being dealt with via images, videos and graphics, which then are made available to other teachers and schools (the *Net in Progress* project). The school is also part of the *European Schoolnet*, a network of Ministries of Education, schools, universities, industries, associations and government bodies with the aim of bringing innovation to teaching and learning; it is also part of the *Living School Lab*, a project for the use of ICTs in schools through the comparison of the best European practices; and it is also part of the *Creative Classroom Lab*, a project for innovative scenarios of teaching and learning with the use of tablets inside and outside the school.

Regarding the "local community" variable (variable 8), it reaches a relatively low value (2): some experts in the craftsmanship and industrial fields are involved with lessons and experiences in the field.

Organization

The organization of learning has values, on average, decidedly higher (3.27). The value reached by the "learning time" variable (variable 9) is equal to 3 because:

- some subjects are taught only in the first or second four-month period with a greater hourly weight per week for four-month periods, others for the whole year;
- at half term the class is divided by levels, allowing a more flexible learning time;
- there are optional subjects, so the schedule will be different for groups of students;
- there are times for individual work, group work, presentations and rest in the "Classroom of the Future".

The "class" variable (variable 10) has a high value (4) as it is particularly open and flexible. This is for the following reasons:

- in the experimentation of the "Anglo-Saxon" type of organization of teaching hours for open-plan classrooms, some subjects are taught only in the first or second four-month period to pairs of sections, others throughout the year: the students attend the same class from September to November; they take an exam that divides them into those who have passed and will study the program in depth and those who have not passed, thus constituting two new classes, remedial and non-remedial, derived from two different sections; the group that did not pass the exam will take a remedial course until January when they will take a new exam to enter the second four-month period, and, if even after that the gaps persist, the student(s) will have to take a remedial course in the afternoon;
- in the "imploded class" – for example, in the teaching module called "energy production from gas" – the class is divided into groups by interest, skill and/or level and then reassembled for the final work; and
- students have the opportunity to choose some subjects (options) to study during the school year, so the class, for some hours, will be divided according to the students' choices.

The same applies to the learning space (variable 11) with a medium-high value (4). The "Classroom of the Future" is in fact also an example of flexibility of spaces: it is a flexible classroom, structured into different spaces and equipped for individual work, group work, traditional, teacher-centered lessons, presentations (the so-called "agora" corner), workshops for the assembly of project work and/or experimentation, and spaces for recreation; it is equipped with movable and modular chairs and desks and various

technological equipment such as a *multitouch* monitor, an electronic microscope and a video camera. The pilot project was extended to 20 classrooms.

The organization of teaching (variable 12) has a value of 3.6 as teachers work together for workshops and foreign languages that involves some joint planning work at an informal level and as there is a coaching activity for new teachers on technology-based teaching.

The curriculum and the educational offer (variable 13) are on average flexible (3) because there exists the possibility to choose from various curricular options, and some subjects have classes of different levels.

Learning

Learning has value, on average, of 3.33. Regarding the object of learning (variable 15), the value reached is medium-high (4): teaching by competences is applied in the multidisciplinary projects such as "Production of Energy from Gas", "Georges La Tour" and "Love and Psyche". IT and editing skills are acquired, along with autonomous work, innovation, creativity and citizenship in the "Classroom of the Future" project and in the production of *Learning Objects*. In addition, the school participates in the "Skills project" of the MIUR (Ministry of Education, University and Research).

The "method of learning" variable (variable 16) reaches a value of 4 for the use of teaching methods including:

- *Spaced Learning*, in which a traditional, teacher-centered lesson is offered to students lasting no more than 10–15 minutes as a presentation or with *Learning Objects*, then the students are left free for 10 minutes or a playful activity is carried out; then 10 minutes are devoted to reviewing parts of the lesson (to activate memory) and then again 10 minutes of free play time are given; in the final part of the lesson (10–20 minutes), learning is assessed;
- the *Flipped Classroom*, or upside-down class: before the lesson a *Learning Object*, a video-recorded lesson or some material to read and examine is sent to the student, and the time in the classroom is used as a workshop for the application-processing of the contents;
- *Collaborative Learning*, a style of teaching that is based on collaboration in the classroom in a playful but constructive manner, which promotes emotional and social development and increases learners' esteem in sharing what they know, and consists in making accessible, in a concrete, visual and tactile way, complex ideas and encourages dialogue in the classroom;
- *Debate Learning*, which consists of the structured learning of techniques and languages to use in discussing effectively in public;
- teaching based on the *Book in Progress* project, that is on the aforementioned texts, in paper and virtual versions, built up by teachers based on the specific needs of the school and students;
- teaching through the aforementioned *Learning Objects*.

The "personalization of learning" variable (variable 17) is medium-high (4) thanks to the innovative teaching methods just mentioned and high-tech classrooms that allow for diversified times and spaces that not only allow individualized learning – different methods with the same objectives – but also personalized – different methods with different objectives – for students with Specific Learning Disabilities (SLD) and/or Special Educational Needs (SEN), for which one focuses on essential objectives. Students with these characteristics are coordinated by the educational and psychological help desk.

The "formalization of learning" variable (variable 18) has a value of 3: the learning context is nonformal with participation in the ministerial project "Alternating School and Work" and informal, considering that in the "Classroom of the Future", students can learn in an informal way in the "Relaxation corner" and that they can take advantage of virtual environments even outside the formal context of the school (e.g., in a park or on a train).

As far as the autonomy of the school is concerned, in the planning of learning (variable 19), it stands at an average value (3): there is a certain autonomy on the part of many teachers, as regards planning, and on the part of the school regarding the schedule and the open-plan classrooms.

Regarding the involvement of students in the process (variable 20), the value is average (3) considering that many of the aforementioned projects involved the students in the implementation.

Tools

The teaching tools are the flagship of the school, and their development is the goal which, from the very beginning, the principal has focused on. Both the ICTs and the equipment for teaching (variables 21 and 22) represent one of the *best practices* in Italy with a value equal to 5.

ICTs consist of classrooms equipped with Interactive Whiteboards (IWBs); *Netbooks* and *Tablets*; *multitouch* monitors; tools for electronic assessment in the classroom, that is, MimioMobiles; tools for the creation of Learning Objects (*Edu Creation*); digital cameras; virtual platforms (*Edmodo, moodle, iTunesU*); the electronic register; tools for editing books (for *Book in Progress*); and the electronic badge for students' access in the morning, for absences and to store the teaching material prepared by the teachers.

Regarding the teaching equipment, the classrooms of the "Classroom of the Future" project are equipped with flexible desks and chairs, that is, modular, according to teaching needs – individual work, pair work and group work; they are equipped with stools in the experimentation and editing area and with soft armchairs in the area for "relaxation". The school is also equipped with numerous laboratories.

Capabilities

Capabilities (Figure 6.1) reach very high values (average 5.44 out of 6) and are expressed as follows: interconnection (5.57 out of 6), redundancy (5.22 out of 6), sharing (5.64 out of 6), restructuring (5.33 out of 6).

Interconnection has very high values in all the variables except for distributed leadership (variable 1) which is a little lower (4.50). It is implemented through the organizational roles allowed by *job enlargement* and *job enrichment* (examined later in "redundancy"), by the presence of two vice-principals, and by the fact that most of the decisions are taken by the teaching staff on proposals by the subject departments or individual teachers and by the parent–teacher–student meetings. The relationships with stakeholders (variable 5) – which assume a value of 5.67 – are frequent and allow high feedback flows both to and from stakeholders: an indicator of this is the possibility of the feedback to be received by the principal which is open to everyone every day.

Redundancy is high with an average value of 5.22 out of 6. The job enlargement and the job enrichment (variable 6) with a value of 4.32 allow a discrete functional redundancy obtained through multiple organizational and managerial roles that the teachers cover, in addition to teaching, including the management and coordination of activities such as relationships with students in the class and their parents; national and European projects, such as the aforementioned projects of the *European Schoolnet* or *Indire* (a research institution of the Ministry of Education) (Project Operating Groups); subject departments: scientific, humanistic, linguistic areas; school networks such as the national *Book in Progress* network with two national editorial departments in Brindisi; student tutoring; innovation regarding teaching and learning technologies; organizational innovation (time schedule, classes, spaces); alternation between school and work (as non-formal learning); external relations (with private companies, such as ENI, ENEL, Avio, and public, such as the public authorities for safety at school); extracurricular activities; tutoring of new teachers; relations with the university and research; and learning of a non-curricular subject in English (C.L.I.L.) (Content and Language Integrated Learning).

Regarding the capabilities concerning sharing, the variables are all above the value of 5.50 with a peak in "trust" (variable 13) with a value of 5.83. The principal, from the beginning of his principalship in this school (2008), shared, not always without obstacles, with the stakeholders (parents, non-teaching staff and companies) his vision of the school and his ideas of innovation based on learning technologies and on the autonomous production of textbooks. Subsequently, some stakeholders contributed and are still contributing to the success of the school initiatives: for example, teaching and nonteaching staff work without receiving any payment during the graduation day in July or to produce the paper books of the *Book in Progress* project. According to the interviewees, shared values include: a passion for teaching

and learning, competence and content through technology, motivation and student success, and better learning results.

The capability regarding restructuring (average 5.33) has a very high value (5.83) in innovation (variable 14) and in speed (variable 15) with a value of 6.

The capability regarding networking (variable 16) with a value of 5.17 is mainly due to school networks and national teacher networks established by the "Majorana" school itself such as that of *Book in Progress*; *Net-In-Progress*, the national network for teacher training toward teaching through technologies (teachers become teachers for other schools); and "Classroom 3.0", the national network of schools managed by *Indire* (a research institution of the Ministry of Education). There are local partnerships as well: the "Majorana" school is a polo school for the organization of the preparation for the university tests by the teachers, created at the request of the students who had finished the fifth year during the 2010/2011 school year, and then was improved with the intervention of university professors and, at the request of the Local Education Authority, it was extended to all the schools in the province. The school has a national partnership with the MIUR (Ministry of Education, University and Research) for the four-year pilot project on applied sciences and numerous international partnerships with the *European SchoolNet*, the *Living School Lab* and the *Creative Classroom*. Furthermore, there is the monitoring of research on innovative learning environments such as the already mentioned *Spaced learning, Flipped classroom, Collaborative Learning* and *Debate Learning*.

6.3 The "Fermi" State High School in Mantua

This school is a state high school and includes a technical school, technological sector (nine sections) and a scientific high school in applied sciences. It has a total of 1,600 students (1,000 in the technical school and 600 in the scientific high school) and 170 teachers. It is considered by *Indire* ("National Institute of Documentation, Innovation and Educational Research") to be an avant-garde school, known to the "Associazione Docenti Italiani (ADI)" (Italian Teachers Association) for its educational experimentation, a case study of research on the Social Report (Paletta, 2011), and is ranked seventh in a recent ranking system by the Agnelli Foundation, Lombardy Region.

Learning Environment

The assessment of the learning environment (Figure H.2 in the appendix) presents results on an average equal to 3.42, subdivided as follows: actors (2.63 out of 5), organization (2.88 out of 5), learning (3.67 out of 5), tools (4.50 out of 5).

Actors

The category "actors" has a low-medium value (2.63), on the whole.

Group work among students (variable 2) has a high value (4) due to the many teaching methods used by teachers who focus on the interaction among students and on the presence of spaces that favor group work, such as the classroom built on the *Technology Enhanced Active Learning* (TEAL) model for an effective acquisition of skills through advanced technology (MIT project of 2008): a classroom double the size of a traditional classroom, in which the desks are built in such a way to be used for individual and group study as they can be arranged as desired, and where there is a Wi-Fi connection (as well as touch-screen monitors), as is the case in the entire school.

The "teachers" variable (variable 3) has a value of 3 because, for example, there are teachers available online in the *Docebo* software in a virtual classroom, outside school time, to allow for a virtual problem setting; that is, the teacher presents problems that are discussed online by students.

The school has a high value (4) in the "communities of practice" variable (variable 5), and the following are few examples where the school is a part of:

- The *Dual Diploma*: a research project, under the patronage of the Regional School Office, which aims at creating a bilingual curriculum for the scientific high school through exchanges of students and teachers; in this way, the students are offered the opportunity to graduate simultaneously in Italy and in the United States with a private Italian school accredited by MIUR (the Ministry of Education, University and Research), the "Guglielmo Marconi" school in New York.
- The Italian Teachers Association, with which it regularly collaborates on teaching innovations and on the organization of spaces.
- The *Indire* (the National Institute of Documentation, Innovation and Educational Research) network, with which it collaborated on various occasions, including the MIT project, "Debating", regarding presentation skills and the "Class 3.0 project: When Space Teaches".

Tutoring (variable 6) stands at a medium-low value (2) through peer tutoring with experienced students.

The intervention of the local community (variable 8) has a value of 3 and occurs, for example, through the project with ENI, "School-Enterprise Network": the company and the school meet at the beginning of the year to plan for one skill to be achieved together – for example, "the use of chemistry laboratories in safe conditions". In addition, the school is part of the "Club of 15", a network that brings together the 15 technical schools of the Italian provinces with the highest GDP in the manufacturing sector, with which, among other things, it builds up alternating school-work programs.

Organization

The "organization" category has an overall value of 2.88.

In particular, as regards the "learning" variable (variable 10), the value is equal to 3. Through a project created in collaboration with the Ministry, the classes are combined in pairs, and the planning is done jointly in such a way as to allow for open classes by levels, interests, and options, constituting the so-called *No w@ll class* or school without classes.

Regarding the learning spaces (variable 11), the value is high (4). The school is organized by classrooms based on subjects and not classes – the so-called "classroom without classes". Each classroom is furnished and has the proper equipment for a particular subject (e.g., History), and the students move from class to class. With a view to revisiting the scholastic architecture, on the model of the "cave" of the Danish school *Hellerup*, a colorful space was built for individual or group work to be used, for example, during the hours of substitute teaching, in the alternative hours of religion, or to watch a film: the project is called "Ore buche, ma non troppo" (Free periods, but not too many). The aforementioned TEAL is also an example of an adaptable multi-activity space that provides flexible spaces for individual and group work. In the school, there are spaces devoted to accessing ICT resources such as the *Docebo* environment that is also used as an archive for lessons and materials for the class and for sharing with teachers.

The curriculum and the educational offer (variable 13) are flexible, with a value of 3, as they allow the activation of subject options as routes of levels in the same subject. Furthermore, 20–30% of the total hours of autonomy are allocated to support subjects such as Physics, Chemistry, or English.

The involvement of students in the organization of the school (variable 14) has a value of 3: the students were used during the summer training period to build up the school network and to organize the library and the workshops; during the school year, the students participated, in collaboration with the teachers, in the construction of IWBs.

Learning

Learning as a whole has a value of 3.67.

The "method of learning" variable (variable 16) represents one of the *best practices* with a very high value (5). Among the numerous innovative teaching methods used by teachers are:

- *Cooperative Learning*;
- *Peer Education* or tutoring with experienced students;
- the *Flipped Classroom*, or upside-down class;
- *Spaced Learning*;
- *Highlights for Students*: the school is part of the *Highlights for High Schools in Italy* project that includes a number of MIT doctoral students in

scientific subjects, who carry out teaching activities for a month at the school; the school also welcomes university students as language assistants for one year;
- teaching by means of the e-book called "*Physically Speaking*";
- "*Problem posing & solving for Maths and IT*"; and
- the *iTEC – Innovative Technologies for an Engaging Classroom* – with "*Indire*" (the National Institute of Documentation, Innovation and Educational Research).

The aforementioned teaching methods allow a high degree of individualization and personalization of learning (variable 17) with a value of 4, especially if carried out with students with Specific Learning Disorders or Special Educational Needs. Furthermore, a certain degree of individualization is also allowed thanks to the "school without classes" which allows for groups differentiated by interest or level.

The school time dedicated to nonformal and informal contexts (variable 18) is high (4) since the close relationship with the local community makes it possible to build up various school–work alternation routes with local companies (140); moreover, the space in the school devoted to the project "Free periods, but not too many" also makes it possible to use informal learning contexts. Such a school environment also allows for a certain degree of autonomy in the planning of learning (variable 19) by the school, a variable that has a value of 3.

Tools

Tools are on average characterized by a very high value (4.5).

The school has a high value (4) for ICT equipment (variable 21): IWBs in all the classrooms, presence of some *multitouch* monitors, virtual platforms (*Docebo* and *Moodle*) also used to store material, and an electronic register.

The "teaching equipment" variable (variable 22) represents one of the *best practices* with a value of 5 as these devices allow arrangements suitable for group and individual work: for example, in the TEAL classroom, the desks are built similar to "origami" and allow a certain flexibility. The space "free periods, but not too many" allows informal work and presentations in a public space.

Capabilities

Capabilities (Figure H.2) are medium-high on average (4.69 out of 6) and are as follows: interconnection (4.82 out of 6), redundancy (4.38 out of 6), sharing (4.82 out of 6), restructuring (4.76 out of 6).

Interconnection – with an average value of 4.82 – has a value of 3.58 in distributed leadership (variable 1), and it is implemented through the heads

of departments, projects and vice-principals. The "relations with users/stakeholders" variable (variable 5) has a high value (5.25) and occurs with various actors such as:

- students, whom the school asks their opinions, for example, on the new architecture "Spaces for individualized learning and for cooperative learning";
- the teachers involved by the school, for example, in the "Project Group Report" to get feedback on the projects;
- parents who, through the "*Fermi Tutti*" (*Hold On Everybody*) association – created in 2012 to support projects and activities for students of the school, promote collaboration with school bodies and sociocultural institutions in the area; they organize meetings, events and courses on the topics of school, education, training, culture and art; they also fund scholarships and awards;
- *Confindustria* (the Italian industrial employers' federation), *l'Associazione Piccoli Industriali* (the association of young entrepreneurs), the Chamber of Commerce, *il Collegio dei Periti* (the College of Experts) and the university that interfaces with the Technical Scientific Committee.

Redundancy has a medium value equal to 4.38, with a lower value in the functional category (variable 6), and more homogeneous in cognitive, information and relational redundancy (variables 7, 8, 9).

Functional redundancy (variable 6) assumes a value of 3.97 and is expressed in the different organizational roles that the teachers assume in the management of multiple units and activities: departments; parent–teacher–student meetings (coordinators); projects (instrumental functions); assessment and self-assessment (e.g., in the *VALes* project, in the report on the Annual Report); student tutoring; teaching innovation; remedial courses, assistance and inclusion; the welcoming of new students and new teachers; alternation of school–work and training periods with the MIUR (Ministry of Education, University and Research); PTOF (the three-year plan of the educational offer); workshops; environmental education, education on legality, health, sports; development (languages, Olympics, the arts); educational trips, international projects, exchanges, language training periods; training; planning of learning; ITCs and safety; services (library, digital library, printing); organizational innovation (e.g., that of the time schedule, classes, spaces); school networks (*Dual Diploma, Highlights for Students*); international relations; and relations with the university and research.

Sharing is high (4.82), especially in organizational sharing (variable 12) with a value of 5.19 and trust (variable 13) with a value of 5.17. The values and the vision are shared at the beginning of the school year in the Mission and in the PTOF (The three-year plan of the educational offer) and are, as the principal says: scientific and technical excellence in an international

perspective; the adaptation of learning to students and not that of students to learning, for a scientific citizenship; internationalization; the development of group work; the involvement of the stakeholders.

Restructuring with an average value of 4.76 has a high value in innovation (variable 14) of 5.13, as the school invests in teaching innovations and in the development of new services, as can be seen from the various projects (e.g., the project "*Classroom 3.0*" and the *Hellerup* experiment), within an organizational culture in which one can take the initiative and occasionally make mistakes (*try & learn*). The "external networking" variable (variable 16) with a value of 4.75 is characterized by networks of teachers and schools with the *Highlights for Students* (MIT) project; the Report on the Annual Report; the *VALes* project (*Invalsi*); the "*Classroom 3.0*" project (MIUR) (the Ministry of Education, University and Research); the Danish school *Hellerup*; and by partnerships with the "Pacioli" Technical High School in Crema and with the "Guglielmo Marconi" School in New York. The strategic flexibility variable (variable 19) has a value of 5.13 because the school is careful to exploit the opportunities given by the market to prepare new strategies.

6.4 The "Gioia" State High School in Piacenza

It is a high school that includes a classical high school, a scientific high school and a linguistic high school. It has 1,800 students and 140 teachers.

Learning Environment

The measurement of the learning environment (Figure H.3 in the appendix) presents results of 2.65 on average and are as follows: actors (2.68 out of 5), organization (2.92 out of 5), learning (3.00 out of 5), tools (2 of 5).

Actors

The variable "actors" contains value equal to 2.68, on an average. The low values (equal to 1) for the involvement of parents and grandparents (variable 7) and the local community (variable 8) are offset by higher values, equal to 3.4, in students (variable 1) and equal to 4 in group work among teachers (variable 4) and in the community of practice (variable 5).

The "students" variable (variable 1) has, as mentioned before, a value of 3.4: in fact, in the "*Città dei Filosofi*" (The City of Philosophers) project, initially designed to begin the teaching of philosophy in the first year of high school, the school extends beyond only high school and includes among its users those of junior high schools, primary schools, nursery schools and nursing home. To this end, a network of schools (active for 10 years) was created called "*Philosophy for Children*, Building a Research Community", funded by the Province.

Students' group work (variable 2) has an average value (3); among the various educational group activities, noteworthy of mention are:

- the construction of a radio telescope dish for the school, with consequent documentary on the history of communication with script and theatrical representation;
- the editing of a newspaper, "*Il tricolore*" (the Italian flag), for the 150th anniversary of the unification of Italy with various public acknowledgments and the construction of a historical newscast (for didactics of the product).

Variable 3 (teachers) has a value of 3: in addition to the teaching staff, there is the possibility of having university teachers teach from a distance through an online philosophical research community for students in collaboration with the University of Val d'Aosta. In the "*City of Philosophers*" project, students become teachers for students of the junior high school, the primary school and the nursery school and for elderly people from nursery homes.

Furthermore, what contributes to constitute a high value (4) in the work of teaching (variable 4) and in communities of practice (variable 5), in addition to the aforementioned online philosophical research community, is a community of schools and teachers in the province of Piacenza on skills education coordinated by the Province and in collaboration with the Catholic University of Piacenza which, among other things, published these experiences in a volume titled "*Skills and Teaching Units: Comparing Experiences*" (Guasti, 2011).

Organization

The organization of learning has a value of 2.92 on an average.

The "class" variable (variable 10) is on average flexible (achieving a value of 3) as it can be divided into groups of students, even of different ages, according to their interests.

Regarding the learning space (variable 11) the value is equal to 4. In fact, the school is characterized by varied spaces with "*The City of Philosophers*" project and spaces devoted to accessing virtual resources such as those of the philosophical research community mentioned earlier. These projects also make learning time flexible (variable 9) (with a value of 2).

Regarding teaching (variable 12), the value reached is 3.6 as:

- in some subjects, there is the simultaneous presence of teachers, thus alternating individual teaching with group teaching;
- each new teacher must complete 15 hours of training with other senior teachers to learn about the school, the curricula, and the way of working.

The educational offer (variable 13) has a medium-low value (2): as part of the autonomy, the school has chosen to teach a curricular subject (History) in English from the first year of study to the fifth.

Learning

The category "learning" has an average value of 3.

Regarding the object of learning (variable 15), the value reached is high (4). This school is characterized by a collaborative environment and a will to experiment, developed by the principal, Professor Gianna Arvedi (now retired), during her 12 years of service, in which the school was one of the 20 autonomous schools to experiment the Berlinguer reform which included, among other things, the production of curricula on the basis of skills/competences. It is a school that works mostly with these objectives; the aforementioned text (Guasti, 2011) on teaching by competences is a clear demonstration.

The method of learning (variable 16) is innovative – with a value of 3 – considering the various projects of product teaching, for projects and workshops, which also allow a certain degree (value 3) of personalization of learning (variable 17), especially in the form of individualization – that is, different methods proposed to students to reach objectives that are common to all. In order to keep track of the experimentations and of the work done by the teachers and to have sources from which new teachers can draw on, the school has a well-equipped place available where you can find materials as listed in the following:

- all incoming information and documentary materials (from the outside into the school);
- the thematic dossiers (e.g., on autonomy, skills and curricula, modularity, state examination, school self-analysis);
- the documents regarding the planning of the school (e.g., on the remedial work, the incoming and outgoing orientation, the local integration of the national curriculum, the options offered in the final three-year period);
- the formalized teaching experiences, related to ordinary and experimental teaching (e.g., on the team-teaching experience of History and Law, nonverbal and multimedia languages, optional courses);
- the paper material, audio–video recordings, or other multimedia material for keeping up-to-date, all made possible thanks to a warehouse fed by the students who participate in external training activities.

Regarding the formalization of learning (variable 18), the value reached is medium-low (2). The learning context is partly nonformal when leaving the school to involve the local community in the "*City of Philosophers*" project.

The autonomy of the school in planning (variable 19) has a value of 3: there is a good creative willingness on the part of many teachers.

The involvement of students in the learning process (variable 20) assumes an average value (3): many of the teaching projects have involved students in the implementation of the methods.

Tools

The profile of the tools as a whole is medium-low (2).

Specifically, ICTs for teaching (variable 21) has a value of 3: the school has had an electronic register since 1994, and today the IWB is present in every classroom. Each class has a virtual page in Dropbox with lessons, materials, and work done in class, and the online philosophical research community for students represents a virtual platform for learning.

As for teaching equipment (variable 22), the value is low (1) as the classrooms and the school are still traditional.

Capabilities

Capabilities (Figure H.3) assume high values (4.49 out of 6) as follows: interconnection (4.88 out of 6), redundancy (4.08 out of 6), sharing (4.52 out of 6), restructuring (4.46 out of 6).

Interconnection (4.88 out of 6) has a very high value of 5.60 in internal networking (variable 2); high value (5) in cooperation (variable 3) understood as willingness to make the skills and knowledge available to help others; and again high value (5) in the orientation of users/stakeholders (variable 5) as the school maintains frequent and constructive contacts with students and families.

Redundancy (4.08 out of 6) has a medium-high value (4.80) in information redundancy: the "lessons learned" are made available to all collaborators, and there is sharing of important information among organizational units (parent–teacher–student meetings, teachers' meetings, committees and administrative office).

Sharing (4.52 out of 6) has values of 4.78 in "organizational sharing" (variable 12) and 4.93 in "trust" (variable 13): the culture created over the years by the principal, the aforementioned Professor Gianna Arvedi, today is part of the way teachers work. They work by means of committees, supported in the objectives and proposals by the confidence of colleagues and the overall organizational climate.

Restructuring (4.46 out of 6) has a very high value (5.50) in innovation (variable 14) and a high value (5) in speed (variable 15): the school invests in innovations to teaching methodologies and the development of new services, within a *try & learn* organizational culture, which still guarantees speed and effectiveness in the changes.

6.5 Collegio del Mondo Unito (The United World College) of the Adriatic in Duino (Trieste)

The United World College of the Adriatic is a reality that stands out in the Italian panorama for the originality of its educational approach. It occupies a lot of space both in the Italian and foreign press, with numerous articles and reports also on television (e.g., "The Dream School" on the MTV channel).

The College is an independent school belonging to the Colleges of the United World, an international movement that brings together students from all over the world, selected solely on the basis of merit, with the aim of promoting peace and international cooperation. The school is attended by about 200 students (residential), aged between 16 and 19, all holding a scholarship, and coming from more than 80 different countries. The College offers a two-year study program (third and fourth years in the Italian system), aimed at achieving the International Baccalaureate, an exam corresponding to the Italian high school diploma, recognized in more than 80 countries around the world. The characteristic aspect of the College is the multilingual border area in which it is located. Students live in residences strongly rooted in the community of Duino.

Learning Environment

The measurement of the learning environment (Figure H.4) presents results on an average equal to 2.64 and divided as follows: actors (2.23), organization (3.33), learning (3.50), tools (1.50).

The "actors" category has an average value corresponding to 2.23. The highest values are 3 in group work among students (variable 2), 3 in the "teachers" variable (variable 3), 3 in that of "group work among teachers" (variable 4) and 3 in "tutoring" (variable 6).

The "learning organization" category reaches an average value of 3.33. Regarding the "learning time" variable (variable 9), the value is equal to 4. The school is characterized by the fact that it has to meet the requirements of the International Baccalaureate, presenting exams in six subjects to which each student is given a personalized schedule, the classes vary according to the subjects and the chosen level (Standard Level or High Level), and the schedule is repeated for one cycle every eight days, instead of five/six days of the traditional school week.

Regarding the learning space (variable 11), the value is equal to 3: the space is in fact characterized by classrooms devoted to several subjects. It is the students who move from classroom to classroom; there are various spaces where you can study individually, in small or large groups as in the aforementioned activities, or in laboratories; school life, being residential, has many indoor and outdoor spaces where throughout the day, the young people can meet formally or informally.

The "curriculum and the educational offer" variable (variable 13) has a very high value (5) and represents one of the *best practices* because students are offered a series of activities that enrich the educational offer. The activities offered also have the merit of a high degree (value 4) of involvement of the students in their organization (variable 14). Examples of these activities – which go beyond those included in the curriculum of the International Baccalaureate – are:

- the Project Weeks, a week during the school year in which the lessons are interrupted, and the students participate in initiatives and projects organized by them with the aim of studying one of the aspects of the College's mission more in depth;
- the *Focus*, presentations on topics of particular national or international importance organized by students weekly, on Sunday evenings;
- *International Affairs*, seminars and presentations by personalities and authorities from different fields regarding their specific field of professional interest;
- The *National Weeks*, weeks in which different groups of students present their culture to the other students of the College;
- the *International Shows*, where on several occasions during the school year students organize dance, music and sketch shows for recreational or charity purposes. Traditionally, three shows are organized to celebrate special moments during the school year: the *Introduction Show*, at the beginning of the school year to welcome new students; the *EE-show* that takes the name of the English abbreviation for the thesis (*Extended Essay* = *EE*), organized after the deadline for the presentation of the thesis, just before the Christmas holidays; and the *IB Show* organized after the examinations of the International Baccalaureate (IB) in May.

The "learning" category has an average value corresponding to 3.50. In particular, the "object of learning" variable (variable 15) has a very high value (5 out of 5). In fact, in this school, as part of the programming of the International Baccalaureate, teaching and assessment are by competences: for example, in the *Theory of Knowledge* subject, the knowledge and skills learned during the course must be applied to solve a real issue and then the results of the analysis are applied also to similar situations.

Regarding the "formalization of learning" variable (variable 18), the value reached is equal to 4. The learning context is mostly informal since the environment, being residential, constitutes learning opportunities in every place. Furthermore, the College gives particular importance to the "Creativity, Action, Service" program (CAS), which means that every student participates throughout the year on a weekly basis in at least one creative activity, one physical activity and one social service, organized by the teachers or proposed by the students themselves and rooted in the community of Duino (e.g., teaching in the "Università della Terza Età" (University for

the Elderly) or teaching English in elementary schools). These activities are considered to be an integral part of the education of the United World Colleges Movement and are a requirement for the issuing of the diploma.

As you can see from the particularity of the school, a certain degree of autonomy – a value of 3 – is reserved for teachers in the design of learning (variable 19), although within the strict IB programming. In this school, every teacher, in addition to organizing two activities for the CAS program, is the tutor of 10 students for the choice of courses and for the various problems related to age and life outside the home (*tutorship*). The teaching approach is designed to promote students' responsibility and self-commitment. The involvement of students in the learning process (variable 20) has a value equal to 3.

The ICTs and teaching equipment (variables 21 and 22) are definitely low (values 2 and 1): the school has traditional equipment, with the possibility of using computers and projecting videos, but, as the interviewed principal Professor Mike Price states, it is a choice of the school, with the conviction that it is not new technologies that motivate students and achieve better results.

Capabilities

Capabilities (Figure H.4) assume a high value (average 4.39 out of 6) as follows: interconnection (4.85 out of 6), redundancy (3.97 out of 6), sharing (4.69 out of 6), restructuring (4.06 out of 6).

Interconnection (4.85) has the highest value in cooperation (variable 3) of 5.75, as the staff is ready to help and share skills with others. The orientation to the users/stakeholders (variable 5) has a value of 4.88 as the school has frequent and constructive contacts with students and families.

Redundancy (3.97) has the highest value in the information variable (variable 8) of 5.08 as the lessons learned are made available to all collaborators, and there is sharing of important information among organizational units (parent–teacher–student meetings, teaching staff, committees and administrative office employees). The "relational redundancy" variable (variable 9) has a value of 4.33 because the solution to problems occurs through comparison with other organizational areas, which is encouraged by the school.

Sharing (4.69) has the highest value in the "strategic" variable (variable 11) of 5.03, as the future management of the school is widely shared, and the teachers succeed in transforming the vision of the school into a passion. The "organizational sharing" variable (variable 12) has a value of 5.25 as everyone cooperates on reaching common objectives. A good organizational climate favors the objectives and encourages the teachers' proposals and their frequent group discussions.

Restructuring (4.06) has the highest value in the "reading of the environment" variable (variable 17) of 5.25 as the school monitors the external environment to look for new opportunities and observe the actions of

the best schools. "Operational flexibility" (variable 18) has a value of 4.50 considering that the school is able to restructure its resources to offer new services; as regards "strategic flexibility" (variable 19), the value reached is 4.83: the school is attentive to the changes in the external world in order to prepare new educational strategies.

6.6 The "Russell" State High School in Cles (Trento)

The "Russell" School in Cles is a high school and includes a classical high school, a scientific high school, a high school of applied sciences, a high school of human sciences and a social-economic high school. About 1,000 students attend the school, and there are 150 teachers.

The school, in order to observe the variables of learning and monitoring educational processes, carries out annual self-assessment procedures that take into consideration the level of parental education; the entry level of the students; the presence of students with special needs and foreign students; the availability of structural, technological, financial and human resources; school dropouts; the scholastic atmosphere; the final results; the enhancement of excellence; the results of the *Invalsi* (National Institute for Assessing the Educational System) tests; and user satisfaction.

It is a well-known school because in 2009, it was adjudged as the best school in the world according to the OECD-PISA classification: it was the subject of various television programs, including Quark.

Learning Environment

The learning environment (Figure H.5) presents results on an average equal to 1.98, divided as follows: actors (1.40 out of 5), organization (3.00 out of 5), learning (2.00 out of 5), tools (1.50 out of 5).

The category "actors" with an average value of 1.40 out of 5 has a higher value (3) in the "group work among teachers" variable (variable 4). To foster innovation, teachers meet regularly for planning and organizing educational activities and projects with the principal.

As regards the category "organization" with an average value of 3 out of 5, with reference to variable 9 (learning time) which assumes the value of 4, the so-called "compacted schedule" must be mentioned, for which some subjects are taught throughout the year – for example, Italian, Mathematics, Latin and English – and others are concentrated in a shorter period – for example, History – to get more profound study and motivation from the students. Regarding variable 10 (class articulation) which assumes a value of 4, the Russell school realizes one of the most innovative aspects: the open class system. The year is divided into three periods: at the beginning of the second quarter, for two hours a week, the class is separated into two and joined to other classes: a remedial group for key subjects, for example,

Latin and Mathematics with more competent and motivated teachers, and an improvement group with different activities, such as theater or language certifications; in the third quarter, the groups are reunited. Remedial and improvement courses are then assessed by students.

The physical learning space (variable 11) has a value of 2: the public space in the center of the school is used a lot for public events and for moments of getting together as, for example, musical events.

The curriculum and the educational offer (variable 13) have a value of 3 thanks to the activation of level routes – of strengthening or in-depth study – and of many extracurricular activities, including the learning of a musical instrument.

The involvement of students in the organization of the school (variable 14) takes on a value of 2: every year, the students spontaneously write a yearbook with the most significant experiences of the year.

Capabilities

The school's capabilities (Figure H.5) assume a high value (average 4.42 out of 6) as follows: interconnection (4.98 out of 6), redundancy (3.61 out of 6), sharing (4.24 out of 6), restructuring (4.85 out of 6).

Interconnection (4.98) has homogeneous values in all the variables: integration stands out (variable 4) with a value of 5.50 as the framework of roles and responsibilities is clear to everyone, as well as who has the skills and specialized knowledge relevant to the work of others.

Redundancy has a medium-low value (3.61). The "information redundancy" variable (variable 8) has a value of 4.63 as the lessons learned are made available to all, and there is sharing of important information among organizational units.

Sharing (4.24) has homogeneous values except for the sharing of values (variable 10) which has a value equal to 3.79.

Restructuring, with results that are on average high (4.85), has the highest value in the "reading of the environment" variable (variable 17) of 5.17, as the school frequently monitors the external environment to identify new opportunities. The "operational flexibility" variable (variable 18) has a value of 5.33 as the school is able to restructure its resources to offer new services. The "strategic flexibility" variable (variable 19) assumes a value of 5.50 because the school is careful to exploit the opportunities given by the environment to prepare new strategies.

6.7 The "Piazzi Lena Perpenti" State High School in Sondrio

This school is a high school and includes a classical high school, a linguistic high school, a high school of human sciences and a social-economic high school. There are 735 students and 77 teachers.

Learning Environment

The learning environment (Figure H.6) has an average value equal to 1.75 out of 5 as follows: actors (1.88), organization (1.46), learning (2.17), tools (1.50).

The category "actors" – with an average value of 1.88 – has a value of 3 in the "students" variable (variable 1). The students, in fact, on several occasions are involved in projects for advertising the local area – for example, the realization of a brochure on Valtellina titled *Bagni di Bormio* (the Baths of Bormio). These projects are an opportunity for collaborative teaching among students (variable 2) which has a value of 3 and for group work among teachers (variable 4) which has a value of 2. These initiatives, which bring into play a plurality of skills and competences, are often promoted by the principal Professor Maria Grazia Carnazzola and are then drawn on by the territory.

Tutoring (variable 6) has a value of 3 as students are offered remedial courses on a permanent basis through a help desk – by subjects and aimed at bridging the gaps – and an assisted study help desk – generic, for all subjects – from October to May (600–800 hours per year). The school, in order to monitor the results of school activities and tutoring, each year assesses learning, in terms of the number of "*debiti formativi*" (a system that allows a student who has not reached a sufficient standard in a subject to move up to the next year and make up the insufficiency at a later date), the number of students not admitted to the following year and the results of the final exam and compares them with the records of previous years.

The category "organization" has low values (1.46) in almost all of the variables.

The category "learning", which reaches an average value of 2.17, is characterized by a value equal to 3 in the "object of learning" variable. The lack of a Multimedia Interactive Whiteboard led a classical high school teacher to build an educational module to allow students to discover the elements and physical properties of this tool, with the consequent construction of the device with "poor man's materials", at a cost of only €60. At the end of the course, two patents were obtained, both relating to an electronic glove to activate the IWB. This not only allowed group work among students but also allowed the possibility to work by competences. Regarding the "personalization of learning" variable (variable 17), the value is equal to 3: after having participated in various projects on teaching methodology regarding disabilities and Specific Learning Disabilities, the school became a pole for the province for the disabled people and students with SLD.

The category "tools" with a value of 1.5 out of 5 does not present elements that are particularly significant.

Capabilities

The category "capabilities" (Figure H.6) reaches a medium-high value (average 4.29 out of 6), articulated as follows: interconnection (4.47 out of 6),

redundancy (4.31 out of 6), sharing (4.38 out of 6), restructuring (4.01 out of 6).

From an organizational point of view, a strong leadership by the principal must be highlighted, who – in addition to using the classic tools proper to school legislation and with a university preparation in the psycho-socio-pedagogical field – regularly attends leadership courses with the goal of continuously improving the relations with teachers and of enhancing their value.

Interconnection (4.47) has a high value (5.17) in the "orientation to users/stakeholders" variable (variable 5): the school handles the contacts with the students and families to build up the educational offer and to listen to needs and criticisms.

Redundancy (4.31) has a high value (5.08) in the information variable (variable 8) since the lessons learned are made available to all the collaborators, and there is a sharing of the important information among organizational units (parent–teacher–student meetings, teaching staff meetings, committees, etc.).

Sharing (4.38) is high (4.92) in the "sharing of values" variable (variable 10): the staff knows them and knows that coherent behavior is rewarded.

Restructuring (4.01) has a value of 4.50 in the "reading of the environment" variable (variable 17) because the school frequently monitors the external environment to identify new opportunities. The "operational flexibility" variable (variable 18) reaches a value of 4.50 as the school is capable of restructuring its resources to offer new services. The "strategic flexibility" variable (variable 19) has a value of 4.58: the school is careful to exploit the opportunities given by the environment to prepare new strategies.

6.8 The "Barsanti" State Technological Institute in Castelfranco Veneto (Treviso)

This school is a high school and includes a technical high school with various specializations in Mechanics, Mechatronics and Energy; in Electronics and Electrical Engineering; in IT and Telecommunications; and in Transportation and Logistics. It has about 900 students and 100 teachers on the whole.

We point out that in this school, the departments are evaluated by the principal and the teachers are evaluated by the students. The evaluation of teachers takes place on the basis of four categories of competences: teaching, relational, by subjects and evaluative. The results are returned to the teacher compared to those of the others and are discussed with the principal.

Learning Environment

The learning environment (Figure H.7) presents results on an average of 1.58 out of 5, expressed as follows: actors (1.80 out of 5), organization (1.50 out of 5), learning (1.50 out of 5), tools (1.50 out of 5).

The category "actors" with an average value of 1.80 out of 5 has a value of 1.80 in the "students" variable (variable 1). "Barsanti" is one of the few schools where, instead of doing the traditional welcoming, it is the parents who are welcomed: the parents of first- and second-year students, not distinguished by class or section, are invited to school on the initiative of the teachers, who create some discussion groups and propose topical issues concerning the life of their children (e.g., the absence of motivation at school and bullying) making it possible for the parents themselves to reflect on these issues.

Regarding the "teachers" variable (variable 3), the value is 2. The subvariable (item) *teaching among peers* is noteworthy: the fifth-year students offer one hour per week in extracurricular time to dedicate to supporting the boys and girls of the first year, a student-raised initiative aimed at helping the new recruits (*peer teaching/tutoring*).

The organization of learning that has an average value of 1.50 out of 5 is characterized by a value of 2 in the "spaces" variable (variable 11), which is devoted to the numerous laboratories, and in the "educational offer" variable (variable 13), since various extracurricular activities are proposed, among which Cambridge language and ECDL certifications are included.

The "learning" variable with an average value of 1.50 presents the best value equal to 2 for the methodology (variable 16) and in the formalization of learning (variable 18).

Capabilities

The "capabilities" category (Figure H.8) has an average value (3.72 out of 6) as follows: interconnection (4.50 out of 6), redundancy (2.92 out of 6), sharing (3.69 out of 6), restructuring (3.79 out of 6). It should be noted that there were two interviewees out of the three planned.

The value for interconnection (4.50) and, in particular, for internal networking (variable 2) stands out with a value of 5.75 due to the ability to build good personal relationships and to communicate effectively. The "integration" variable (variable 4) assumes a value of 5.25 as the set of roles and responsibilities is clear, as well as the map of people with skills and knowledge relevant to the work of others. The lowest value (3) assumed by the five variables on which interconnection is articulated is that of the "distributed leadership" variable (variable 1): the delegation of responsibility toward the principal's collaborators, teachers and collaborators could be greater.

The datum for redundancy is below the average (2.92 out of 6). The "information redundancy" variable (variable 8) stands out with a value of 3.50, so lessons learned are made available to all, and there is a sharing of important information among organizational units. The 2 out of 6 value of the "functional redundancy" variable (variable 6) is not high: the ability to perform different functions on the part of teachers and collaborators could be expanded.

Sharing with an average value of 3.69 out of 6 has, among its highest values, the "organizational sharing" variable (variable 12) with a value of 4.33, as there is cooperation on reaching common objectives, the organizational atmosphere is good and group discussions are frequent. The "trust" variable (variable 13) reaches a value of 4 as there is a considerable level of trust on the part of collaborators and external partners (e.g., other educational and/or territorial agencies). A developmental directive might be represented by a greater sharing of values (variable 10) and strategies (variable 11), with values of 3.25 and 3.17 out of 6, respectively.

The "restructuring" category, which has an average value of 3.79, is characterized by homogeneous values in all the variables except for that of the speed with which it completes the great changes effectively (variable 15), which has a lower value (3).

6.9 The "Randi" Comprehensive Institute in Ravenna

Until 2013, the "9th Circolo Didattico" (School District) in Ravenna included a nursery school and four primary schools. Due to the reorganization of the school network in the municipal area, it became the "Randi Comprehensive Institute" consisting of two nursery schools, three primary schools and a junior high school. Overall, the school has nearly 1,200 students and 110 teachers.

From an organizational point of view, the principal Anna Morrone, who has worked in the school for many years, has constantly promoted projects for the improvement of the school such as:

- School Management Control with a project started in 2003/04 with Professor Angelo Paletta from the University of Bologna;
- the Strategic Planning and the *Balanced Scorecard* in 2005/06 in collaboration with the Regional School Office; and
- the self-assessment of organizational performance and of the teacher (Legislative Decree. 150/2009, known as the "Brunetta decree").

Learning Environment

The learning environment (Figure H.8) has an average value of 2.81 out of 5, divided as follows: actors (2.16 out of 5), organization (2.66 out of 5), learning (3.40 out of 5), tools (3 of 5).

Actors

The category "actors", with an average value of 2.16, has values of 1.8 in the "students" variable (variable 1) and 3 in the "group work among students" variable (variable 2). The students are in fact from different school levels and work in groups on the various activities proposed by the school.

The "group work among teachers" variable (variable 4) has a value of 3 as teachers often meet to organize educational activities.

The development of communities of practice (variable 5) has a value of 2 as the school has joined "*Without a Backpack, for a Community School*", a network of 180 Italian schools united by the fact that they do not use a backpack to go to school but a simple briefcase for their homework.

The teaching method adopted is that of the *Global Curriculum Approach (GCA)* which enables the planning of the entire educational environment intended as a system that relates intangible and material artifacts, software and hardware. Learning is situational; it takes place in a context of relationships (class/school) between subjects and subjects and between subjects and objects. These relationships define a story and constitute the vital fabric of a community, the scholastic one, inserted into a wider local community. The activities are the focal point, how things are done, and the teaching practices, rather than the objectives to be achieved. The classroom is the heart of the organization, and its structure is as follows (Figure 6.2).

- Forum Area: This area consists of a number of desks arranged in a horseshoe shape on a carpet in which discussions on various problems can be activated, moments of common reading in small groups or alone

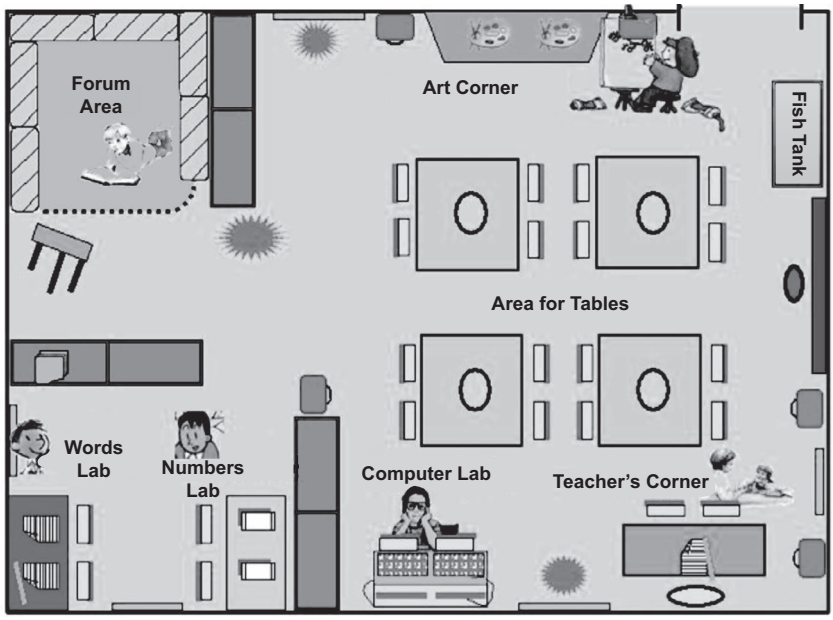


Figure 6.2 A "*Without a Backpack*" class

(Source: Adapted from www.indire.it/aesse/content/index.php?action=read_school&id_m=3472&id_cnt=5356)

can be done, or presentations can be made. Tools for recording and playing back images and songs are also available.
- The Art Corner (angolo delle arti): dedicated to workshop activities and equipped with a table; a shelf; and the materials needed to draw, paint, model and build.
- The Area for Tables (area tavoli): individual work is carried out here, in pairs, or in groups for the whole class. Each table is equipped with a chest of drawers and two blackboards.
- The Teacher's Corner (angolo docente): space reserved for the teacher (which replaces the traditional desk).
- The Computer Lab: dedicated to computer equipment. Each computer (with audio headphones) is used by a student who has simple, friendly, educational software available equipped with the possibility for self-assessment that covers the various subject areas.
- The Numbers Lab (Lab dei numeri): all the materials for learning Mathematics such as measuring instruments are stored here.
- The Words Lab (Lab. delle parole): all materials such as encyclopedias, books, files, and writing and listening materials are stored here.
- Wardrobes: the teaching materials regarding the various subjects, such as maps and materials for small experiments, are placed here in a visible and accessible way.

Organization

The "organization of learning" category that reaches an average value of 2.66 out of 5 is characterized by the "learning space" variable (variable 11) with a value of 2 and the "teaching" variable (variable 12) with a value of 2.3. This school is characterized by the training of its teachers, which also takes place thanks to coaching advice from the Strategic Consulting Center of Rimini, the School of Palo Alto. For example, a mini-master program was prepared for a group of teachers on dysfunctional behaviors, topics that were shared with the teaching staff at the end of the year.

Along the same lines, since 2011, the school has been part of a pilot project on communication called "The Effective Teacher", which focuses on four areas: teacher–student relationship, teacher–parent relationship, teacher–teacher relationship and teacher–principal relationship.

Everything was planned and arranged by the principal who invested heavily in:

- relationships and internal and external communication (teachers, auxiliary staff, parents, local bodies);
- training as a method of dealing with the critical issues highlighted by teachers; and
- the presence of supporting tutors in the classroom with teachers who, in this way, feel supported and "no longer alone in their difficulties".

Within the projects, the principal first involves a more motivated group – "in the primary school this is easier" – which then reports to the teaching staff. The working groups among teachers are divided by thematic area and by personal predisposition (e.g., the issue of school dropouts, the issue of the inclusion of foreign students, the issue of the disabled, the issue of physical activities), and then they act as forces that drive educational innovation forward.

The "involvement of parents in school organization" variable (variable 14) has a high value (4).

In 2010, during the renovation of the school building, there was a strong support from parents who actively participated in raising funds through public meetings. The initiative started from the need felt by the teachers of a methodological renewal starting from the physical environment. The school was designed with ecological parameters and with the assistance of the architect Maria Grazia Mura from the *Without a Backpack* network. Furthermore, through collaboration with the Department of Agricultural Policies and local associations, an outdoor botanical laboratory was set up, with a garden and vegetable garden, built with the participation of students and, from 2013, it could also be used by other schools of the surrounding area.

Learning

The "learning" category, with an average value of 3.40, is characterized by innovative teaching methodologies (variable 16) and the "personalized learning" variable (variable 17), both of which reach a value of 4. As an example, we can point out:

- "*The Page – The Site – The Scene*" (Carlone *et al.*, 2003): this is a project for the introduction of multimedia into the primary school, which covers the first to fifth grade of primary school, aimed at synergistic use both of the languages of theater and dance and that of the more digital languages as well.
- "*CorpoGiochi*" (Francia and Carlone, 2007; Carlone *et al.*, 2012): this is a teaching methodology for body expression and emotional education for nursery school, primary school and junior high schools, which involves various subjects and teachers, paying particular attention to the emotions of children and their harmonious development, favoring the continuity among different school levels and developing a holistic idea of the school and an ecological type of education and teaching, convinced of the fact that at the basis of any learning/teaching relationship, there is an affective and relational component that can positively or negatively influence the process.

These and other projects also make it possible to favor informal contexts of learning (variable 18) which assume a value of 3. Teachers are particularly autonomous in the planning of learning (variable 19) which has a value of 4.

Tools

The category "tools" – with an average value of 3 – is characterized by a medium-low value (2) in ICTs (variable 21) and a medium-high value (4) for equipment (variable 22): in fact, the "Without a Backpack" classrooms project allows for a flexible arrangement of desks and chairs for individual work and group work, and a corner for presentations.

Capabilities

Capabilities (Figure H.8) assume a medium-high value (average 4.75 out of 6) as follows: interconnection (4.70 out of 6), redundancy (4.86 out of 6), sharing (5.06 out of 6), restructuring (4.39 out of 6).

Interconnection (average 4.70) has the highest value (5) in the "distributed leadership" variable (variable 1) since decision-making processes are highly distributed, and the staff can influence decisions regarding their work. The principal delegates her functions to the coordinators, for example, of the educational branch, who also act as catalysts for information from below: this allows for the preparation of the ground and to share any possible problems long before the formal decision being taken in the teachers' meeting. The orientation to the users/stakeholders (variable 5) has a high value (5) as the school takes care of contacts with students and families to build up their offer and to listen to needs and criticisms.

Redundancy, with an average value of 4.86 out of 6, stands out in the "information" variable (variable 8) with a value of 5.17 as the lessons learned are made available to all collaborators, and there is a sharing of important information among the organizational units. The "relational redundancy" variable (variable 9) assumes a high value of 5.50: the solutions to the problems occur through a comparison with the other organizational areas, an action that is strongly promoted.

Sharing – with an average score of 5.06 – has the highest score (5.42) in the "value sharing" variable (variable 10): teachers are aware of common values and share them, and the behaviors consistent with the values themselves are rewarded.

Restructuring (average 4.39) excels in the speed (5.33) of the change (variable 15). It presents a high value (5) in innovation (variable 14), as the school invests in the innovation of teaching methodologies and in the development of new services, within a "try & learn" organizational culture, which guarantees effectiveness and speed in changes.

6.10 The Comprehensive Institute in Montespertoli (Florence)

This state institute includes two nursery schools, two primary schools and one junior high school which together have 1,100 students and about 110 teachers.

Learning Environment

The learning environment (Figure H.9) has an average value of 2.77 articulated as follows: actors (1.88 out of 5), organization (3.20 out of 5), learning (3.00 out of 5), tools (3 out of 5).

The actors, with an average value of 1.88, are characterized by a value of 3 in two variables: "group work among students" (variable 2) and "group work among teachers" (variable 4). Since 2004, the primary school and the junior high school have been part of the national "*Without a Backpack*" community of practice, described in the previous case study of the "Randi Institute" in Ravenna.

The organization of learning, which reaches an average value of 3.20 out of 5, is characterized by a value of 3 in the "learning time" variable (variable 9) and by a value of 4 in the "class" variable (variable 10). Moreover, the "learning space" variable (variable 11) has the maximum value equal to 5, while the "curriculum and the educational offer" variable (variable 13) reaches a value of 3. These high values are due to the fact that the school carries out innovative activities not only through their participation in the "*Without a Backpack*" network but also through other research projects. An example is the one promoted by *Indire* and the Emilia Romagna Region in the period 2009–2011 with the involvement of schools in Tuscany, Liguria and Marche regions, in the use of the ecological paradigm in the institute's project, which is the activation of a curriculum focused on the person, on the needs, on the problems and on the life of the students, aimed at taking on responsibility toward the environment, understood as the heritage of the entire humanity, starting from the single contexts of life and relationships: from the space of the classroom to that of the city, up to the space of the world. From the "organ pipe-type" curriculum, derived from the objective-analytical paradigm, one goes on to the experience-oriented curriculum, an ecological-systemic paradigm, a curriculum that strives to be integrated, not cumulative, with the person at the center (inserted within a community), which firmly links the subject dimension with the educational dimension (values of citizenship). This curriculum is multidimensional, so that next to and within the subjects (which remain fundamental) "other dimensions" find space, which have equal importance (e.g., the values, relationality and planning of the students).

These innovations also make it possible to have in the "learning" category an average value of 3 with a value of 4 both in the "method of learning" variable (variable 16) and in that of the "personalization of learning" (variable 17); a value of 3 in the formalization of learning variable (variable 18), 2 in the "scholastic autonomy in the planning of learning" variable (variable 19) and 3 in the "involvement of students and parents in the learning process" variable (variable 20).

The tools available reach an average value of 3 with a low value (2) in the ICTs (variable 21) and high value (4) in the "teaching equipment" variable

(variable 22). In fact, in the "*Without a Backpack*" classrooms, there is a flexible arrangement of desks and chairs that allows for a traditional, lecture-type of teaching; group work; individual work; informal learning; and public presentations.

Capabilities

The capabilities (Figure H.9) have a medium-high value (average 4.55 out of 6) as follows: interconnection (4.93 out of 6), redundancy (4.78 out of 6), sharing (4.50 out of 6), restructuring (3.97 out of 6).

Interconnection (4.93) is high (5.33) in the "distributed leadership" variable (variable 1), as decision-making processes are highly decentralized, and staff can influence decisions regarding their work. The "internal networking" variable (variable 2) takes on a value of 5.33, so the school has high skills in promoting good personal relationships and effective communication among collaborators.

Redundancy (4.78) distinguishes itself by the value of the "relational redundancy" variable (variable 9) which is 5.33: comparison and relationships are greatly encouraged by the school. With regard to the "cognitive redundancy" variable (variable 7), the value reached is high (5 out of 6): the development of the teachers' knowledge and skills is recognized as the primary objective of the school, while collaborators regularly learn useful skills from their colleagues and take advantage of training programs whose contents go beyond those strictly necessary for their work.

Sharing (4.50) stands out with a high value (5 out of 6) in trust (variable 13) among collaborators and on the part of the external partners.

Restructuring (3.97) is high both in the "innovation" variable (variable 14) and in the "speed" variable (variable 15) with values of 5.33 and 5, respectively.

6.11 The "Centro Educativo Italo Svizzero" (Italian-Swiss Educational Center) in Rimini

The Italian-Swiss Educational Center (ISEC) was founded in 1946 thanks to the action of international solidarity by the Swiss Worker's Aid led by Margherita Zoebeli. It is a non-state institute, a state-recognized private school that includes a primary school section, a nursery school, an elementary school, an educational group for adolescents, a press center for young adults in difficulty, an educational documentation center, a center for extracurricular educational activities, a center for international educational cooperation and a pedagogical park for active education. It is considered an excellence in Italy.

The school is an educational village for children aged 2 to 11 and is one of the few examples, in our country, of a non-state secular school, where there is scholastic integration of children with a handicap, even a serious one, and

which, starting with them, promotes a quality school experience for every child and for each one in light of the principles of freedom, solidarity and cooperation. It houses 300 children with a high percentage of disabled children (8%) and is able to satisfy only one-third of its requests for enrollment.

The teachers at the school, as it is a state-recognized private school facility, work about 120 hours a year more than their state-school counterparts and for salaries that are on the average 15–20% lower. However, it is not easy to be hired: a training period, even as a volunteer, is a necessary prerequisite. Teachers are gratified by working in an avant-garde, prestigious school, as well as by the possibility of becoming trainers of other teachers, outside of the school, who wish to learn the most advanced educational methodologies experimented by the Center.

Learning Environment

The "learning environment" category (Figure H.10) has an average value of 2.56 out of 5 as follows: actors (2.60 out of 5), organization (3.33 out of 5), learning (2.80 out of 5), tools (1.50 out of 5).

Actors

The actors, with an average value of 2.60, are characterized by a medium-low value (2.6) in the "students" variable (variable 1): the school has students of different school levels and, in some laboratory classes, of different ages. The "group work among students" variable (variable 2) has an average value of 3. Teachers (variable 3) have a value of 2 because sometimes there are teaching activities among peers: for example, fifth-grade pupils who read stories to kindergarten children. The "group work among teachers" variable (variable 4) has a high value (4), and the tutoring activity (variable 6) reaches an average value of 3.

Organization

The organization of learning with an average value of 3.33 has a high value (4) in the "class" variable (variable 10): in fact, the two sections of each grade of primary school – about 44 children – are merged into a single group (unified classes) which is then divided by activity, level and on the basis of the effective coexistence among the different types of pupils. Furthermore, every Monday afternoon, the class opens to expressive, manual and artistic workshops for about 11 children, not divided by class or age, which change every four Mondays.

As far as the "learning time" variable (variable 9) and the "physical learning space" variable (variable 11) are concerned, the values are average (3). The school, working by open classes, has a flexible schedule: there are times for individual or group work and for individual lessons with disabled

students. Learning units are longer – an hour and a quarter – and at the change at the end of the lesson period, students often move to different spaces. A characteristic of the school is the wooden houses. Each house is devoted to the unified class of two sections with two communicating rooms, with corners for individual and group discussion, and personal ones for disabled students with the assistance of an educator. All the houses have a common "square" for the break.

Regarding the "teaching" variable (variable 12), the school represents one of the *best practices*, with a value of 5 out of 5, as there are three teachers per unified class that alternate according to the activities; therefore, two teachers for the two groups and a remedial teacher or, in the case of serious disabilities, two to follow pupils with particular difficulties in the differentiated paths. The team then is made up of the transversal teachers of English, music and religion who meet weekly to plan and share their experience in the classroom, in a process of constant redefinition of the work. Furthermore, during the year, older teachers train the newly hired teachers – coaching – transmitting the operational practices and the school values.

As for the "curriculum and the educational offer" variable (variable 13), the value is an average of 3, with the possibility of activating different levels within a subject and various extracurricular workshops.

Learning and Tools

Learning with an average value of 2.80 is characterized by high values (4) both in the "method of learning" variable (variable 16) and in the "personalization of learning" variable (variable 17). From the teaching point of view, there is no traditional lesson in the classrooms; teachers adopt different teaching methods according to the class groups (individualization) and especially for students with difficulties (personalization).

Tools have an average equal to 1.50 with a low value (2) for the "ICTs for teaching" variable (variable 21) as there is one computer per class used for students with difficulties.

Capabilities

The capabilities (Figure H.10) have a high value (average 5.07 out of 6) as follows: interconnection (5.50 out of 6), redundancy (4.53 out of 6), sharing (5.31 of 6), restructuring (4.94 out of 6).

Interconnection (5.50) stands out in the "cooperation" variable (variable 3) with a value of 5.83 as there is willingness to make one's skills and knowledge available to help other teachers. The "orientation to the users/stakeholders" variable (variable 5) reaches the maximum value (6): the school has frequent contacts with students and families to build the educational offer and to listen to needs and criticisms. The school also involves parents, for

example, with a typical lesson to show them live how teaching takes place in the classrooms.

Redundancy (4.53) has a high value (5) in the "cognitive redundancy" variable (variable 7) and even higher value (5.17) in the "relational redundancy" variable (variable 9).

Sharing (5.31) has a high value (5.17) in the "sharing of values" variable (variable 10): ISEC is in fact characterized by a strong and shared identity: teachers are very motivated because they know they work in a quality school, which is recognized and which constitutes an important reference point for their career. Sharing is even higher (5.39) in the "strategic sharing" variable (variable 11) and yet even higher (5.67) in the "organizational sharing" variable (variable 12).

Restructuring (4.94) is high (5.17) in the "innovation" variable (variable 14) – teachers are free to experiment – and even higher (5.33) in the "speed" variable (variable 15).

6.12 The "eSpazia" Comprehensive Institute in Monterotondo (Rome)

This state institute includes three nursery schools, a primary school and a junior high school. There are about 1,000 students and about 130 teachers. The school is mentioned in articles that appear in national newspapers such as *La Repubblica*, thanks to the innovations to teaching methodologies and organization that have been put into practice.

Learning Environment

The learning environment (Figure H.11) presents results on an average of 2.52 out of 5, divided as follows: actors (2.10 out of 5), organization (2.66 out of 5), learning (2.83 out of 5), tools (2.50 out of 5).

Actors

The "actors" category with an average value of 2.10 out of 5 has a value of 1.8 in the "students" variable (variable 1): the school is characterized by students of different ages in the workshops of theater, photography, graphics and music.

The "group work among students" variable (variable 2) has a high value (4), since group work (often in Cooperative Learning) is the prevalent teaching method in workshops and curricular activities. The school, in fact, adopts the teaching method of the "*Without a Backpack*" network described earlier (see "Randi" Comprehensive Institute in Ravenna).

The "student tutoring" variable (variable 6) is characterized by an average value (3), also due to the school's participation in the "Orientation Project" when Berlinguer was the Minister of Education at the end of the 1990s.

Already at that time, the school had established a teacher-tutor who coordinated the teaching activity – by competences – of the teachers and acted as a tutor for the students. The teacher-tutor now accompanies and supports students and families during their scholastic career.

Organization

The "learning organization" category – which has an average value of 2.66 – is characterized by a partially flexible learning time (variable 9) (2): the daily school timetable is structured in four units of 90 minutes each in order to allow for teaching in a *Cooperative Learning* atmosphere and a more effective type of learning as the students' attention focuses on fewer activities (four subjects instead of six).

The organization of the class (variable 10) is very flexible (4) since different configurations in groups are possible thanks to the workshops which can be: vertical (for different ages), horizontal (for different sections), thematic (for different interests: e.g., theater, photography, graphics and music) and by level (remedial work and enrichment programs).

Regarding the physical space (variable 11), the value is medium (3). The "*Without a Backpack*" methodology and structure allow time for individual study, group work, individual lessons and presentations.

The "organization of teaching" variable (variable 12) with a value of 2.30 is characterized by:

- *teacher coaching:* for 10 years, a consulting firm – the "Prospecta" in Milan – has been following the teachers regarding the management of communication with students, colleagues and parents and for the management of classroom time;
- *teacher caretaking:* one or two teachers choose to follow the new hired teachers or substitutes during the year to introduce the school, the practices, the "how to work" ethics, and to avoid disorientation and exclusion.

Regarding the "organization of the educational offer" variable (variable 13), the value reached is 2: the school offers numerous extracurricular activities such as the aforementioned workshops.

Learning

The "learning" category has an average value of 2.83. The "object of learning" variable (variable 15) is characterized by a value of 2 as a plan for teaching methodologies is envisaged by competences starting from the Orientation Project mentioned earlier.

The "method of learning" variable (variable 16) has a value of 4 and is characterized by innovative teaching methods for most of the school

time. This allows for a high degree of personalization (variable 17), with a value of 4.

Tools

The "tools" category with an average value of 2.50 has a low value (1) in the "ICTs for teaching" variable (variable 21) and high value (4) for the "teaching equipment" variable (variable 22): the "*Without a Backpack*" classrooms allow for appropriate seating arrangements for individual work, group work and presentations.

Capabilities

The capabilities category (Figure H.11) reaches a very high value (average 5.65 out of 6) as follows: interconnection (5 out of 6), redundancy (5.58 out of 6), sharing (6 out of 6), restructuring (6 out of 6). These very high values (too high according to the authors) are due to the self-evaluation of a single interviewee who answered the questionnaire (unfortunately, it was not possible to register the other two self-assessments).

Interconnection – with an average value of 5 – has a value of 3.5 in the "distributed leadership" variable (variable 1) which is also implemented through an intermediate body (the *staff*) between the administration and the teaching staff, with consultative and decision-making functions, established by the principal Professor Caterina Manco, consisting of the principal, coordinators of different schools, department heads, teachers with instrumental functions, help desk psychologists, coordinators of social workers and Administrative Technical Assistants (ATA). The *staff* meets weekly.

With regard to the "orientation to users/stakeholders" variable (variable 5), the value is high (6) as there are frequent and constructive contacts with students and families. For example, there is a "Sportello Amico" (a "friendly help desk"), where a teacher is available every day for an hour to listen to parents. In addition, the principal commissioned some research from external bodies regarding the opinions of stakeholders about the school. She monitors the results of the students until the first and second year of their high school studies in order to get feedback on the work of the school, which she regularly reports to the teachers.

Redundancy reaches an average value of 5.58. Regarding the "relational redundancy" variable (variable 9), the value is 6: the principal is fully competent from an organizational point of view, and she regularly attends courses on school management.

6.13 The "Marconi" Junior High School in Modena

This school is a state junior high school that, together with two nursery schools and four primary schools, makes up the tenth Comprehensive

Institute in Modena. The "Marconi" Junior High School alone has about 600 students and 70 teachers.

Learning Environment

The learning environment (Figure H.12) has an average value equal to 2.43, articulated as follows: actors (2.33 out of 5), organization (1.4 out of 5), learning (3 out of 5), tools (3 out of 5).

The actors, with an average value of 2, have a high value (4) in the "group work among students" variable (variable 2), since a collaborative teaching methodology prevails in the school. Teachers (variable 3) with a value of 2 are also available online via the *Edmodo* platform which allows for relationships with students outside the school walls.

The "organization of learning" category that reaches an average value of 1.40 has, thanks to the use of the *Edmodo* platform, values equal to 2 in the "learning time" variable (variable 9) and in the "learning space" variable (variable 11).

The "learning" category with an average value of 3 has a high value (4) in the "method of learning" variable (variable 16): the prevalent teaching methodology in the classes is cooperative learning, as is stated by Enrico Sitta, teacher of religion and vice-principal, who first applied this method to his class, and who, over time, involved other teachers. The methods of assessment with the *rubric* are also shared; the *rubric* is a tool in which the performances on a student's test are explained in terms of expectations; the test is divided into parts with the analyzed dimensions (the criteria), the definitions (the descriptors) and scales of measurement (levels).

The "tools" that are available on average reach a value of 3 with a high value (4) for the "ICTs" variable and a low value (2) for that of "teaching equipment" (variable 22). The school has been among the schools chosen for the *cl@sse 2.0* program since 2012, meaning that it participates in the educational project for the experimentation of advanced teaching methods in collaboration with *Indire* (the National Institute for Documentation, Innovation and Educational Research) and some associated universities: students and teachers can have available to them technological devices and multimedia devices; in addition, classrooms are equipped with Wi-Fi. Moreover, the *Edmodo* virtual platform allows teachers' lessons and materials to be stored for sharing with teachers; students (also to make materials available when you are absent from school); and parents (the platform is open in a "guest" mode and allows parents to become aware of classroom activities). The "teaching equipment" variable (variable 22) has a value of 2: the classrooms in which Cooperative Learning is carried out are furnished with large tables for group work.

Capabilities

The "capabilities" category (Figure H.12) has a medium-high value (4.66 out of 6) as follows: interconnection (5 out of 6), redundancy (5.13 out of 6), sharing (4.58 out of 6), restructuring (3.92 out of 6).

The "organizational sharing" variable (variable 12) reaches a high value (6): for example, to carry out the self-assessment of the school and a greater sharing of the assessment process, at the beginning of the school year, the vice-principal presents the progress of the students during the course of their studies, from the first to the third year, up to the results of the junior high school final exams and in the first two years of high school.

6.14 The "Giovanni XXIII" Comprehensive Institute in Tricesimo (Udine)

This state school includes three nursery schools, four primary schools and two junior high schools with a total of 1,136 students and 180 teachers.

Learning Environment

The learning environment (Figure H.13) has an average value of 2.10, expressed as follows: actors (1.90 out of 5), organization (2.5 out of 5), learning (2.5 out of 5), tools (1.5 out of 5). Please note that unfortunately only 12 variables out of 22 were registered.

The "actors" category, with an average value (1.9), has a value of 2.6 in the "students" variable (variable 1) and 3 in the "group work among teachers" variable (variable 4). In fact, the school gets benefits from being a comprehensive institute and having students of different levels and thus being able to work on a vertical curriculum plan: the teachers of the different school levels meet regularly to define the macro-objectives of the entire school, which are then subdivided into the various individual subjects.

The "organization of learning" category reaches an average value of 2.5 and has results equal to 2 in the "learning time" variable (variable 9) and 4 in the "class" variable (variable 10). Among the interesting aspects of the teaching methodology, within a flexible schedule, is the fact that the classes are disassembled for remedial work and enrichment during the year. As for the "educational offer" variable (variable 13), the value reached is 2 as the students can choose, based on their interests, to participate in the workshops: horizontal, with students of the same age but of different sections; and vertical, with students of different ages.

Learning with an average value of 2.5 is characterized by the "object of learning" variable (variable 15) with a value of 3: there are inter-school work groups of teachers with members belonging to different types of school, that work, for example, on teaching by competences, on Target Tests, on the

basic learning objectives that students must reach at the end of *Primary School* and at the end of *Junior High School*.

Capabilities

Capabilities (Figure H.13) have an average value, equal to 4.62, expressed as follows: interconnection (5.13 out of 6), redundancy (4.49 out of 6), sharing (4.58 out of 6), restructuring (4.26 out of 6).

Interconnection, with an average value of 5.13, is characterized by the "distributed leadership" variable (variable 1) with a value of 5.17. The principal, Tiziana Cavedoni, has established an intermediate body between the administration and the teaching staff – also in this case called "staff" – with teaching and organizational functions, which meets five times a year; it consists of the principal, the coordinators of the different schools, teachers with instrumental functions (e.g., the people in charge of the Educational Policy Plan, of Specific Learning Disorders and of various projects) and Administrative and Technical Auxiliary staff.

6.15 The "Ristori" Comprehensive Institute in Naples

This institute includes a nursery school, a primary school and a junior high school. The primary school and the junior high school have about 700 students and 85 teachers. The school is located in a degraded area of the city (Forcella) and manages to cope with social problems such as school dropouts and social inclusion. It is a school with an excess of enrollments.

Learning Environment

The learning environment (Figure H.14) has an average value of 1.92, articulated as follows: actors (1.77 out of 5), organization (2 out of 5), learning (2.4 out of 5), tools (1.5 out of 5).

The "actors" category with an average value of 1.77 out of 5 have a higher value (2.6) in the "students" variable (variable 1), as the students belong to different types of schools and often, in the workshop classes, are of different ages. The "teachers" variable (variable 3) has a value of 2; teachers often collaborate with professionals from associations who deal with remedial work and the *malaise* of growing up. Tutoring (variable 6) has an average value of 3 as it is a parent–child help desk with a psychologist who is available to listen to the problems and discomforts of students and parents.

The "organization of learning" variable, which assumes an average value of 1.80, is characterized by a value of 2 for the "flexible learning time" variable (variable 9) since the school is open until late – thus, it is called "*School-Community 8 am–8 pm*" – offering various workshops and sports activities for students and parents and a cozy place where people can spend time in the afternoon. The "class" variable (variable 10) has a value of 3:

it is open by interests and levels as it is possible for students to participate in workshops to study some subjects or other topics in depth, and it is also open to classes for remedial work or for enrichment. The curriculum (variable 13) is flexible (value 3) since different paths can be followed in the same subject, and the extracurricular educational offer is varied, since there are numerous sports activities and workshops: the theater workshops for parents are interesting – for example, the ones on the emancipation of women or parenting.

"Learning", with an average value of 2.4, presents an average value (3) in the "personalization of learning" variable (variable 17), since the numerous cases of social distress require the school to adopt *ad hoc* learning strategies. The "formalization of learning" variable (variable 18) has an intermediate value of 3: the informal context within the school is expressed in sports and workshop activities and during breaks.

The tools available have a value of 1.50: there are IWBs in all of the classrooms, thanks to the participation in the European structural funds (ESF), for which the "Ristori" school has also been a pole school for other institutions.

Capabilities

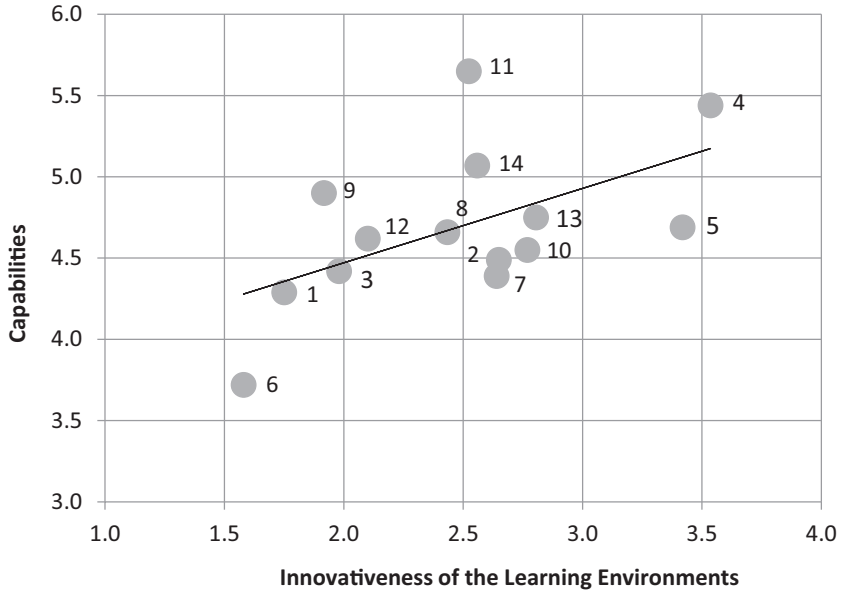
Capabilities (Figure H.14) reach a high value (average 4.90 out of 6) as follows: interconnection (5 out of 6), redundancy (5 out of 6), sharing (4.76 out of 6), restructuring (4.85 out of 6).

Interconnection, with an average value of 5, is high (5.17) in leadership (variable 1): control is distributed, in fact and also by due right, to the heads of individual schools. "Sharing", which has an average value of 4.76, stands out in the "trust" variable (variable 13), with a value of 5.33. There is indeed trust among the collaborators and the external partners: the principal, Fernanda Tucillo, manages to motivate the staff by gratifying them psychologically and monetarily by means of calls for bids for MIUR (Ministry of Education, University and Research) and PON (National Operational Program) projects and creating a strong identity for the institute, and this leads almost all the teachers to become involved in roles, projects and calls for bids with various types of responsibilities.

6.16 An Overall Analysis of the 14 Schools

The relationship between the results of the analysis of the innovation of learning environments and the analysis of the capabilities in the 14 schools considered can be seen in Figure 6.3. Complete data are available in appendices I and J.

A. In **Appendix I** – Comparison of the Measurement of the Learning Environments in the 14 Schools, it is possible to examine:



Key

1 - "Piazzi Lena Perpenti" State High School in Sondrio
2 - "Gioia" State High School in Piacenza
3 - "Russell" State High School in Cles
4 - "Majorana" State High School in Brindisi
5 - "Fermi" State High School in Mantova
6 - "Barsanti" State Technological Institute in Castelfranco Veneto
7 - "Collegio del Mondo Unito" School in Duino
8 - "Marconi" Junior High School in Modena
9 - "Ristori" Comprehensive Institute in Naples
10 - Comprehensive Institute in Montespertoli
11 - "eSpazia" Comprehensive Institute in Monterotondo
12 - "Giovanni XXIII" Comprehensive Institute in Tricesimo
13 - "Randi" Comprehensive Institute in Ravenna
14 - "CEIS" in Rimini

Figure 6.3 Relationship between innovation of learning environments and capabilities in the 14 schools examined

- **Table I.1** – The average results of the measurement of innovation in the learning environments collected in the four categories: A. Actors, B. Organization, C. Learning and D. tools;
- **Table I.2** – Results of the measurement of the eight variables of category A – The Actors of Learning: 1. Students 2. Group work among students 3. Teachers 4. Group work among teachers 5. Community of practice 6. Tutoring activity 7. Intervention of parents or grandparents; 8. Intervention of the local community;

- **Table I.3** – Results of the measurement of the six variables of class B – The Organization of Learning: 9. Learning time; 10. Class; 11. Learning space; 12. Teaching; 13. Curriculum and educational offer; 14. Involvement of students or parents in organizing the school;
- **Table I.4** – Results of the measurement of the six variables of category C – Learning: 15. Object of learning 16. Method of learning: class time devoted to innovative teaching methods 17. Personalization of learning: school time devoted to individualized and personalized teaching; 18. Formalization of learning: school time devoted to nonformal and informal learning contexts; 19. Scholastic autonomy in planning the learning; 20. Involvement of students in the learning process;
- **Table I.5** – Results of the measurement of the two variables of category D – Tools: 21. ICTs for teaching; 22. Teaching equipment.

B. In **Appendix J** – Comparison of the Measurements of the Organizational Capabilities of the 14 Schools, it is possible to examine:

- **Table J.1** – Average results of the measurement of the four organizational capabilities: Interconnection, redundancy, sharing, restructuring
- **Table J.2** – Results of the measurement of the five variables of the organizational capability Interconnection: 1. Distributed leadership; 2. Internal networking; 3. Cooperation; 4. Integration; 5. Orientation to users/stakeholders;
- **Table J.3** – Results of the measurement of the four variables of the organizational capability Redundancy: 6. Functional redundancy; 7. Cognitive redundancy; 8. Information redundancy; 9. Relational redundancy;
- **Table J.4** – Results of the measurement of the four variables of the organizational capability Sharing: 10. Sharing of values; 11. Strategic sharing; 12. Organizational sharing; 13. Trust;
- **Table J.5** – Results of the measurement of the six variables of the organizational capability Restructuring: 14. Innovation; 15. Speed; 16. External networking; 17. Reading the environment; 18. Operational flexibility; 19. Strategic flexibility.

It is possible to notice that there is a good correlation between the innovation of the learning environments and the organizational capabilities typical of self-organization: that is, the greater the school's self-organization, the greater the innovation of its learning environment.

The "Majorana" Institute (case study no. 4) has the highest results (3.54 out of 5) in learning environments and in capabilities (5.44 out of 6). The results are explained by the fact that the principal has invested in interconnection

capability (5.57 out of 6), especially in internal networking and cooperation. Something to be remembered is the parents' support in allocating the money that was to be used for the purchase of paper books – saved via the *Book in Progress* project – to the acquisition of the first netbooks. Equally important were the sharing of the vision (5.64 out of 6), to involve the teachers in the change, and the restructuring (5.33 out of 6), since the school was one of the first schools to focus on new technologies applied to teaching.

Another positive case is that of the "Fermi" Institute in Mantova (no. 5) which invested in the capability of restructuring (4.76 out of 6) allowing the school to rethink its spaces, the equipment for teaching and the methods of learning.

The "Barsanti" Institute (case study no. 6) comes lowest both in learning environments (1.58 out of 5) and in capabilities (3.72 out of 6). The very low value of the capabilities might be affected by the fact that the self-assessment was carried out only by two interviewees instead of three as expected.

There is an atypical case, the comprehensive school "eSpazia" (case study no. 11), in which the high value reached by capabilities (5.65 out of 6) does not correspond to a similar innovative learning environment (2.52 out of 5): this case, according to the authors, should be viewed with caution since the very high value for the capabilities is due to the self-assessment of the only interviewee (out of the three expected) who answered the questionnaire.

Innovative Learning Environments

It is interesting to analyze which are the categories or macro-variables (actors, organization, learning, tools) and the more and less developed learning variables (Figure 6.4).

The category which is on the average more provocative (2.80 out of 5) is "learning", expressed by its six variables: the object of learning, the method of learning, the personalization of learning, the formalization of learning, scholastic autonomy in the planning of learning and the involvement of students in the learning process.

While the category which is less provocative (2.12 out of 5) is that of the "actors", expressed in its eight variables: students, group work among students, teachers, group work among teachers, community of practice, tutoring activity, intervention of parents or grandparents, intervention of the local community.

Organization (2.58) and tools (2.39) have intermediate values.

As regards the variables within each category, see the results in Figure 6.5. With regard to the most provocative category, that is, the "learning" category (2.80 out of 5), the highest variable is no. 17, that is, the personalization of learning (3.45 out of 5): school time devoted to individualized teaching methods (different teaching methods) and personalized teachings

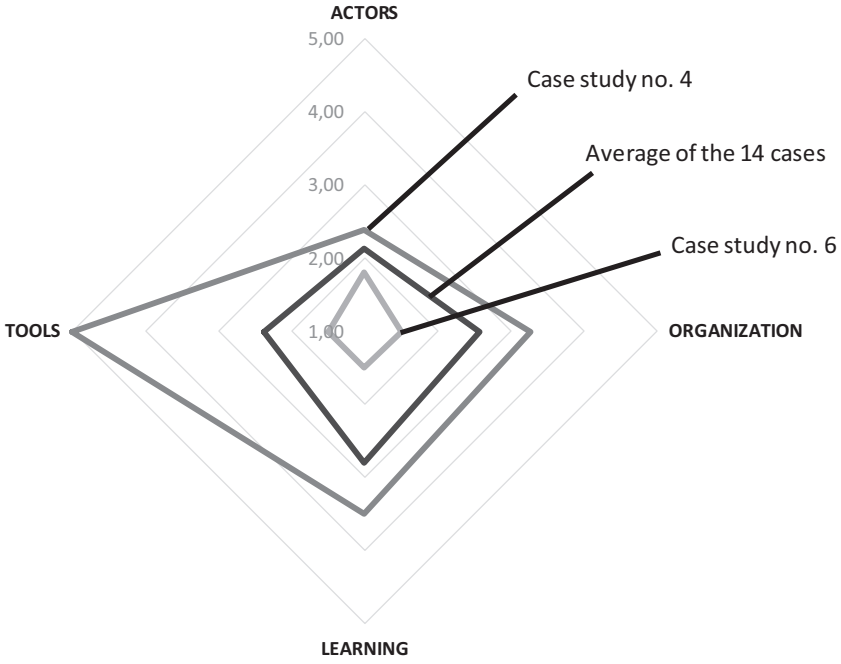


Figure 6.4 Results of the survey on learning environments by macro-variable or category

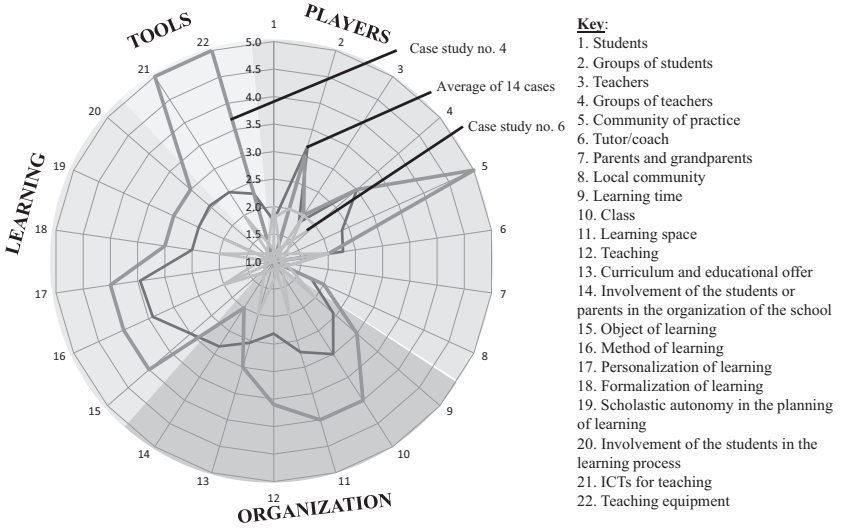


Figure 6.5 Results of the survey on learning environments by variable

(different cognitive goals). With reference to the lowest category, that is, the "actors" category (2.12 out of 5), the lowest variable is no. 7, that is, the intervention of parents or grandparents (1 out of 5). Since 1 is the lowest value, it appears that in the 14 cases examined, parental involvement is practically negligible.

Organizational Capabilities

As for capabilities, in the 14 case studies examined (Figure 6.6), there are no major differences in the average values among the individual capabilities: interconnection (4.95 out of 6), redundancy (4.49), sharing (4.77) and restructuring (4.54).

In Figure 6.7, we can see that for the 14 case studies, the most provocative meso-capability is number 5, that is the orientation toward the user/stakeholder, defined as the ability to direct the organization's activities to the external environment, building up connections and relationships with the users aimed at identifying and jointly developing the value proposed through an approach that is capable of personalizing the offer gearing it to the actual needs of the users and aiming at consolidating reputation and trust.

The meso-capability that is on average the lowest is no. 6, that is, "functional redundancy" defined as the ability to perform functions in a quantity and a quality that are higher than those strictly necessary, a result that indicates an area with great potential for improvement.

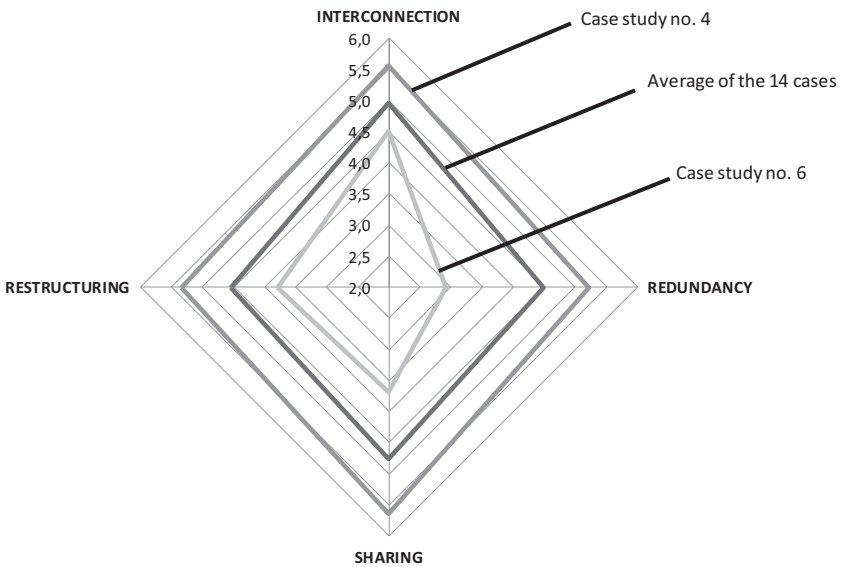


Figure 6.6 Results of the survey on organizational macro-capabilities

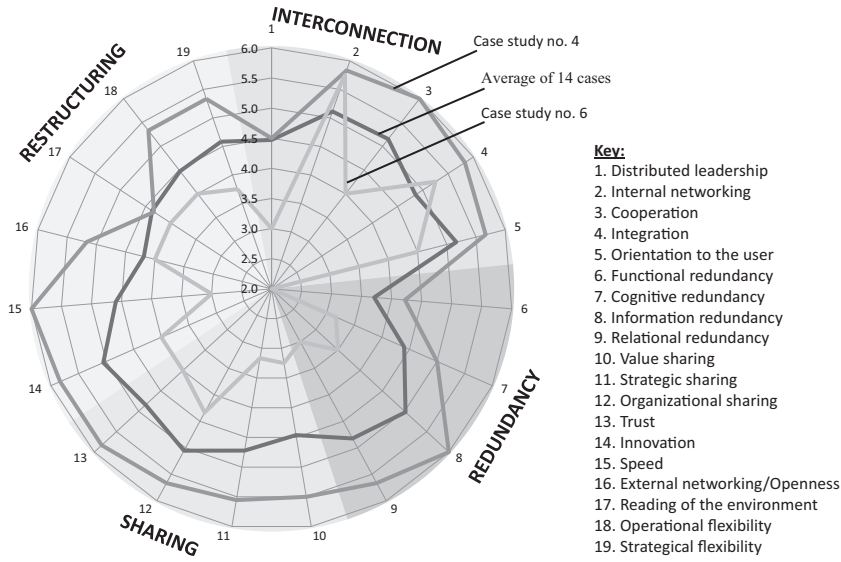


Figure 6.7 Results of the survey on organizational meso-capabilities

6.17 The "Quartieri Spagnoli" (Spanish Neighborhood) Association in Naples

Among the particularly innovative Italian experiences, we have decided to include two realities (the "Quartieri Spagnoli" (Spanish Neighborhood) and the "Maestri di Strada" (Street Teachers), both associations in Naples) that are not really schools, but they have to do with education because they help children who have abandoned school to get reintegrated. They represent particularly innovative learning environments in the sense indicated by us.

The Onlus "Quartieri Spagnoli" Association is an institution that, since the early 90s, has been implementing projects approved and cofinanced by the European Union, the Ministry of the Interior, the Region, the Province and the Municipality of Naples, as well as by some foundations. It is considered to be one of the *best practices* according to the Institute for the Development of Vocational Training of Workers and the "Bicocca" University in Milan. Some activities initiated by the institution later became pilot activities taken on by the public policies of the Municipality of Naples, such as the Social Help Desk, the Labor Help Desk and the Tutor for Custody.

The Association carries out pretraining and training activities with the most basic elements of socialization toward work and the inclusion of the students in craft workshops and small workshops. Small workshops,

personalized routes toward connecting up with work possibilities, basic orientation and socialization to training and work are also created: the activities are monitored and assessed by ISFOL (Institute for the Training of Workers) regarding innovation and effectiveness.

The "Trespassing" Project (2009–2012), for example, financed by private and regional capital, was aimed at offering participation in personalized socialization paths toward a work culture, with training periods in affiliated companies and individualized and group counseling, aimed at those subjected to the risk of social and labor exclusion. The project aimed to offer, on a micro-urban scale (the "Quartieri Spagnoli" and "Forcella" areas of Naples), training courses so as to avoid social exclusion and increase the employability of the beneficiaries. A project manager we were able to interview – Mr. Salvatore Pirozzi – told us that the activities called for an average weekly commitment of about 20 hours, with the possibility of personalizing the schedules, and for a total duration of about 8 months. The girls and boys, aged between 16 and 18, were already in possession of a junior high school diploma, were exempt from compulsory education, but were outside the school and professional training circuits. In this path, there was no "class" but only students or groups of students with individualized plans. The learning environment consisted of the artisan workshop, and, at the end of the path, there was a trial test and the certification of skills.

6.18 The "Maestri di Strada" (Street Teachers) Association in Naples

The "Maestri di Strada" is an association of educators and professionals who work to combat the dropping out of school and at promoting the citizenship of young people. It was formally established in 2003 when the then President of the Republic Carlo Azeglio Ciampi made a donation to the three coordinators of the "Chance Project": Marco Rossi Doria, Angela Villani and Cesare Moreno, who formed the first nucleus of "Maestri di Strada" (Street Teachers). Today, the association is led by Cesare Moreno, whom we had the opportunity to interview regarding the "Chance Project", an experience recognized as a practice of excellence by the Council of Europe and the European Union, and by the National Childhood and Adolescent Observatory, and was popular with the media.

The program was strongly hinged on the school structure. Funded in different forms by the Ministries of Education and Social Affairs – now by the Campania Region – the Project is part of the policies aimed at remedial education, in particular the education of those who did not attend the former compulsory school (14 years), and then it was extended to cover subsequent ages, as a result of raising compulsory schooling to 18 years of age.

The Project, located in three disadvantaged areas of the city, has now been extended to 12 schools and covers the province of Naples. It began by taking charge of 90 boys and girls who progressively grew in number to over 300. These are young people recommended by social services and whose families were forced to respect the rulings issued by the Juvenile Court.

The focus was on the numerically most favorable relationship between teachers and students, one to six, and on work based on skills. The teachers – primary school teachers, junior high school teachers, high school teachers, social educators, laboratory experts, artisans and psychologists – were chosen individually by the three founders not on the basis of rankings but on the basis of their professional experience in the field and their motivation.

As far as the teaching methodology is concerned, Cooperative Learning is used for 50% of the total time, and regarding the organization of learning there are open-plan classrooms with workshops that are both inside the school and outside the school and mixed.

The results were excellent: regarding the third year of junior high school, 90% were successful; for the years following the junior high school diploma, the results were lower, but were still significant (around 50%).

6.19 Who Promotes Self-Organization in the 14 Schools?

The 14 scholastic realities analyzed have a very important characteristic in common: the predisposition of the learning environments did not come from "above" (the Ministry, regional school offices, etc.) but from the "bottom", that is, from the self-activation of individuals, groups, or networks of teachers and/or principals, and in some cases assisted by students and parents. In other words, scholastic autonomy has been expressed in self-organization. Moving from the new educational needs of young people, teachers, principals, students and parents have moved with the aim of realizing innovative ways of learning for the 21st century.

We asked ourselves who are the most active actors in these processes of self-organization in the 14 case studies of the research project. Who promotes self-organization in the first place? The principal? The teachers? Teacher networks? The students? The parents?

In Table 6.3, we report case by case the evaluations on this issue, shared with the interviewees. Most learning environments were designed by principals (10), a good part by teachers (5) and coordinators of school networks (4), and a minority by students (2) and parents (1). In particular, the "Majorana" school in Brindisi managed to transform a school activity (*Book in Progress*) into that of a national network of institutes.

Often, the arrangement of learning environments is not limited to the inside of the school but makes use of the collaboration and partnership of external actors such as schools, territorial bodies, national or international companies and institutes. Table 6.4 shows that the partnerships are local (four), national (four) and international (two).

Table 6.3 Classification of schools by the subjects that promote self-organization

No.	*Name*	*Principal*	*Coordinator of School Networks*	*Teachers*	*Networks of Teachers*	*Students*	*Parents*
1	The "Piazzi Lena Perpenti" State High School in Sondrio	●		●			
2	The "Gioia" State High School in Piacenza			●			
3	The "Russell" State High School in Cles (Province of Trento)	●					
4	The "Majorana" State High School in Brindisi	●	●	●	●		
5	"Fermi" State High School in Mantua	●					
6	The "Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)					●	
7	The "Collegio del Mondo Unito" in Duino (Province of Trieste)	●	●			●	
8	The "Marconi" Junior High School in Modena	●		●			
9	The "Ristori" Comprehensive Institute in Naples	●					
10	The Comprehensive Institute in Montespertoli (Province of Florence)		●				
11	The "eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)	●	●				
12	The "Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)	●					
13	The "Randi" Comprehensive Institute in Ravenna			●			●
14	The "Centro Educativo Italo Svizzero" (Italian-Swiss Education Center) in Rimini	●					
TOTAL		10	4	5	1	2	1

Table 6.4 Type of partnership that promotes innovative learning environments

No.	*Name*	*Partnerships*		
		Local	*National*	*International*
1	The "Piazzi Lena Perpenti" State High School in Sondrio			
2	The "Gioia" State High School in Piacenza	●		
3	The "Russell" State High School in Cles (Province of Trento)			
4	The "Majorana" State High School in Brindisi	●	●	●
5	"Fermi" State High School in Mantua	●	●	●
6	The "Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)			
7	The "Collegio del Mondo Unito" in Duino (Province of Trieste)			
8	The "Marconi" Junior High School in Modena			
9	The "Ristori" Comprehensive Institute in Naples			
10	The Comprehensive Institute in Montespertoli (Province of Florence)			
11	The "eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)		●	
12	The "Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)			
13	The "Randi" Comprehensive Institute in Ravenna	●	●	
14	The "Centro Educativo Italo Svizzero" (Italian-Swiss Education Center) in Rimini			
TOTAL		4	4	2

In particular:

- The "Gioia" State High School in Piacenza collaborates with junior high schools, primary schools and nursery schools, with a nursing home and with the Val d'Aosta University;
- The "Majorana" State High School in Brindisi has partnerships: at the local and national level with other schools (see the aforementioned *Book*

in Progress project); at the national level with the MIUR for a pilot project on the four-year high school with specialization in Applied Sciences; and internationally with organizations such as the *European SchoolNet*, the *Living School Lab*, the *Creative Classroom* and companies such as ENI, ENEL and Avio;

- The "Fermi" State High School in Mantua has many partnerships: local ones such as with the "Pacioli" Technical High School in Crema; national ones with the MIUR ("Classroom 3.0" project) and with *Invalsi* (the *VALes* project); international ones with the Danish school *Hellerup* (learning spaces), with "Guglielmo Marconi" in New York (*Dual Diploma*) and with MIT (*Highlights for Students* project and TEAL project –*Technology Enhanced Active Learning*);
- The "eSpazia" Comprehensive Institute in Monterotondo (Rome) stands out for its partnerships at the national level: adoption of the *Without a Backpack* methodology and structuring of the network of 180 Italian schools; participation in the Orientation Project of the MIUR that generated the institution of the teacher-tutor figure; collaboration with the company Prospecta of Milan in the *Teacher Coaching* project;
- The "Randi" Comprehensive Institute in Ravenna has developed local partnerships, with the Department of Agricultural Policies of the Municipality and local associations, to set up the aforementioned outdoor botanical workshop, and with the Strategic Consultation Center in Rimini, the Palo Alto School for the training of their teachers and national partnerships with the aforementioned membership in the *Without a Backpack* network.

6.20 The Limits to and the Prospects for the Research

This study presents some limitations that must be mentioned as they simultaneously indicate possible new directions for an eventual continuation and expansion of the research project:

- As regards the tool for the assessment of learning environments:
  - The criteria for the assignment of scores require additional work to validate the metric; for the sake of simplicity, the metric used took into account only the number of items present in the single variable (vertical metric) and not the depth of their use (horizontal metric);
  - It was not possible to consider the weight that the 22 variables have in learning, as there is not yet an exhaustive reference literature that allows a comparison and therefore a weighting of all the variables considered: a research perspective is therefore represented by work in this sense.
  - The tool was tested in 14 case studies. Only a survey on a larger sample of schools would allow an even more solid validation of the tool.

  - In addition, to focus better on the subject of the research (nursery school, primary school and secondary school) some items of the 22 variables could be more specific or integrated with *ad hoc* items.

- According to the 2013 OECD research cited many times, an innovative learning environment is also effective: however, this assumption should be verified by crossing the data relating to the innovation of learning environments with the learning outcomes of the students, according to the notes of the national *Invalsi* assessments and as per the international OECD-PISA assessments.
- Only a survey on a much larger sample of schools would provide a more significant empirical basis for validating the conclusions and possibly making school policies.

Concluding Remarks

The results obtained from the field research indicate how the capabilities of self-organized schools are positively correlated with innovative learning environments. This is the most significant conclusion reached from the survey. In other words, in the schools where the typical capabilities of self-organization are more developed, there are learning environments which are more innovative. The best school (case 4 – the "Majorana" State High School in Brindisi) has high values both in self-organization capabilities (5.44 out of 6) and in innovative learning environments (3.54 out of 5).

The 14 scholastic realities analyzed have a very important characteristic in common: the prearrangement of the learning environments did not start from "above" (the Ministry, regional school offices, etc.) but from the "bottom", that is, from the self-activation of individuals, groups, or networks of teachers and/or principals and in some cases assisted by students and parents. In these schools, autonomy has evolved into self-organization. Self-organization in the development of innovative learning environments was promoted primarily by the principals (ten), but also by teachers (five), coordinators of school networks (four), students (two) and parents (one).

The prearrangement of learning environments was not limited within the school, but it made use of local partnerships (four) with schools and territorial bodies and national (four) and international (two) partnerships with companies and institutes.

Conclusions

The research work at the 14 schools that were analyzed highlighted how there is a positive correlation between the capabilities of school self-organization and the innovation of learning environments, as is well summarized in Figure A.

In other words, the more self-organized schools are, the more innovative learning environments are.

Field tests confirm that innovation works if it is generated from below and extended to other schools. See, for example, the experience, promoted by *Indire* (a research institution of the Ministry of Education), of the Movement of Educational Avant-gardes, a network established in 2014 by 22 Italian schools, which today have become 1,052. The network has the function of supporting schools in implementing organizational and educational practices oriented toward innovation. A real community of practices has been created, where less experienced schools can find the help of those that have already successfully experimented them (see Appendix K).

The outcome of the empirical work described in the text primarily empowers teachers, their scientific associations, their communities of practice, and secondly, schools with their principals, networks of schools and their governing and coordinating bodies. The key tasks of defining policies, allocating resources, implementing measures of accompaniment, networking, evaluation of outgoing results, etc. are left to the scholastic apex, namely the Ministry of Education, Regional School Offices, Territorial School Offices, Supporting Agencies (*Invalsi*, *Indire*, etc.).

The typical capabilities of self-organization are the key resources for offering students effective learning environments.

As reiterated in the text, self-organization is not synonymous with self-management: it is a different logic of organization, which can only be realized in the presence of well-defined conditions, the research on and creation of which is the task of the best teachers and the best principals.

Resistance to self-organization comes from both the top and bottom of the school organizational pyramid.

Resistance from the top, that is, from the Ministry, derives from the fact that the greater autonomy – which must be guaranteed to teachers,

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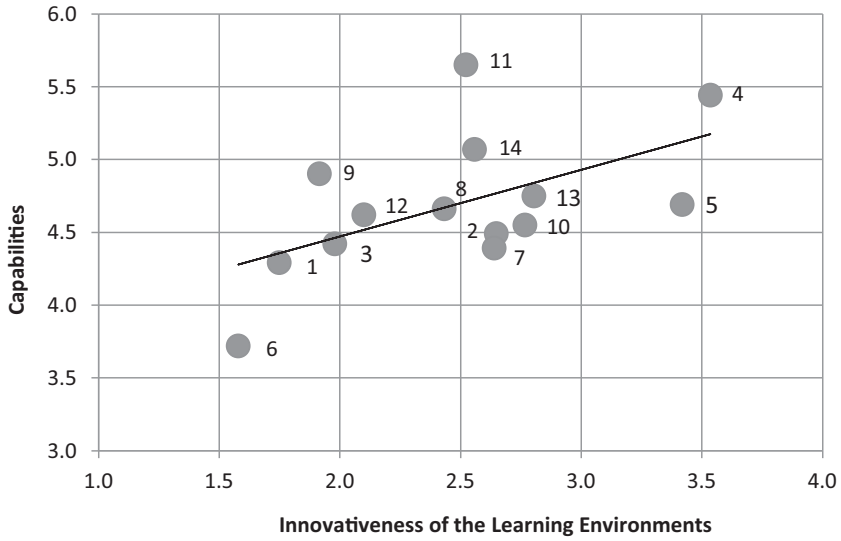

Key:

1 - "Piazzi Lena Perpenti" State High School in Sondrio
2 - "Gioia" State High School in Piacenza
3 - "Russell" State High School in Cles
4 - "Majorana" State High School in Brindisi
5 - "Fermi" State High School in Mantova
6 - "Barsanti" State Technological Institute in Castelfranco Veneto
7 - "Collegio del Mondo Unito" School in Duino
8 - "Marconi" Junior High School in Modena
9 - "Ristori" Comprehensive Institute in Naples
10 - Comprehensive Institute in Montespertoli
11 - "eSpazia" Comprehensive Institute in Monterotondo
12 - "Giovanni XXIII" Comprehensive Institute in Tricesimo
13 - "Randi" Comprehensive Institute in Ravenna
14 - "CEIS" in Rimini

Figure A Relationship between the capabilities of self-organization and the innovativeness of learning environments

technicians and principals who self-organize to innovate the learning environments and the school – is experienced as a reduction in the capacity of the Ministry itself to monitor activities. We have seen (see Section 3.5) that the idea of 1993 of giving schools – understood as autonomous educating communities – real financial autonomy has never been implemented. Schools, in fact, have organizational autonomy and autonomy regarding teaching, but not financial autonomy. They are still considered as bodies with the task of implementing the central administration policies throughout the territory and therefore, they only manage a budget consisting of an allotment by the State for operating expenses. Being really autonomous schools (on

an organizational, educational and financial level) is nevertheless a starting point: the point of arrival is that of self-organized schools (see Section 5.8). In other words, real scholastic autonomy is a necessary, but not a sufficient, condition to guaranteeing effective learning. And to do this we must focus on self-organization as an evolution of scholastic autonomy.

Resistance from the top can also come from the principal. We are used to a leadership that controls. But this reduces the leader to a mere controller. The aforementioned Mario Andretti, historic Ferrari driver, reminds us that: "If everything is under control, you are going too slowly".

The fundamental conceptual step to overcoming resistance from the top is to understand that self-organization does not imply loss of power. Power is like knowledge: it can be duplicated. The conceptualization of power as a non-zero-sum entity is the critical step toward understanding the essence of empowerment and the management of systems by multiple minds. Empowerment is not an abdication of power, nor a sharing of power. It is a duplication of power.

However, resistance also comes from those who are at the bottom. Hierarchy, the illusion of order, control and predictability, is much safer and more reassuring. Many people also within the school expect stability; they expect that the helmsmen – first and foremost, the Ministry, the school offices and the principals – know exactly where to go. They expect those who are at the top to know more than those who are at the bottom.

If self-organization does not prevail in a widespread and stable way, the reason is because it requires particular attitudes and involves profound changes in the behavior of all the people in the organization, up to the most peripheral ones. As we have seen, the Jesuits who set almost impossible goals for their brothers had understood all this: the choice of admitting only the "very apt" to the order was functional to the need to have, in order to operate in complex environments, only people with an intra-entrepreneurial spirit and capable of self-leadership. That is, to have people, in a word, ready for "greater things".

Resistance from the bottom will never be overcome if the school lacks a soul, a common inspiration, a dream, a passion that involves all the collaborators in the zest for discovery, the satisfaction of research, in the construction of the new, in the satisfaction of creating something of their own, something that distinguishes them, something that gives meaning to their own history, to their life project, to a more just and responsible project of society.

Self-organization requires energy in order to succeed. Self-organization does not take place unless there is a continuous flow of energy from the outside to the inside of the system. External energy is necessary so that complex adaptive systems – such as schools and classes – can organize themselves. And this flow is guaranteed by the intra-entrepreneurship of teachers (in the class) and of principals (in the school). School changes if its players push from the bottom for new activities, if they bring new challenges and goals to everyone's attention, if they form and break connections inside and outside the school.

In a school that promotes self-organization, principals and teachers move from a classic role of "planning and control" (of school and learning, respectively) to a new one of "creation and supervision" of the context (school and learning, respectively). A context where the real motivation is self-motivation, the result of a shared vision, obtained with the example of the leader that provides the energy of change.

To increase the quality of the learning processes and of schools, it is necessary to focus on the capabilities of self-organization, that is on the participation and the assumption of responsibility by all in a logic of intra-entrepreneurship.

You need distributed, inter-connected, self-motivated and self-activated intelligence. These problems are not solved at a central level. The Ministry is necessary, but it is not enough. The future is in the periphery, within self-organized schools, capable of promoting fruitful interconnected networks of students, technicians, teachers, principals and schools. In conclusion: self-organization is the most fascinating future of a truly autonomous school.

Epilogue

To the heroes of the school
who broke the chains

The Chained Elephant

Demiàn: *I can't, I can't!*
Jorge: *Are you sure?*
Demiàn: *Yes, I would love to sit down in front of you and tell you what I feel . . . But I know I can't do that.*

Jorge sat down like a Buddha on those horrible blue armchairs in his study. He smiled, looked into Demiàn's eyes, lowering his voice as he used to do every time he wanted to be listened to carefully, and said:

Jorge: *I'll tell you a story.*

And without waiting for Demiàn's assent he began to tell his story.

Jorge: *When I was a little boy, I loved circuses, I especially liked the animals. I was particularly attracted to the elephants which, as I discovered later, were the favorite animals of many other children. During the show, that beast showed off a weight, a size and a really extraordinary power . . . but after its act, and up until a moment before entering the scene, the elephant was always tied to a stake stuck in the ground, with a chain that held one of its legs.*

Yet the stake was a tiny piece of wood planted in the ground only a few centimeters deep. And even though the chain was large and strong, it seemed obvious to me that an animal capable of uprooting a tree could easily rid itself of that stake and escape.

It was quite a mystery.

What kept it tied up, then?

Why didn't it run away?

When I was five or six, I still trusted the wisdom of grownups. So, I asked a teacher, a father or an uncle to solve the mystery of the elephant. Some of them explained to me that the elephant did not run away because it was trained. Then I asked the obvious question: "If it is trained, why do they chain it?" I don't remember getting any coherent answer.

Over time, I forgot about the mystery of the elephant and the stake and thought of it only when I came across other people who asked the same question.

Fortunately for me, a few years ago I discovered that someone had been wise enough to find the right answer: the circus elephant does not run away because it has been tied to a similar stake since it was very, very little.

I closed my eyes and imagined the helpless newborn baby elephant tied to a stake. I am sure that, at that moment, the baby elephant tried to push and to pull and sweated in an attempt to free itself. But despite its efforts, it couldn't because the stake was too firmly planted in the ground for the little elephant to displace it.

I saw it falling asleep exhausted and the next day trying again and also the next day and the one after that . . .

Until one day, a terrible day for its story, the animal accepted its impotence, resigning itself to its destiny. The huge and powerful elephant we see at the circus does not run away because, poor fellow, it believes it cannot escape. The memory of its impotence that it experienced immediately after birth is imprinted inside its brain. And the bad thing is that it never seriously returned to that memory. And never again did it test its strength, never again . . .

That's right, Demiàn. We are all a bit like the circus elephant: we go around chained to hundreds of stakes that take away our freedom.

We live thinking that "we can't" do a lot of things simply because once, when we were little, we tried and failed.

So, we did like the elephant, we recorded this message in our memory: I can't, I can't and I'll never be able to.

We grew up carrying with us the message that we transmitted to ourselves, so we don't try to get rid of the stake anymore.

Sometimes, when we feel the grip of the chains and shake them and hear them grate, we look out of the corner of our eyes and think: I can't, I can't and I'll never be able to.

Jorge took a long break. Then he approached Demiàn, he sat down on the floor in front of him and continued.

Jorge: *That's what is happening to you too, Demiàn. You live conditioned by the memory of a Demiàn who no longer exists and who did not make it.*

The only way to know if you can do it is to try again, putting your heart into it . . . all your heart!

Jorge Bucay
Adapted from *Let Me Tell You a Story. Tales Along the Road to Happiness* (2013)

Afterword

Luigi Berlinguer writes at the conclusion of his "Preface" to this volume:

> In other words, we propose another kind of school, not the one managed so far by the apparatus in Viale Trastevere (the seat of the Italian Ministry of Education); a truly autonomous, self-organized school, the true school of autonomy, which is able to understand and value the contribution of artistic experience, creativity, work culture, their full formative nature for the cultural and social formation of the citizen, in a truly democratic country.

The question – at this point – is whether this kind of school is really possible in our country.

The two authors of this book do not seem to have doubts regarding this: this prospect is not only desirable but the only one truly credible for Italy.[1]

However, in my opinion, at least two open questions should not be neglected, questions that concern, on the one hand, the governance processes of the school system as a whole and, on the other, the role of students and their real capacity for having a voice in institutional processes.

The first question, addressed in particular in Chapter 3 of the book, has been raised several times in recent years[2] and concerns the relationship between the autonomy of individual institutions (in our case, those of the school) and the policies of the public sector.

The second question is actually present throughout the book, but it has perhaps more complex implications regarding the relationship between self-organization and democracy, seen by the various actors within the school.

Let us now try to take a closer look at the two issues mentioned.

1. How to "Give Voice" to Students in Scholastic Organization

Recently, the global network of "changemaker schools" of Ashoka, the non-profit organization that brings together social entrepreneurs from all over the world, awarded five Italian schools, four public ones and one private

one,[3] which had passed the international selections by entering the ranking of 200 state-of-the-art institutions registered by the organization in over 50 countries worldwide.

The schools were identified not only for their ability to break the patterns of traditional teaching and to be at the forefront of digital innovation but also for being able to act as a concrete example for change in Italian schools. It is interesting to note that among these five, there are the "Majorana" school in Brindisi and the "Collegio del Mundo Unito" (College of the United World) in Duino, which are among the significant cases reported in the book by De Toni and De Marchi.

The emphasis on the "innovativeness" of schools – now prevalent also in media terms – should not however lead to neglecting its multi-level character and, in particular, the social dimension and the role of the actors, in our case first of all that of students and the territory.[4]

In De Toni and De Marchi's text, this dimension is taken on several times, starting from Chapter 2 through the analysis of international cases and especially in the meta-analysis summarized in the framework proposed in Figure 2.14 (in which 8 out of the 22 variables refer to the actors).[5]

A "reductionist" approach to innovation must therefore be avoided, as shown by the best experiences cited by the authors and others that have recently become the international focus of scholars,[6] such as the ESBZ school in Berlin.

In these experiences the students "have a voice" in the decisions that concern them.

The students' voice has always been identified as a pillar for successful school reforms as researchers, institutions and educational supporting organizations around the world have seen the inclusion of students in reform processes as a vital force.

There are many reasons for this process of including students in the decision-making processes of educational institutions. At least two are worth mentioning:

1. It is an opportunity for learning about democracy. Traditionally, our schools consider democracy as something to teach, not something to be practiced. Although most schools include educational programs for "the development of responsible citizens" (at least in their mission statements), the involvement of students in governance, starting with class and school representatives, is commonly regarded as something marginal and mostly aimed at managing events of student interest, not as a real exercise of participatory democracy. There is considerable evidence in this regard that the involvement and commitment of students in a school can be increased if students feel they have a real say in the matter.[7]
2. It helps develop student leadership. The only way to learn to be a leader is to act in a leadership role. From this point of view, it would be necessary to train students ad hoc, not only to make use of the most brilliant

> and politically more experienced ones, for example through the activation of educational leadership workshops connected to the election procedures in parent–teacher–student meetings and school representatives.[8]

The authors appropriately recall this commitment for leadership training in the book (in the concluding remarks to Chapter 4):

> *"Hierarchy and self-organization are not alternatives, but they coexist in the time and space of organizations. Hierarchical organizational models, "management" styles of leadership and subordinate behavior work well in contexts with a low degree of complexity and with people who have a low intra-entrepreneurial aptitude. Vice versa, models of self-organization, "constructionist" styles of leadership and self-leader behavior work well in highly complex contexts and with people who have a high intra-entrepreneurial aptitude".*

However, rhetoric on participation is very widespread in schools. Indeed, the most frequent cliché of a certain kind of school management and of many educational policy-makers is: "We are doing it for the good of the students".

Actually, it is rather rare that students are really included in the decision-making process at the school level (as indeed happens also in many countries for parents).

In this regard, the book's **Conclusions** refer to another important warning: "*Self-organization is not synonymous with self-management: it is a different logic of organization, which can only be realized in the presence of well-defined conditions, the research on and creation of which is the task of the best teachers and the best principals"*.

However, in my opinion, this warning reiterates the role of the students: to what extent is the school made (designed and managed) only *for* them or even *with and by* them?

2. The Relationship Between School Self-Organization and the Governance of the School System

Finland in 2013 undertook a process of reforming its education system with the aim of concluding it in 2020. It is based on three criteria for intervention:

1. the training of teachers, who are well-selected and well-paid and carry out studies designed specifically for teaching,
2. the involvement of communities and territories, which is continuous,
3. the graduality of innovation, which works with variable geometry thanks to autonomy, but at the same time it can count on stability in educational policies in the medium-long term ("governments may change, but not the education policy").

I have cited this example to highlight the diversity of approach and tradition with respect to the educational policies of our country, in which improvisation and blind inertia often prevail over graduality.

Actually, inertia is a typical characteristic of educational systems, which on the one hand, by nature, tend to perpetuate curricular, pedagogical models and organizational forms, and on the other hand, they suffer the pressures of conflicting interests of politicians, trade unions, voters, parents, businesses and other stakeholders. For this reason, especially in compulsory educational systems, it is rather difficult to activate coherent and far-reaching reforms.[9]

Charles Fadel, founder of the *Center for Curriculum Redesign in Boston*,[10] argues that 21st-century curricula must be radically redefined in terms of depth and versatility. In this re-definition, the promotion of character qualities is evoked, among which mindfulness, curiosity, courage, resilience, ethos and leadership. This in turn requires the training of young people to meta-learning, understood not only as that on the cognitive level but also as the internalization of an evolutionary vision of one's abilities.

Who decides and does this?

All this has numerous consequences, even at the micro-system level, such as individual schools.

In the **Conclusions**, the authors firmly argue that "*real scholastic autonomy is a necessary but not a sufficient condition to guaranteeing effective learning. And to do this we must focus on self-organization as an evolution of scholastic autonomy*". This means that

> self-organization requires energy in order to succeed. Self-organization does not take place unless there is a continuous flow of energy from the outside to the inside of the system. External energy is necessary so that complex adaptive systems – such as schools and classes – can organize themselves. And this flow is guaranteed by the intra-entrepreneurship of teachers (in the class) and of principals (in the school). School changes if its actors push from the bottom for new activities, if they bring new challenges and goals to everyone's attention, if they form and break connections both inside and outside the school.

However, experience teaches us that this "internal" energy is not self-fertilizing (like in certain nuclear reactors), but it requires "external energy".

This is a crucial point that relates in particular to the role of school policies and governance. Who guarantees the necessary external energy?

The Authors evoke a hint of response when they maintain that

> the fundamental conceptual step to overcoming resistance from the top is to understand that self-organization does not imply loss of power. Power is like knowledge: it can be duplicated. The conceptualization of power as a non-zero-sum entity is the critical step towards understanding the essence of empowerment and the management of systems

by multiple minds. Empowerment is not an abdication of power, nor a sharing of power. It is a duplication of power.

The issue of power on the one hand evokes even more relevant questions (which are not even possible to mention here);[11] on the other hand, it testifies to the great depth of the proposed analysis, in particular when the authors point out the implications that the innovations and the organizational transformations have at the cultural, ethical and anthropological levels.

Perhaps exactly because of this, and with a great deal of intellectual honesty, the authors remind us – in several passages – of the "work that remains to be done", both in terms of in-depth analysis and connections, and regarding methodologies.

This "open work" thus confirms a remarkable generative value that will certainly make it possible to resume and discuss in the future also many themes linked to the paradigm of complexity assumed as a cornerstone by the authors, including for example the role of social actors, the relationship between "structural" conditions and grassroots initiative, between systemic devices and individual, social, or group capabilities ("volunteerism"?).

Certainly, for those who work in schools, it is fascinating to know that "the future is in the periphery, but the "chained elephant" of the Epilogue reminds us that the process of self-organization outlined by the authors implies a courageous metamorphosis and a strong political conscience.

by Arduino Salatin

Notes

1. The proposal for truly autonomous schools with a "special statute" has been put forward in the last two decades by many; among the various cases we can cite for example the one made several times by the ADI (the Italian Teachers Association) in various conferences and pronunciations, anchored mostly to innovative international experiences.
2. In this regard, for example, the Astrid Foundation in Rome or the Censis (Independent institute carrying out research on social conditions in Italy) can be mentioned. See the summary by Giuseppe De Rita, *La crisi delle istituzioni come giunture fra potere e popolo (The crisis of institutions as links between power and people),* Censis Foundation, Rome, June 2017.
3. The schools selected are: the "E. Majorana" school in Brindisi, the "San Giorgio" comprehensive Institute in Mantua, the "Collegio del Mundo Unito dell'Adriatico" (the College of the United World of the Adriatic) in Duino, the "Città Pestalozzi" school in Florence and the "Liceo Attilio Bertolucci" in Parma (see www.vita.it/it/article/2017/09/11/ashoka-premia-le-cinque-scuole-italiane-piu-innovative). The award-winning schools were chosen through mapping work begun in 2015 by means of the snowball analysis technique, a system of chain reporting based on interviews in 200 schools selected for their innovative capacity. At Changemaker Schools, students learn about the importance of qualities such as empathy, creativity, leadership and teamwork so that they can best grow in the modern world and find solutions to our most complex problems (source: www.ashoka. org). Ashoka was founded by Bill Drayton in 1980 in the belief that there is no more powerful a force

for changing the world than a social entrepreneur: a person motivated by an innovative idea that can help solve a social problem at its root. The best social entrepreneurs in the world are the ones who manage to bring forward solutions that permanently alter existing models and paradigms.

4. In this regard, see the project called "Reconnections", promoted in Turin by the Foundation for the school of the "Compagnia di San Paolo", in which support for innovation is seen as a multilevel action (infrastructures, technologies, organization, teaching). see Benussi L., *Reconnections*, in "Tuttoscuola", no. 573, 2017, pp. 64–65. The title of the project also evokes – and not by chance I believe – the dimension of "interconnection" as one of the key areas of self-organizational capabilities.
5. The authors emphasize the fact that "the challenge is therefore the construction of learning environments that involve a multiplicity of actors, based on a flexible organization, designed on the key variables of learning and characterized by a high profile of technologies and equipment".
6. This is the case, for example, of the ESBZ (*Evangelischen Schule Berlin Zentrum*) school (source: www.ev-schule-zentrum.de/) founded and led by Margret Rasfeld who was inspired by the "Principles for the development of a sustainable education" of the Delors Commission (1996) and the "Agenda 2030 for sustainable development". In this school there is self-organization of learning and peer-to-peer learning, where students learn in groups that are mixed by age, helping each other. They learn by projects. Each student has a teacher-tutor that he/she meets once a week. There are no marks up to 16 years of age. Each lesson begins with a period of silence and good news on the subject. Every week there is a school assembly, in which students learn to express their opinions, criticisms and appreciations.
7. See Brasof M., *Student Voice and School Governance: Distributing Leadership to Youth and Adults,* Routledge Research in Educational Leadership, 2015. The author claims that *While student voice has been well-defined in research, how to sustain youth-adult leadership work is less understood. Students are rarely invited to lead school reform efforts, and when they are, their voice is silenced by the structural arrangements and socio-cultural conditions found in schools*.
8. Something is being done in Italian schools as shown, for example, by the dissemination of tools for the protection of students' "rights and duties". The last case of legislation concerns the "Charter of the rights and duties of male students and female students alternating school with work" (2017).
9. Charles Fadel compares this situation to a supertanker, which is very powerful but difficult to move. In most cases, new objectives and content are included in already-loaded curricula that contribute to further stressing both teachers and students. Furthermore, most of the attention is focused more on "how" than on "what" and this leaves in the background a real innovation of the curriculum (see *Four-dimensional Education for the Twenty-first Century,* paper*,* ADI conference speech, 2017).
10. He is author with Bernie Trilling of the best-seller *21st Century Skills*, Wiley, 2009. See www.curriculumredesign.org
11. Suffice it to mention, just to give an example, the debate aroused by the reflections contained in the posthumous work by U. Beck, *La metamorfosi del mondo (The Metamorphosis of the World)*, Italian edition, Laterza, Bari, 2017, in which there is the proposal of a problematization of the anthropological constants that so far have guided the interpretation of change and the game of power.

Appendices

Appendix A

Stages of the Analysis of the Literature Regarding Learning Environments and Organizational Capabilities

Stage 1 – Selections Concerning the Databases

1.1 Databases consulted

- Scopus SciVerse (magazines covered: 23,600)
- OPAC National Library System
- Catalog of the Paduan Library System
- Library System of the University of Udine

1.2 Items analyzed (up to 2016)

- Articles
- Reviews
- Articles in the process of publication
- Books
- Chapters of books
- Conference articles
- Conference reviews
- Editorials

1.3 Teaching areas considered

- Life Science (>4,300 magazines)
- Health Science (>6,800 magazines)
- Natural Science (>7,200 magazines)
- Social and Human Sciences (>5,300 magazines)

Stage 2 – Searches by Key Words

- Innovative Learning Environment
- Self-organized learning
- Self-organization, self-organized schools
- Self-governed schools
- Emergent schools
- Emergent management model
- School Complexity Theory

Stage 3 – Filters Used

- Title
- Abstract

Stage 4 – Classification and Analysis of the Main Contributions

- Innovative Learning Environments (73 entries)
    - Milrad (2002)
    - Boyd and Jackson (2004)
    - Ramboll Management (2004)
    - Scott *et al.* (2009)
    - Westera *et al.* (2009)
    - Chang and Lee (2010)
    - Istance (2010)
    - Casey and Evans (2011)
    - OECD (2013)
    - Bocconi *et al.* (2014)
    - Boersma *et al.* (2016)
- Self-organized Learning, Self-organized Schools (74 entries)
    - Bower (2003, 2006, 2007)
    - Koper *et al.* (2005)
    - Mitra (2005)
    - Bain (2007)
    - Louys *et al.* (2009)
    - Mitra and Dangwal (2010)
    - Williams *et al.* (2011)
    - Bain *et al.* (2011)
    - Laferrière *et al.* (2012)

Appendix B

Framework for Measuring the Innovativeness of Learning Environments

This appendix describes the 22 variables of the framework for measuring the innovativeness of learning environments, organized in four categories (actors, organization, learning and tools). The ways in which they are measured are also explained.

Category A – Actors in Learning

Table B.1 shows the criteria for the measurement of the eight variables of the "Actors in Learning" category.

Variable 1 – Students

In the framework, the students can:

a) attend a school with other integrated types of schools, such as comprehensive schools (OECD, 2013);
b) be part of the same class, but of different ages (OECD, 2013). Perkins, in the interview mentioned, states that an innovative learning environment, among other things, must make use of teaching to and among students of different ages;
c) be relatives, for example parents, to support the learning of children and/or to build a sense of community around the learning environment (OECD, 2013);
d) be distant learners or students studying from home or from places other than the physical building of the school, as in the Blended Learning methodology;
e) be students from many countries as in international schools; having relationships with many people of different nationalities adds value to the learning experience.

As for disabled students and/or students with Specific Learning Disorders (SLD), the OECD study believes that in some cases innovative environments have been more open and integral than traditional ones and that this

Table B.1 Criteria for the measurement of the eight variables of Category A "Actors in Learning"

Variables							
1. Students (Source: OECD, 2013)	**2. Group work among students** (Source: Istance, 2010; Mitra, 2005)	**3. Teachers** (Source: OECD, 2013)	**4. Group work among teachers** (Wald, Castleberry, 2000; Istance, 2010; OECD, 2013)	**5. Community of practice** (Source: Wenger, 1998; Williams et al., 2011)	**6. Tutoring activities** (Source: Mitra, Dangwal, 2010; OECD, 2013)	**7. Involvement of parents or grandparents** (Source: Mitra, Dangwal, 2010; OECD, 2013)	**8. Involvement of the local community** (Source: Scheerens, 2004; OECD, 2013)
a) students at various levels of school	null = 1	a) online teachers	null = 1	0 = 1	null= 1	null= 1	null= 1
b) students of various ages in the same class	low = 2	b) professors from the academic world of excellence	low = 2	1 C of P = 2	low= 2	low= 2	low= 2
c) relatives as students	average = 3	c) professionals to reduce the risk of dropping out	average = 3	2 Cs of P = 3	average= 3	average = 3	average = 3
d) online students	high = 4	d) peer teaching	high = 4	3 Cs of P = 4	high= 4	high= 4	high= 4
e) international students	very high = 5		very high = 5	4 Cs of P or more = 5	very high= 5	very high = 5	very high = 5
Key:		**Key:**					
0 items = 1		0 items = 1					
1 item = 1.8		1 item= 2					
2 items= 2.6		2 items = 3					
3 items = 3.4		3 items = 4					
4 items = 4.2		4 items = 5					
5 items = 5							

diversity has forced the school to think about ad hoc projects. The presence of students of this type is not a necessary prerequisite for innovation but rather a condition that favors the development of these environments. Cognitive, emotional, motivational, moral differences and social, economic and family conditions can be very different, and they can influence the learning environment: In our research, as in the OECD study (2013), these differences are not analyzed.

Variable 2 – Groups of Students

Most of the authors consider group work as a necessary, though not sufficient, condition for innovative learning environments. Istance (2010) and the OECD (2013), for example, states that to be innovative, environments must be based on the social nature of learning, then on group work and cooperative learning; Mitra (2005) and Mitra and Dangwal (2010), in the *Hole in the Wall* projects, argue that learning, to be effective, must take place with at least two people.

This variable can be measured as school time dedicated to group work, in any form, autonomous or with a stimulus from the teacher, in the classroom, at school, online.

Variable 3 – Teachers

In innovative environments teachers can be:

a) *distant teachers*, not physically at school, but reachable online;
b) professors from the academic world in order to promote excellence in some students;
c) professionals to support students at risk of dropping out of their studies;
d) the students themselves, who can be "teachers" in peer teaching for mutual teaching within the same class and "teachers" to support other students among different age groups (*mentoring*).

Variable 4 – Groups of Teachers

Teachers may prefer individual work or group work, for example in programming, projects and departments. The measurement is made taking into account how much work is done in a group.

Variable 5 – Community of Practice

According to Wenger (1998), learning is not an individual enterprise, with a clearly defined beginning and end, the result of teaching as distinct from practice; indeed, learning is a natural, social phenomenon, the product of situated experience, in which together with practical skills, a social identity

is also acquired; one becomes part of a community and appropriates the organizational and relational characteristics of the community.

The concept of practice plays a fundamental role and should be understood as:

- common semantics, or rather the participants negotiate a meaning, a common sense, always modifiable, but which affects everyone;
- community, or mutual commitment, shared responsibility and historical memory;
- learning, in the sense of meeting between the younger and the elderly in the group, with the acquisition of routines, stories, language, rituals and symbols;
- boundaries, not too rigid, to allow the community and also outsiders to learn.

Teachers can set up or participate in communities of practice (Wald and Castleberry, 2000), which are more informal networks of teachers that go beyond school walls, locally, regionally, nationally or internationally. Consider, for example, the European *eTwinning* network (Bocconi *et al.*, 2014) for planning and building paths, deciding on content and methods.

The measurement takes into account the number of communities of practice the school teachers adhere to.

Variable 6 – Tutor/coach

In a perspective of self-organized learning, in which there is no school as an institution, but the possibility of connecting to the network autonomously, as in the famous SOLE (Mitra, 2005; Mitra and Dangwal, 2010), there is a "cloud" of grandmothers – the Granny Cloud – which act as a support to learning. Or, in a school context where more space is given to autonomy, the teachers themselves can act as tutors/coaches, such as in the Self-managed High School in Paris or in the Entertech project (Boyd and Jackson, 2004).

The measurement of *tutorship* goes from null values (absence of any form of tutoring) up to maximum values characterized by the massive intervention of the tutor alongside normal teaching, as in the two cases examined of *Blended Learning* in San Francisco and of the *School of One* in New York.

Variable 7 – Parents and Grandparents

Parents themselves can be teachers, as support or in other volunteer roles; this strengthens the social resources and the sense of community. Similarly, grandparents can enter the school for projects related to the history of the territory, traditions, especially in primary schools (Mitra and Dangwal, 2010; OECD, 2013).

Parents can also be the alternative to school teachers, as in the *Homeschooling* movement, and therefore outside of the educational institution.

The measurement takes place by estimating the presence of parents and grandparents at school, both as teachers and in other roles.

Variable 8 – Local Community

The community itself in which the school is rooted plays a role in learning – as confirmed in the interviews we conducted at Perkins – for example, through the testimonies of professionals, entrepreneurs, artisans, farmers, representatives of trade associations, experts of local institutions, associations and religious communities (OECD, 2013, Bocconi *et al*., 2014). Field trips into the territory for visits to historical sites, museums, natural parks and so on are also considered essential.

The measurement of this variable takes into account both the participation of these actors in teaching and the orientation of the school to the territory.

Category B – Organization of Learning

The organization of learning is a fundamental dimension for most of the literature, in particular in the studies conducted by Ramboll Management (2004) and the OECD (2013). You can have a very strict organization, equivalent to a score of 1, or a very flexible one, up to a score of 5 (see Table B.2).

Variable 9 – Learning Time

Learning time is considered a key variable in 11 out of 20 contributions (15 from the literature + 5 international cases). Flexibility regarding time is achieved in different ways, for example thanks to:

a) a five-day schedule (the short week), instead of six, to allow 60-minute units and therefore greater involvement, as in the Mevo'ot HaNegev school in Israel where the number of school subjects was also reduced, from eight to five, to make the relationship between teacher and student more personal. Or a timetable that is not on a weekly basis (five or six days) but on a ten-day basis, as in the John Monash Science School in Australia, to allow longer learning units and a consequent more in-depth type of learning. Or a schedule that allows a ten-minute break after each lesson as at the Olds High School Community Learning Campus in Canada (OECD, 2013, 83–84);
b) a mid-week day off for projects or non-formal learning (such as training periods) like at NETschool in Australia (OECD, 2013, 84);
c) less important but longer units of learning (e.g., 75, 90 minutes);

Table B.2 Criteria for the measurement of Category B "Organization of Learning"

VARIABLES					
9. Learning time (Source: Ramboll Management, 2004; OECD, 2013)	**10. Class** (Source: OECD, 2013; Blended Learning; School of One)	**11. Learning space** (Source: OECD, 2013; School of One)	**12. Teaching** (Source: OECD, 2013)	**13. Curriculum and Educational offer** (Source: Self-managed High School in Paris, Homeschooling)	**14. Involvement of students or parents in the organization of the school** (Source: Self-managed High School in Paris)
a) flexible schedule;	a) by curricular choices or by interests	a) classroom devoted to one or more school subjects and to their teachers	a) group teaching	a) activation of choices of school subjects	null = 1
b) a day in mid-week for projects or non-formal learning	b) by levels	b) spaces adaptable to multiple activities, laboratories/ workshops	b) coaching to train new teachers;	b) activation of routes of differing levels in the same school subject	low = 2
c) minor but longer units of learning (e.g., 75, 90 minutes)	c) by profiles with mixed-age groups;	c) spaces for individual study, personalized lessons, small or large groups	c) differentiated teaching to follow specific students (e.g., learning disorders)	c) planning for contents and for competences for external examinations (e.g., IGCSE)	average = 3

d) time for individual work, group work, individual student–teacher lesson, tutoring, learning by teaching/peer teaching	d) organized in small groups as parts of larger systems (e.g., "home", "family", "State")	d) spaces devoted to accessing ICT resources, that is to virtual learning spaces		d) extracurricular activities offered	high = 4
e) schedule personalized ad hoc for some students		e) indoor or outdoor spaces for socializing (e.g., a square, an agora)			very high = 5
f) open entrance and/or exit time		f) structures designed as open spaces (e.g., communicating classrooms)			
g) flexible times of evaluation for various students					
h) "routines" for the beginning and the end of activities					
i) integration of standard school times with "out-of-hours" learning times, that is virtual learning					
j) school time left out of the schedule and rescheduled for curricular activities to choose from					
Key:	**Key:**	**Key:**	**Key:**	**Key:**	
0 items = 1	0 items = 1	0 items = 1	0 items = 1	0 items = 1	
up to 2 items = 2	1 item = 2	up to 2 items = 2	1 item = 2,3	1 item= 2	
up to 4 items = 3	2 items = 3	up to 4 items = 3	2 items = 3,6	2 items = 3	
up to 6 items = 4	3 items = 4	5 items = 4	3 items = 5	3 items = 4	
8 or more items = 5	4 items = 5	6 or more items = 5		4 items = 5	

d) times for individual work, group work or individual student–teacher lessons, on the model of Blended Learning or School of One, or tutoring or learning by teaching (peer learning);
e) a personalized timetable (therefore with different objectives), ad hoc for some students or individualized learning plans (with different methods);
f) open entrance and exit time;
g) flexible evaluation times for different students;
h) "routine" elements for the beginning and end of the activities, to give them meaning (e.g., 5 minutes of radio created by the students);
i) integration of the school's standard times with "out-of-hours" learning times, that is in a virtual way, as in Blended Learning (Ramboll Management, 2004; OECD, 2013);
j) school time left out of the ordinary scheduled class lessons of 60 minutes and redistributed for curricular activities for students to choose from.

The measurement is explained in Table B.2.

Variable 10 – The Class

The class, understood as a group of learners who are learning, in an innovative learning environment is a unit that is more open and flexible, the more actions are encouraged around the following (Ramboll, 2004):

- curricular options or learners' interests;
- the learners' levels of competence;
- the mixed ages of the learners;
- creation of groups of classes called "home", "family", "state"; the classes of students thus become part of a larger group of the class, where the single class participates in the group respectively as a "room", a "family member" or an "organ", with their respective functions, in order to offer a more engaging and identifying relational environment such as the one at Mordialloc College in Australia or at the Colegio Karol Cardenal de Krakow in Chile (OECD, 2013, 81–82).

Variable 11 – Learning Space

The organization of the classroom and of the physical space is a key variable. Physical learning spaces are foreseen:

a) dedicated to one or more school subjects and their teachers;
b) adaptable to multiple activities, such as laboratories/workshops;
c) reserved for individual study or personal lessons, for small or large groups;
d) dedicated to accessing ICT resources, that is virtual learning spaces;

e) indoor spaces for socializing, for example a square, an agora and outdoor spaces for socializing as community-based learning tools;
f) open spaces or communicating classrooms such as the Australian Science and Mathematics School in Australia (OECD, 2013, 62).

Variable 12 – Teaching

The teaching can be:

a) in groups, exploiting the advantages of joint programming, of multiple teaching methods and pedagogies, to promote environments for feedback and for the sharing of teaching practices, and to obtain greater visibility of the work among teachers (OECD, 2013, 72–78);
b) coaching to train new teachers;
c) differentiated to follow specific students (e.g., SLD).

Variable 13 – The Curriculum and the Educational Offer

The concepts of the curriculum and three-year plan of the educational offer foresee – from the moment of their introduction (Regulation of Autonomy, Presidential Decree no. 275 of March 8th 1999) – the integration between the national specifications and the specific context of each school, the students' needs, the social and cultural contexts, the resources available in the schools and in the territory, the demands of families and the territory (Source: Curriculum in the School of Autonomy – Public Education Archives). The Regulation of Autonomy provides for, among other things, freedom to decide on 20–30% of the timetable – depending on the ongoing year – to allow individual institutions a certain liberty to customize the learning routes and the curriculum. To use this flexibility you can:

- activate options of school subjects to choose from in order to customize the curriculum, as envisaged by some experiments prior to the Gelmini reform (e.g., the High School for Communication Studies);
- activate learning routes of different levels within the same school subject, for example, Italian 1 and 2;
- design the programming in modules to include the contents and competences for passing an exam in non-linguistic subjects in English, such as the *International General Certificate of Secondary Education* in English, History and Chemistry, or the teaching of a non-linguistic subject in English not established by the regulations, for example in the lower secondary school or in the third or fourth year of secondary school;
- offer extra-curricular courses, such as music or courses for in-depth study of school subjects. These four actions are the measuring elements of this variable.

Variable 14 – Involvement of the Students or Parents in the Organization of the School

The degree of student involvement in school decisions is a potentially important factor for the effectiveness of learning, such as in the Self-managed High School in Paris where students and teachers together manage administration, funds, cooking, cafeteria, cleaning and so on. This variable is a significant component in secondary schools and less so in the lower secondary school and in the primary school: in this latter case, parental participation is more important. The measurement of the variable is carried out by taking into account the progressive participation in various school decision-making areas recognized or not by the institute's regulations: institute assemblies, management of sporting activities, recreational (parties, radio) and cultural initiatives (conferences, newspapers), management of spaces (libraries, afterschool, bar, canteen) and so on.

Category C – Learning

Learning is divided into six variables as shown in Table B.3. The most effective learning is aimed at the acquisition of skills, based on innovative teaching methods, highly customizable, also in non-formal and informal contexts, whose guidelines are defined with a great deal of autonomy by the school and which recognizes learners as key participants in the process and encourages them to make a full commitment to it.

Variable 15 – Object of Learning

It consists of content, skills and values (OECD, 2013). The degree of innovation consists of the type of the planning of learning: traditional (knowledge) and advanced (skills) divided as follows:

- work toward skills *versus* knowledge;
- refer to general frameworks such as that of *Europe* 2020 divided into eight competences (communication in mother tongue, communication in foreign languages, mathematical competence, digital competence, learning to learn, social and civic competences, sense of initiative and entrepreneurship, awareness and cultural expression); or even more structured frameworks such as those known as "Skills for the 21st Century". These latter ones are the subject of many definitions, including that of the OECD (2013, 45): *"21st-century competencies generally refer to such skills, the ability to apply flexibly meaningfully learned, well-integrated knowledge in different situations and the ability to cope with the social, communication, and emotional demands of rapidly changing environments*", or like that of the "Partnership for 21st-Century Skills" which proposes 3 areas and 11 skills*: Learning and Innovation Skills (Creativity and Innovation,*

Table B.3 Criteria for the measurement of Category C "Learning"

Variables					
15. Object of learning (Source: OECD, 2013)	**16. Method of learning: Class time devoted to innovative teaching** (Source: OECD, 2013)	**17. Personalization of learning: School time devoted to individualized and personalized teaching** (Source: Istance, 2010; Blended Learning; School of One; Home School)	**18. Formalization of learning: School time devoted to non-formal and informal learning contexts** (Source: Istance, 2010; OECD, 2013; Mitra, 2010)	**19. School autonomy in the planning of learning** (Source: Williams et al., 2011)	**20. Involvement of students in the process of learning** (Source: Mitra, 2010; Williams et al., 2011; OECD, 2010a)
no element of planning by competence = 1	null = 1	null = 1	null = 1	null = 1	null = 1
some elements of planning by competence = 2	low = 2	low = 2	low = 2	low = 2	low = 2
all planning by competence = 3	average= 3	average = 3	average = 3	average = 3	average = 3
teaching by competence = 4	high= 4	high = 4	high = 4	high = 4	high = 4
evaluation by competence = 5	very high = 5	very high = 5	very high = 5	very high = 5	very high = 5

Critical Thinking and Problem Solving, Communication and Collaboration), Information, Media and Technology Skills (Information Literacy, Media Literacy, ICT Literacy), Life and Career Skills (Flexibility and Adaptability, Initiative and Self-Direction, Social and Cross-Cultural Skills, Productivity and Accountability, Leadership and Responsibility). See (ncpublicschools.org/docs/profdev/resources/skills/framework.pdf);

- specialize in intercultural and linguistic skills; for example, following the planning by competences of international certification institutes such as the *Cambridge International General Certificate of Secondary Education* or the *Learner's Profile of the International Baccalaureate Organization*; also collaborating with foreign schools for common goals;
- aim at an annual plan by topics, for example environmental sustainability, and orient all the planning of the other school subjects in this sense (interdisciplinarity).

The measurement of the variable takes into account the lesser or greater degree of the school's orientation to planning, teaching and assessment by competences.

Variable 16 – Method of Learning

We move from the sole use of the traditional, lecture-type lesson, *ex-cathedra*, to the use of a plurality of innovative teaching methodologies, for example via problem-solving (e.g., *Inquiry-Based Learning*), cooperative, by project, through the use of virtual environments (OECD, 2013). This variable evaluates how much class time is devoted to teaching methodologies that are different from the traditional, lecture-type lesson.

Variable 17 – Personalization of Learning

In Figure 2.13 three categories of learning have been distinguished: standard (based on equal cognitive objectives and equal teaching methodologies), individualized (based on equal cognitive objectives and different teaching methodologies) and personalized (based on different cognitive objectives and different teaching methodologies).

The degree of the personalization of learning is measured by taking into account the differentiation of objectives and methodologies.

Variable 18 – Formalization of Learning

The learning context can be (see Figure 2.15):

a) formal: "organized and structured and with learning objectives, intentional from the student's point of view" (OECD, 2010b), usually what happens at school, in the classroom;

b) non-formal: "somewhat organized and with objectives, on the initiative of the student or not" (OECD, 2010b), for example in projects, periods of training outside the school, through work;
c) informal: "never organized or with objectives in terms of results, and never intentional from the learner's point of view, understood as learning through experience or experiences" (OECD, 2010b), it can be inside or outside the school, at the workplace, at home or during free time (Istance, 2010; OECD, 2013). Examples are the SOLE (Mitra and Dangwal, 2010).

The three categories of learning contexts must be recognized and integrated to better meet the needs of a knowledge economy and the open societies of the 21st century (OECD, 2010b).

The learning context is measured by taking into account whether the organization of the environment is structured or not and by the presence or absence of intentional objectives on the part of the learners.

Variable 19 – School Autonomy in the Planning of Learning

This variable intends to measure the autonomy of the school in defining objectives, generations, actions and learning and teaching processes understood as in Figure 2.16.

For the purpose of measuring the variable, the degree of autonomy of the school is assessed in the design of domains, characteristics and activities aimed at improving learning and teaching with respect to the standards defined by the central bodies.

Variable 20 – Involvement of Students in the Process of Learning

The 2013 OECD study (p. 159) of learning places the activation of student involvement as the first of the seven conditions for effective learning environments (centrality and involvement of learners, cooperative learning methodologies, professional teachers, attention to differences, planning, evaluation, horizontal integration). The report emphasizes that students are the key participants in the learning process and that it is essential to encourage their active involvement and develop in them an understanding of their activity as learners who are learning. Knowledge is not passively absorbed but continuously built up by the learner. Students must become "self-regulated learners". They should be able to monitor, evaluate and optimize their learning (p. 155). In certain international cases, such as the Self-managed High School in Paris described above, students are even involved in decisions regarding management.

Measurement places the maximum value in relation to the full involvement of students in the learning process.

Category D – Tools

Two types of variables are distinguished: "ICTs" and "teaching equipment" as shown in Table B.4. The scale of measurement used ranges from value 1 (low profile) to value 5 (high profile).

Table B.4 Criteria for the measurement of Category D "Tools"

Variables	
21. ICTs for Teaching (Source: OECD, 2013; Blended Learning; School of One; Home School)	**22. Teaching Equipment** (Source: School of One)
Hardware	a) Flexible arrangement of desks and chairs for traditional learning (for lecture-type class, group work, individual work)
a) Interactive teaching equipment (e.g., IWB)	b) arrangement of equipment for informal learning (e.g., stools, poufs)
b) devices for calculation and communication (e.g., computers, touch-screen monitors, netbooks, tablets, smartphones, etc.)	c) availability of equipment for collective learning environments (e.g., amphitheater for presentations)
c) multimedia equipment (e.g., videocameras, projectors)	d) equipment for educational laboratories/workshops (robotics, 3D printing, chemistry, etc.)
Software	
d) Instruments for planning (for example *Scratch*, *Arduino*) and simulation (e.g., *Easyeda*)	
e) applications aimed at learning: (i) to process images; (ii) to draw; (iii) to record; (iv) to make presentations; (v) to record on PDF; (vi) to store files; (vii) to record audio; (viii) to create videos; (ix) to create books and ebooks; (x) to build mind maps, time lines; (xi) to create comics; (xii) to build and administer tests, etc.; (xiii) to create video games; etc.	
f) virtual learning platforms, e-learning (e.g., *Moodle*, *Docebo*)	
g) tools of communication for teaching purposes (e.g., chatrooms, forums, blogs, social networks)	
h) platforms for attendance registers and computerized evaluations	
Digital Contents	
i) books in PDF, ebooks, learning objects, videogames for teaching purposes, podcasts, second life, etc.)	

Variables	
21. ICTs for Teaching (Source: OECD, 2013; Blended Learning; School of One; Home School)	**22. Teaching Equipment** (Source: School of One)
Key: the assessment takes into account the extent (in terms of number of categories of tools) and depth (in terms of intensity of use in the single class) of the use of ICT equipment as follows:	**Key:** the measurement takes into account the availability of and the more or less forced use of the various kinds of teaching equipment
null = 1	null = 1
low = 2	low = 2
average = 3	average = 3
high = 4	high = 4
very high = 5	very high = 5

Variable 21 – ICTs for Teaching

Technology is an element present in almost all the literature on innovative learning environments (Milrad, 2002; Boyd and Jackson, 2004; Ramboll Management, 2004; Koper *et al.*, 2005; Louys *et al.*, 2009; Scott *et al.*, 2009; Westera *et al.*, 2009; Chang and Lee, 2010; Mitra and Dangwal, 2010; Williams *et al.*, 2011; Casey and Evans, 2011; Laferrière *et al.*, 2012; OECD, 2013). Despite this, the relationship between the technological profile and the effectiveness of learning is not clear. There are various opinions ranging from reference to essentiality (Bain, 2007), to the strong complementarity of technology in learning (Bain *et al.*, 2011), to the inadequacy of technology alone for effective learning environments (Mayer, 2010; OECD, 2013). According to Groff (2013) and the OECD (2013), technology is not essential, but it can be very facilitating and reinforcing for:

- conducting an inquiry-based project and for sharing class work and monitoring its progress;
- connecting the otherwise distant environments, networks and communities;
- getting more commitment, engagement, from the learners;
- individualizing information, communication and materials;
- including students who would otherwise be excluded;
- allowing educators to be online tutors, to teach in other schools or in other countries;
- making content more available;
- making way for simulations or games.

Technology can therefore facilitate compliance with the seven requirements mentioned earlier in the 2013 OECD report to achieve innovative learning environments. It is still possible to comply with the requirements without it: "The mere presence of technology in the form of computers or pads in

school or as a smartphone in the pockets of learners is not in itself sufficient and its application must be centered on the student and not on the technology itself" (OECD, 2013, 195).

The various categories of information and communication technologies that have been identified are nine and can be divided into:

Hardware (three categories):

- interactive teaching equipment (e.g., IWB);
- devices for calculation and communication (e.g., computers, touchscreen monitors, netbooks, tablets, smartphones)
- multimedia equipment (e.g., videocameras, projectors);

Software (five categories):

- instruments for planning (e.g., *Scratch*, *Arduino*) and simulation (e.g., *Easyeda*);
- applications aimed at learning: (i) to process images; (ii) to draw; (iii) to record; (iv) to make presentations; (v) to record on PDF; (vi) to store files; (vii) to record audio; (viii) to create videos; (ix) to create books and ebooks; (x) to build mind maps, time lines; xi) to create comics; (xii) to build and administer tests, etc.; (xiii) to create video games; etc.
- virtual learning platforms, e-learning (e.g., *Moodle*, *Docebo*);
- tools of communication for teaching purposes (e.g., chatrooms, forums, blogs, social networks);
- platforms for attendance registers and computerized evaluations.
  and digital content (1 category):
- books in PDF, ebooks, learning objects, videogames for teaching purposes, podcasts, second life, etc.).

The maximum score is assigned to a wide use (in terms of number of categories of instruments) and encouraged (in terms of number and intensity of use in the single class) of ICT equipment.

Variable 22 – Teaching Equipment

Four important variables have been identified for the equipment: the flexible arrangement for formal learning in the traditional, lecture-type class, for group or individual work made possible by desks and chairs that can be separated and joined together according to the educational need; the arrangement of equipment for informal learning such as stools, poufs; the arrangement of equipment for collective learning environments such as an amphitheater for presentations; equipment for educational laboratories/workshops, for example for robotics, 3D printing, chemistry, etc.).

The measurement takes into account the availability of and the more or less forced use of the various kinds of teaching equipment.

Appendix C

Learning as a Process of Knowledge-Building

Nonaka's Model of Organizational Knowledge Creation

The SECI (Socialization, Externalization, Combination, Internalization) model was proposed in 1994 by Professor Ikujiro Nonaka of the Japanese university of Hitotsubashi. SECI focuses on the processes of knowledge creation within each organization; Nonaka calls them Organizational Knowledge Creation. The model has been expanded and developed in successive publications, primarily in Nonaka and Takeuchi (1995).

The model is built on two dimensions of knowledge: the epistemological one, which distinguishes tacit and explicit knowledge, and the ontological one, which differentiates between individual, group, organizational and inter-organizational knowledge. Nonaka maintains that the continuous conversion between tacit and explicit knowledge and the continuous dialogue at different ontological levels leads to the creation of knowledge.

The conversion between tacit and explicit knowledge takes place by means of four processes (Figure C.1).

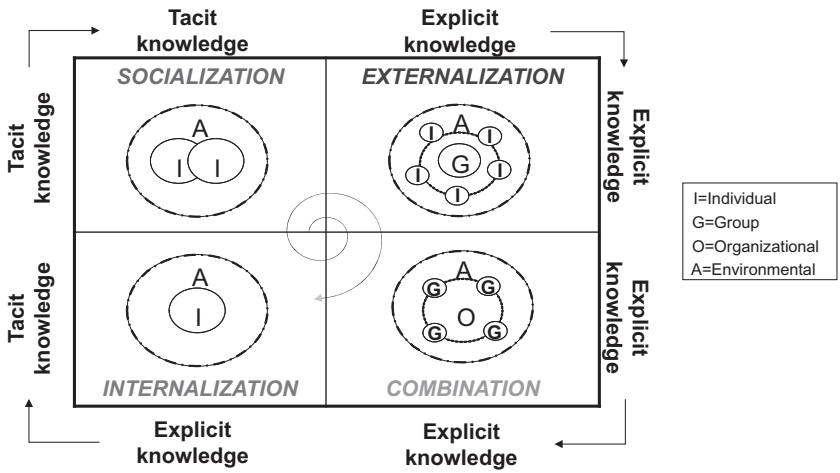

Figure C.1 The Spiral of *Organizational Knowledge Creation*

Source: (Nonaka, 1994 © Informs)

- *Socialization*: This is the process that allows the sharing and creating of tacit knowledge through direct observations and the sharing of experiences.
- *Externalization*: This is the process of the conversion from tacit into explicit knowledge, articulating and codifying it through the sharing of reflections and the writing of documents.
- *Combination*: This is the process that makes it possible to standardize and apply explicit knowledge and information; it is a process that is strongly supported both by computer-based technologies (databases, business intelligence tools, etc.) and by typical web-based tools (the Internet, intranet, etc.).
- *Internalization*: This is the process that allows one to acquire explicit knowledge through learning, which can take place both through concrete experiences and through reading and reflection.

The SECI model is represented by a spiral because it emphasizes the continuity of the process of knowledge creation. It arises at an individual level and develops through the interactions among individuals (group), concluding at an organizational level and sometimes going beyond organizational (inter-organizational) boundaries. This process tends to become wider and faster the more the actors themselves become involved.

In order for this process to happen, it is necessary to create the conditions that make it possible. According to Nonaka, knowledge requires a context in order to be created, "*there is no creation without place*" (Casey, 1997). Unlike the Cartesian dualism that provides for the clear separation between subject and object, in the SECI model the subject (the people and their modalities of participation) and the object of the process of creation (knowledge) reside in a specific context (Nonaka *et al.*, 2000). In Japanese, this context is called *Ba*, which can be translated as "space", "place". The *Ba* can be defined as a shared context in which knowledge is created, shared and used.

This space can be physical (e.g., an office), virtual (e.g., a teleconference), mental (e.g., shared experiences) or any combination of these. Four types of *Ba* are proposed, defined by two dimensions: the type of interaction (individual or collective) and the media used for interaction (face-to-face or virtual, e.g., books, manuals, emails, videoconferences, technological devices).

The different types of Ba, each supporting each different phase of the SECI model, are (Figure C.2):

- *Originating Ba*: The conversion of tacit knowledge into tacit (socialization) takes place through personal interaction among individuals. The interaction takes place in a place where it is possible to share experiences, emotions and feelings. To realize this type of *Ba*, it is necessary to

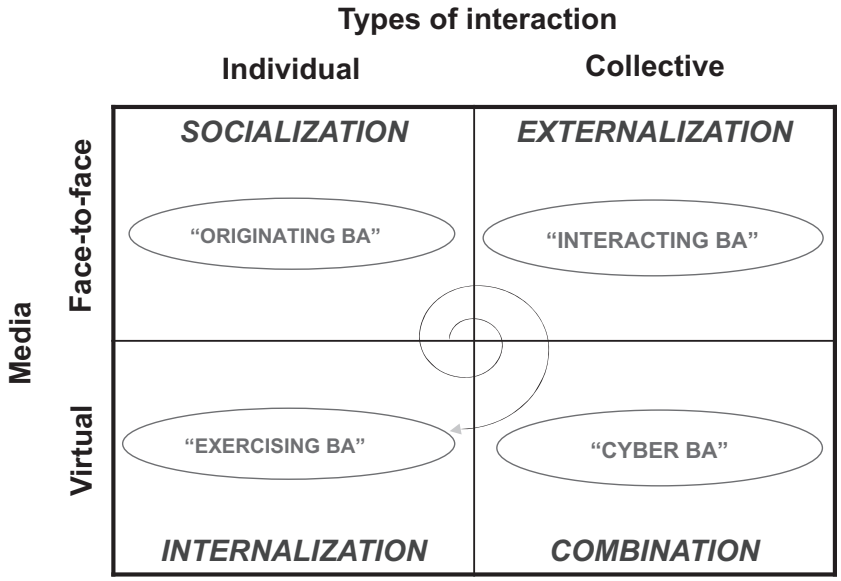

Figure C.2 Relationship among the types of *Ba* and the phases of the SECI process
(Source: Adapted from Nonaka, Konno, 1998 – please contact Sage for permission to re-use)

remove all the obstacles that hinder the circulation of knowledge. For this purpose, new information technologies (e.g., videoconferences) that allow the exchange of tacit knowledge among people, who are even physically distant, may also be useful.

- *Interacting Ba*: The conversion of tacit knowledge into explicit knowledge (externalization) takes place in a place designed for interaction and creative discussion within groups or teams. Some possible contexts may be meetings, staff meetings or tools for online work such as groupware, forums, blogs and mailing lists.
- *Cyber Ba*: The conversion of explicit knowledge into explicit (combination) is realized and improved by the availability of information technologies that provide different formats for the treatment of explicit codified knowledge. In this way a great number of people can participate in the process of creation, systematization and classification of knowledge.
- *Exercizing Ba*: The conversion of explicit knowledge into tacit (internalization) occurs through on-the-job training. Also in this case, information technologies (the Internet, intranet, e-learning systems, electronic manuals, etc.) support this conversion of knowledge while assisting individuals in learning.

The key concept behind *Ba* is interaction. Knowledge is created through the interaction among individuals within a context (Nonaka *et al.*, 2000). Some authors (Simon, Grant) argue instead that the process of knowledge creation originates in the individual and that the main role of the company is the application of the knowledge of individuals. For Nonaka, the creation of knowledge is a dynamic process that takes shape when all four conversion processes are implemented to form a continuous spiral. That is, knowledge is generated by interaction, so more than talking about individual knowledge, it is appropriate to talk about organizational knowledge.

Nonaka and Konno (1998) also provide suggestions to facilitate individual conversions of knowledge, for example the creation of a team or an interaction space in order to facilitate the sharing of the participants' experiences and perspectives. The concepts that have formed within the teams can be combined with the existing knowledge present within the company or coming from the outside.

The Ba, which according to Nonaka *et al*. (2000) is expensive to develop and maintain, exists at different ontological levels, and these can be linked together in order to amplify the process of knowledge creation.

Nonaka's work (1994) is certainly a reference work in the field of Knowledge Management. In fact, in 2017 it was mentioned 21,297 times in *Google Scholar* and that of Nonaka and Takeuchi (1995) a total of 39,324 times.

Appendix D

Questionnaire for Measuring the Innovativeness of the Learning Environments (For the Teaching Staff)

by Alberto F. De Toni & Stefano De Marchi

School	
Name and surname of the person being interviewed	
Role	

Please respond to the following statements in an affirmative or negative (true/false) manner, or by expressing your opinion on the items by assigning a value from 1 to 5: 1 = null; 2 = low; 3 = average; 4 = high; 5 = very high

CATEGORY A: ACTORS

Variable 1: Students		
I	Is the school an "Istituto Comprensivo" (a school including various levels of schools: nursery school, primary school, junior high school, senior high school all under one principal)?	ⓉⒻ
II	Do the classes have students of various ages (e.g., a Maths class for excellent students from the 3rd and 4th years)?	ⓉⒻ
III	Are there relatives of students among the students?	ⓉⒻ
IV	Are there virtual students, that is students attending via an online platform?	ⓉⒻ
V	Are there international students?	ⓉⒻ
Variable 2: Groups of Students		
VI	On average, how much group work among students is carried out at school?	①②③④⑤
Variable 3: Teachers		
VII	Does the school have any virtual, online teachers?	ⓉⒻ
VIII	Does the school have any university professors among its teaching staff?	ⓉⒻ
IX	Does the school make use of any professionals to reduce the risk of students dropping out?	ⓉⒻ
X	Does the school make use of *peer teaching* among students?	ⓉⒻ

(Continued)

(Continued)

Variable 4: Group Work Among Teachers		
XI	How much of the teachers' work is carried out in groups?	①②③④⑤
Variable 5: Community of Practice		
XII	How many communities of practice for teachers does the school belong to?	①②③④⑤
Variable 6: Tutoring Activities		
XIII	Is there any form of tutoring?	①②③④⑤
Variable 7: Involvement of Parents or Grandparents		
XIV	How much involvement do parents and/or grandparents have in the school?	①②③④⑤
Variable 8: Involvement of the Local Community		
XV	How much is the local community involved in the school?	①②③④⑤
CATEGORY B: ORGANIZATION		
Variable 9: Learning Time		
XVI	Is the school timetable flexible (in that it changes during the school year for didactic reasons, or a different schedule from that of 6 days a week)?	ⓉⒻ
XVII	Do you devote one day a week to projects, or to non-formal learning?	ⓉⒻ
XVIII	Are there fewer, but longer learning units (e.g., 90, 120 minutes)?	ⓉⒻ
XIX	Are there times for individual work, group work, teacher–student work, tutoring or peer learning?	ⓉⒻ
XX	Are there diversified schedules for personalized or individualized plans?	ⓉⒻ
XXI	Are there flexible entrance and exit times?	ⓉⒻ
XXII	Are the assessment times flexible based on the different needs of the students?	ⓉⒻ
XXIII	Are there any routines at the beginning or at the end of the activities (e.g., 5 minutes of radio created by the students)?	ⓉⒻ
XXIV	Are the standard times integrated with moments of virtual learning?	ⓉⒻ
XXV	Is the school time that has been gained by modules lasting less than 60 minutes redistributed for activities chosen by students?	ⓉⒻ
Variable 10: The Class		
XXVI	Do students have optional subjects?	ⓉⒻ
XXVII	Are there classes arranged differently by level?	ⓉⒻ
XXVIII	Are there classes made up of students of different ages (e.g., Maths class for excellent students of the 3rd and 4th years)?	ⓉⒻ
XXIX	Is the school organized in small groups that are part of larger systems (e.g., "home", "family", "State")?	ⓉⒻ

Variable 11: Learning Space		
XXX	Is the school organized into classrooms devoted to one or more subjects and to their teachers?	ⓉⒻ
XXXI	Are there spaces adaptable to multi-activities, laboratories/ workshops?	ⓉⒻ
XXXII	Are there spaces for individual study, individual lessons, small or large groups?	ⓉⒻ
XXXIII	Are there spaces devoted to accessing ICT resources, that is virtual learning spaces?	ⓉⒻ
XXXIV	Are there indoor or outdoor public spaces for socializing (e.g., a square of the "Agora" type)?	ⓉⒻ
XXXV	Is there an "openspace" type of structuring, designed for open spaces? (e.g., communicating classrooms)	ⓉⒻ
Variable 12: Teaching		
XXXVI	Are there forms of group teaching among teachers?	ⓉⒻ
XXXVII	Are there forms of coaching to train new teachers?	ⓉⒻ
XXXVIII	Are there differentiated forms of teaching to follow specific students (e.g., Specific Learning Disorders – SLD)?	ⓉⒻ
Variable 13: Curriculum and Educational Offer		
XIL	Are there optional subjects, with respect to the basic curriculum?	ⓉⒻ
XL	Are there any routes according to levels within the same school subject?	ⓉⒻ
XLI	Is there any planning for external examinations (e.g., exams regarding the IGCSE programs, the International Baccalaureate exams or language certifications)?	ⓉⒻ
XLII	Are extracurricular activities offered to the students, different from the previous ones (e.g., music, sports, robotics courses)?	ⓉⒻ
Variable 14: Involvement of Students in the Organization of the School		
XLIII	How much do students take part in the organization of the school (e.g., peer learning, school rules and regulations, sports and cultural events, management of the public-library spaces, after-school activities, café)?★	①②③④⑤
CATEGORY C: LEARNING		
Variable 15: Object of Learning		
XLIV	How in-depth is the teaching for competences dealt with?	ⓉⒻ
	There are some aspects of planning by competence	ⓉⒻ
	Everything is planned by competence	ⓉⒻ
	Teaching methodologies by competence	ⓉⒻ
	Assessment by competence	
Variable 16: Method of Learning, Class Time Devoted to Innovative Teaching Methods		
XLV	How much class time is devoted to teaching methods that are alternative to the traditional lecture-type lesson?	①②③④⑤

(Continued)

(Continued)

Variable 17: Personalization of Learning		
XLVI	How much school time is devoted to individualized or personalized teaching methodologies?	①②③④⑤
Variable 18: Formalization of Learning		
XLVII	How much school time is devoted to non-formal and informal learning contexts?	①②③④⑤
Variable 19: Scholastic Autonomy in the Planning of Learning		
XLIII	How much autonomy is left to the school for the planning of learning?	①②③④⑤
Variable 20: Involvement of Students in the Process of Learning		
XLIX	To what degree are students involved in the decisions regarding the process, modalities and objects of learning?	①②③④⑤
CATEGORY D: TOOLS		
Variable 21: ICTs for Teaching		
L	How wide (in terms of number of types of tools) and in-depth (in terms of intensity of use in the single class) is the following ICT equipment used: **Hardware** a) Interactive teaching equipment (e.g., IWB); b) tools for calculation and communication (e.g., computers, touch-screen monitors, netbooks, tablets, smartphones, etc.); c) multimedia equipment (e.g., videocameras, projectors, etc.); **Software** d) Programming (e.g., *Scratch*, *Arduino*) and simulation (e.g., *Easyeda*) tools; e) applications for learning: (i) to process images; (ii) to draw; (iii) to record; (iv) to make presentations; (v) to record on PDF; (vi) to store files; (vii) to record audio; (viii) to create videos; (ix) to create books and ebooks; (x) to build mind maps, time lines; (xi) to create comics; (xii) to build and administer tests, etc.; (xiii) to create video games; etc. f) virtual learning platforms, e-learning (e.g., *Moodle*, *Docebo*); g) tools of communication for teaching purposes (e.g., chatrooms, forums, blogs, social networks); h) platforms for attendance registers and computerized evaluations; **Digital Contents** i) books in PDF, ebooks, learning objects, videogames for teaching purposes, podcasts, second life, etc.	①②③④⑤

Variable 22: Teaching Equipment

LI	How extensive (in terms of number of categories of tools) and in-depth (in terms of intensity of use in the single class) is the use of ICT equipment as follows: a) flexible arrangement of desks and chairs for formal learning (for a traditional lecture-type class, for group, individual work); b) the arrangement of equipment for informal learning (e.g., stools, poufs); c) the arrangement of equipment for collective learning environments (e.g., amphitheater for presentations) d) equipment for educational laboratories (robotics, 3D printing, chemistry, etc.)	①②③④⑤

* If it is a primary school, the subject of the question is "parents" and not "students".

Appendix E

Legislation Regarding Scholastic Autonomy

The process of autonomization of the scholastic institutions has lasted more than 20 years, divided into the following stages:

First Stage – 1993

Law no. 537 of December 24, 1993 – with Carlo Azeglio Ciampi as Prime Minister (April 28, 1993–May 10, 1994) and Rosa Russo Iervolino as the Minister of Education – attributed a judicial identity to all schools of every order and level giving them autonomy regarding organization, finances, teaching methods, research and development (art. 4). The law was never applied as it delegated the implementation of autonomy to legislative decrees. This delegation was canceled by the subsequent Government headed by Silvio Berlusconi (May 10, 1994–January 17, 1995) with Francesco D'Onofrio as the Minister of Education.

Second Stage – 1997

Law no. 59 of March 15, 1997 (the so-called first Bassanini law) with Romano Prodi as Prime Minister (May 17, 1996–October 21, 1998) and Luigi Berlinguer as the Minister of Education had the primary objective of financial, organizational and didactic autonomy of each institute and envisaged an organizational system that is not just a passive recipient of rules and circulars, but a service delivery center capable of independently designing educational routes, to develop new methods and to develop research and experimentation (Pepe and Strano, 2016).

The core of this law, represented by Article 21, provided for the confirmation of the attribution of a legal identity (paragraph 1) to all those educational institutions that had certain minimum requirements regarding size (paragraph 4). The transition to the new regime of autonomy was accompanied by initiatives for the training of staff, an analysis of territorial and social realities, and it was carried out according to criteria of graduality in order to enhance the individual educational institutions' capacities for establishing initiatives (paragraph 4).

For these educational institutions there was a financial allocation made up of the assignment of the State for the administrative and didactic functioning to carry out the activities of education, training and guidance specific to each type and to each specialized orientation (paragraph 5).

The aforementioned educational institutions with legal personality enjoyed organizational and didactic autonomy, in compliance with the objectives of the national educational system and the rules at the national level (paragraph 7). Autonomy was organizational and educational.

Organizational autonomy was aimed at achieving flexibility, diversification, efficiency and effectiveness of the school service, the integration of and better use of resources and structures, the introduction of innovative technologies and coordination with the surrounding territory. That autonomy was expressed freely, also by overcoming the constraints regarding the lesson unit of one hour, the class as a group unit and the methods of the organization and use of teachers, according to the purpose of optimizing the human, financial, technological, material and temporal limits within the constraints of the number of days of annual teaching activities established at a national level; in a week of not less than five days and in compliance with the annual service obligations of the teachers, also providing for a specific multi-week plan (paragraph 8).

Teaching autonomy was aimed at pursuing the general objectives of the national education system, respecting the freedom of education, freedom of educational choice on the part of families and the right to learn. It consisted of the free and planned choice of methodologies, tools, organization and teaching times, to be adopted in compliance with the possible plurality of methodological options, and in any initiative that is an expression of a freedom in planning, including the possible offer of optional or additional courses and in compliance with the training needs of the students. All this while respecting the total annual amount of time established for each curriculum and that established for each of the school subjects and activities indicated as fundamental for each type or course of study and the obligation of adopting procedures and instruments for verifying and evaluating school productivity and the achievement of objectives (paragraph 9).

In exercising this autonomy, schools, both individually and together with others, could expand the educational offer by adding training courses for adults, initiatives to prevent the abandonment and dropping out of school, initiatives to use the facilities and technologies also in extra-curricular hours and for purposes of connecting with the world of work, initiatives for participation in national, regional or community programs and, within the framework of agreements between the regions and the school administration, integrated routes among different training systems.

The autonomous educational institutions also had autonomy of research, experimentation and development within the limits of the productive exercise of didactic and organizational autonomy (paragraph 10). Furthermore, conventions could be stipulated with the universities with the aim

of encouraging activities of updating, of research and of educational and university orientation (paragraph 12).

In short, there was organizational autonomy (paragraph 8) and educational autonomy (paragraph 9), while financial autonomy disappeared and a less demanding "financial endowment" appeared, made up of the assignment of administrative and didactic functions by the State (paragraph 5). In practice, the idea of 1993, which was never implemented, of giving schools a real financial autonomy with an ordinary financing fund with which to pay staff like the Universities, was abandoned. Schools remained organs of the state with organizational and teaching autonomy.

Third Stage – 1999

In fulfillment of the aforementioned principles, the Regulation containing rules regarding the autonomy of educational institutions pursuant to Article 21 of Law no. 59 of March 15, 1997, was issued (Presidential Decree no. 275 of March 8, 1999) with Massimo D'Alema as Prime Minister (October 21, 1998–December 22, 1999) and Luigi Berlinguer as the Minister of Education. The Regulation defined the organizational and educational autonomy of schools as a guarantee of freedom of education and of cultural pluralism and provided for the design and implementation of education, training and educational interventions according to the different contexts, to the requests made by families and to the specific characteristics of the subjects involved, consistent with the aims of the national system of education (article 1, paragraph 2).

To this end, each educational institution would prepare a Plan of their Educational Offer (POF, Piano dell'Offerta Formativa), or the basic document constituting the cultural identity and the plan of schools, in which each single school expressed the curricular, extracurricular, educational and organizational plans that the school would adopt within the scope of its autonomy.The POF, in line with the general and educational objectives of the different types and specialized orientation of studies determined at a national level, reflected the needs of the cultural, social and economic context of the local reality, taking into account the territorial plan of the educational offer. It was drawn up taking into account the proposals and opinions formulated by the bodies and associations, including those of parents and, for upper secondary schools, of students (Article 3).

Article 4 specified the autonomy of teaching in detail. Educational institutions can adopt all the forms of flexibility they deem appropriate, such as (paragraph 2):

- the modular distribution of the annual number of hours of each school subject and activity;
- the definition of teaching units that do not coincide with the hourly unit of the lesson and the use of residual hourly spaces;

- the activation of individualized didactic routes, in respect of the general principle of integrating the pupils into the class and into the group, also in relation to those pupils who have a handicap;
- the modular distribution of groups of students coming from the same or from different classes or from different years of the course of study;
- the aggregation of school subjects into subject areas.

Furthermore, training courses that involve several subjects and activities as well as courses in foreign languages in implementation of international agreements (paragraph 3) can also be scheduled, based on the interests expressed by the students as well.

With regard to autonomy in organization, article 5 decreed that educational institutions could adopt, also with regard to the use of teachers, any organizational modality that was an expression of freedom of planning, ensuring the promotion and support of innovative processes and the improvement of the educational offer (paragraph 1).

It was possible to adapt the school calendar to the needs deriving from the plan of the educational offer (paragraph 2); how to flexibly organize the overall schedule of the curriculum and that devoted to the individual school subjects also on the basis of a multi-week plan, while still maintaining the distribution of the lessons in no fewer than five weekly days and respecting the total number of yearly or multi-yearly hours, or the number of hours established for the cycle of the single mandatory subjects and activities (paragraph 3).

The ways teachers were to be utilized could be diversified in the various classes according to any differentiations in the methodological and organizational choices adopted in the plan of the educational offer (paragraph 4).

Regarding the autonomy of research, experimentation and development – article 6 – educational institutions could, individually or together with other schools, deal with (paragraph 1):

- educational planning and evaluative research;
- training and cultural and professional refresher courses for school staff;
- innovations regarding methodology and school subjects;
- didactic research on information and communication technologies and their integration into educational processes;
- educational documentation and its dissemination within the school;
- exchanges of information, experiences and teaching materials;
- the integration among the various branches of the school system and, in agreement with the competent institutional bodies, among the various training systems, including professional training.

To do this, schools could develop and enhance the exchange of documentation and information by activating mutual links with the European Education Center – now "Invalsi" – the Library of pedagogical documentation and

regional Institutes of research, experimentation and educational refresher courses to keep up-to-date, with universities and other public and private bodies that carry out research activities (paragraph 3).

Article 7 provided for the promotion of or adherence to network agreements – the so-called networks of schools – which may have as their object educational activities, activities of research, experimentation and development, training and updating; activities of administration and accounting, of the purchase of goods and services, organization and other activities consistent with institutional functions (paragraph 2).

The agreements might include temporary exchanges of teachers (paragraph 3). Laboratories could be set up aimed, for example, at (paragraph 6):

- didactic research and experimentation;
- the documentation, according to procedures defined at a national level for the widest circulation, also by means of the telematic network, of research, experiences, documents and information;
- in-service training of school staff;
- educational and professional orientation.

Article 8 defined the compulsory curriculum that every educational institution had to draw up in its Plan of the Educational Offer (comma 1). This was to contain:

- the general objectives of the educational process;
- specific learning objectives related to the pupils' skills;
- the subjects and activities that make up the national share of the curricula and the relative annual number of hours;
- the overall annual mandatory schedule of the curricula including the mandatory national quota and the mandatory quota reserved for educational institutions;
- the limits of temporal flexibility to carry out offsets between school subjects and activities of the national share of the curriculum;
- standards related to the quality of the service;
- the general guidelines concerning the assessment of students, the recognition of credits and the conditional advancement of students to the next grade dependent on retaking failed exams;
- the general criteria for the organization of training courses aimed at permanent adult education, even at a distance, to be implemented in the integrated system of education, training, work.

The determination of the curriculum must take into account the different educational needs of the students that have been concretely identified, of the need to guarantee effective actions of continuity and orientation, of the needs and expectations expressed by the families, by the local bodies, by

the social, cultural and economic contexts of the territory. Options can be offered to students and families (paragraph 4).

The curriculum of the individual educational institution could be customized in relation to international actions, projects or agreements (paragraph 5).

Furthermore, educational institutions, individually, networked or in partnership with each other, can expand the educational offer by taking into account the needs of the cultural, social and economic context of the local realities (article 9, paragraph 1). Curricula can be enriched with optional subjects and activities (paragraph 2).

Last of all, within the initiatives aimed at innovation, the Minister of Public Education promotes, possibly with special funding available in the ordinary budget allocations, projects at national, regional and local levels, aimed at exploring any innovations concerning study systems, their articulation and length, integration among educational systems, processes of continuity and orientation (article 11, paragraph 1). Educational institutions that are characterized by innovation in teaching and organization (paragraph 2) can also be recognized.

Fourth Stage – 2001

The process of autonomization was perfected with the constitutional reform of Title V of Part II of the Constitution (Constitutional Law no. 3 of October 18, 2001) – with Silvio Berlusconi as Prime Minister (June 11, 2001–April 23, 2005) and Letizia Moratti as the Minister of Education – which legitimized, at a constitutional level, the recognition of autonomy to schools (article 117). From this moment on, the regulatory framework underlying autonomy established by the previous regulations became the starting point for any further development.

Fifth Stage – 2012

With the passing of law no. 35 of April 4, 2012 – with Mario Monti as Prime Minister (November 16, 2011–April 27, 2013) and Francesco Profumo as the Minister of Education – the autonomy of educational institutions was consolidated and developed by enhancing managerial autonomy according to criteria of flexibility and enhancing the responsibility and professionalism of the school staff. Therefore, guidelines were adopted in order to:

a) strengthen the autonomy of educational institutions, also through the eventual redefinition of the aspects connected to the transfer of resources, upon the beginning of a specific experimental project;
b) define, for each educational institution, a staff of autonomy, functional to the ordinary didactic, educational, administrative, technical and

auxiliary activities, to the needs of the development of excellence, of scholastic improvement, integration and support for pupils with special educational needs and of a plan for the needs of the school staff, also for the purpose of extending school time;

c) establish territorial networks among educational institutions, in order to achieve the optimal management of human, instrumental and financial resources;

d) set up a system that would make the staff stable for at least three years.

Sixth Stage – 2015

With the passing of law no. 107 of July 13, 2015 – with Matteo Renzi as Prime Minister (February 21, 2014–December 12, 2016) and Stefania Giannini as Minister of Education – the so-called "Good School", autonomy was recognized and extended further. In article 1, paragraph 3, forms of flexibility of educational and organizational autonomy, established in the Regulations of 1999, were reconfirmed to fully achieve the school curriculum, to enhance the students' potential and styles of learning, to enhance the value of the professional scholastic community, to establish collaboration and planning and to involve the families and the surrounding territory. In particular, the following aspects should be remembered:

- the modular distribution of the total yearly number of hours for each school subject, including activities and interdisciplinary teaching methods;
- the strengthening of school time even beyond the models of and managing of the time schedules, within the limits of what autonomy provides, considering the choices of the students and the families;
- the flexible plans of the entire curricular schedule for many weeks and that devoted to each single school subject, also by means of the distribution of the class group.

In order to fully implement the process of autonomization, the staff of autonomy was confirmed, in function of the educational, organizational and planning needs of the educational institutions as would emerge from the Three-Year Plan of the Educational Offer (Three-Year *POF*). Teachers within the staff of autonomy contribute to the implementation of the three-year plan by means of their activities of teaching, empowerment, support, organization, planning and coordination (paragraph 5).

To do this, the educational institutions must identify the need for posts within the autonomy staff in relation to the educational offer they intend to carry out, in compliance with the total number of teaching hours and taking into account the degree of autonomy of the curricula and the spaces of flexibility, as well as in reference to initiatives to strengthen the educational offer and project activities, in order to achieve the educational

objectives identified as priorities (paragraph 7). As an example, the law mentions:

- enhancement and strengthening of language skills, including those via the use of the methodology known as Content and Language Integrated Learning (CLIL);
- enhancement of mathematical-logical and scientific skills;
- enhancing practical skills in music and culture, in art and in the history of art, in cinema, etc.;
- the development of skills in the field of active and democratic citizenship by means of the enhancement of intercultural education and peace, respect for differences and dialogue among cultures; the enhancement of legal, economic and financial knowledge and education toward self-entrepreneurship;
- the development of responsible behavior inspired by knowledge and respect for legality, environmental sustainability;
- literacy in the art, techniques and media of the production and dissemination of images;
- the enhancement of motor disciplines;
- the development of students' digital skills;
- the enhancement of laboratory methods;
- preventing and combating the incidents of students dropping out of school, all forms of discrimination and bullying, including cyberbullying;
- the strengthening of the right to study for pupils with special educational needs and their integration into the school environment through individualized and personalized courses;
- the opening of the schools in the afternoon and the decrease in the number of pupils and students per class or in class groups, also with the enhancement of school time or the restructuring of the entire amount of school time;
- an increase in the alternation of school and work during the second cycle of instruction;
- the enhancement of individualized educational courses and of the involvement of students, etc.
- With the new law, the Plan of the Educational Offer (POF) is replaced by the Three-Year Plan of the Educational Offer (Three-Year POF): the fundamental document constituting the cultural identity and the plan of educational institutions which clearly establishes curricular, extracurricular, educational and organizational plans that individual schools adopt in the context of their autonomy (paragraph 14).

Appendix F

Questionnaire for Measuring Organizational Capabilities (For the Teaching and Administrative Staff)

School	
Name and surname of the person being interviewed	
Role	

Please express the degree of your agreement by assigning a value from 1 to 6 to the following statements
1 = completely disagree; 6 = completely in agreement (NA = I can't answer/not applicable)

INTERCONNECTION	1. Distributed leadership	I	Decision-making processes are widely distributed.	①②③④⑤⑥ NA
		II	I can influence decisions regarding my work.	①②③④⑤⑥ NA
	2. Internal networking	III	We have no ability to build good personal relationships within our workplace.	①②③④⑤⑥ NA
		IV	Our school has all the necessary tools to allow its employees to communicate efficiently.	①②③④⑤⑥ NA
	3. Cooperation	V	In our school the experienced people are willing to help the others.	①②③④⑤⑥ NA
		VI	In our school each collaborator always shares his or her skills and knowledge with colleagues when they request it.	①②③④⑤⑥ NA
	4. Integration	VII	We do not have a clear overall understanding of the roles and responsibilities of others.	①②③④⑤⑥ NA
		VIII	We are fully aware of those in the group who have skills and specialized knowledge relevant to our work.	①②③④⑤⑥ NA
	5. Orientation to the users/ stakeholders	IX	We work closely with our users (students, families) when we develop our offer.	①②③④⑤⑥ NA
		X	Our school is always ready and willing to listen to the needs and criticisms of the users.	①②③④⑤⑥ NA

REDUNDANCY	6. Functional redundancy	XI	In our school, employees have a large number of redundant skills that allow them to perform different activities effectively when and if necessary.	①②③④⑤⑥ NA
		XII	In our school collaborators are regularly rotated to various activities and given various responsibilities.	①②③④⑤⑥ NA
		XIII	In our school the description of tasks and responsibilities is not at all stringent.	①②③④⑤⑥ NA
	7. Cognitive redundancy	XIV	In our school employees regularly learn useful skills from their colleagues.	①②③④⑤⑥ NA
		XV	Our school provides employees with training programs that give them greater skills than those that are strictly necessary for their work.	①②③④⑤⑥ NA
		XVI	The development of competences, knowledge and skills of the staff is not recognized as a primary goal of the school.	①②③④⑤⑥ NA
	8. Information redundancy	XVII	Our school makes its "lessons learned" available to all employees.	①②③④⑤⑥ NA
		XVIII	In our school, if an organizational body (the council, the teaching group, a committee, the administrative staff, etc.) obtains important information, this is not promptly communicated to the other bodies or departments.	①②③④⑤⑥ NA
	9. Relational redundancy	XIX	Our school encourages employees to get answers from all organizational bodies in solving problems.	①②③④⑤⑥ NA
		XX	Our school motivates employees to create social relationships with colleagues from other organizational bodies.	①②③④⑤⑥ NA
SHARING	10. Value sharing	XXI	Collaborators are unable to describe the shared values of our school.	①②③④⑤⑥ NA
		XXII	In our school, behavior consistent with the organizational culture is rewarded.	①②③④⑤⑥ NA
	11. Strategic sharing	XXIII	The future direction of our school is clearly communicated to all.	①②③④⑤⑥ NA
		XXIV	Teachers manage to turn the vision into a passion.	①②③④⑤⑥ NA
		XXV	The strategy is expressed in clear objectives that are relevant to my work.	①②③④⑤⑥ NA

(Continued)

(Continued)

SHARING	12. Organizational sharing	XXVI	In our school, the members of the working team (project, department, etc.) cooperate in order to achieve the common goals.	①②③④⑤⑥ NA
		XXVII	The overall organizational atmosphere supports the activities and objectives of the committees.	①②③④⑤⑥ NA
		XXVIII	In our school, teams never use group discussions to review their thoughts.	①②③④⑤⑥ NA
	13. Trust	XXIX	There is a considerable degree of trust among the employees in this school.	①②③④⑤⑥ NA
		XXX	Relations with external partners are characterized by high degrees of trust (e.g., other educational and/or territorial agencies).	①②③④⑤⑥ NA
RESTRUCTURING	14. Innovation	XXXI	The school invests heavily in educational innovation and in the development of new services.	①②③④⑤⑥ NA
		XXXII	Our school has an organizational culture that allows its employees to take the initiative and occasionally make mistakes.	①②③④⑤⑥ NA
	15. Speed	XXXIII	The school is not able to carry out big changes quickly and effectively.	①②③④⑤⑥ NA
	16. External networking	XXXIV	Our school motivates its collaborators to create close social relationships with the collaborators of its educational partners (e.g., Community of Practice, partnerships, networks).	①②③④⑤⑥ NA
		XXXV	Our school has formalized systems to identify which potential educational partners (e.g., Communities of Practice, partnerships, networks) might be attractive to us.	①②③④⑤⑥ NA
	17. Reading the environment	XXXVI	Our school frequently monitors the external environment to identify new opportunities.	①②③④⑤⑥ NA
		XXXVII	The actions of our competitors are never monitored.	①②③④⑤⑥ NA
	18. Operational flexibility	XXXVIII	Our tools and our operating practices can be easily reset to create new services and products.	①②③④⑤⑥ NA

19.	Strategic flexibility	XXXIX	The school principal seeks to know the characteristics of the environment for the preparation of appropriate educational strategies for every possible present and future situation.	①②③④⑤⑥ NA
		XL	Our school has no difficulty in making the most of new opportunities.	①②③④⑤⑥ NA

Please note that questions III, VII, XVI, XVIII, XXI, XXVIII, XXXIII, XXXVII are control questions.

Appendix G

Organizational Structure of the Research: Questions, Project and Methodology

Introduction

In this Appendix the research questions are formulated and justified, the strategy by which the research was carried out and the methodology of the research is explained, that is, why the analysis was chosen for multiple case studies, how the cases were selected, how the sample was constructed, how the tools and protocols were developed, how the field research and data collection were conducted, and finally how the data was documented, coded and analyzed to test the hypotheses. The questionnaires for measuring the learning environments and the typical capabilities of self-organized schools were presented respectively in appendices D and F.

The Research Questions

The first question arises from due gaps pointed out in the literature:

1. No comprehensible organizational model exists of all the variables that make a learning environment innovative;
2. an assessment tool is missing that would make it possible to measure the degree of innovativeness of the environments, to classify the standard environments and the *best practices*. Therefore, the first question for the research was:

1. *How can the levels of innovation of the learning environments be measured?*

It is important to try to answer this question because it is appropriate for every school to know where it lies in its progress toward becoming an innovative learning environment, that is its becoming an effective environment (OECD, 2010a, 2013; Mitra and Dangwal, 2010; Williams *et al*., 2011). It is also important to understand what devices can be activated to develop those kinds of environments.

The second question arose from two more gaps inferred from the literature:

1. The lack of a comprehensive model of all the typical capabilities of self-organized schools, which takes into account other dimensions present in studies on self-organization in general (De Toni *et al.*, 2011);
2. A measurement tool that also allows schools to be ordered based on their ability to organize themselves. The second research question was therefore:

2. *How can the capabilities typical of self-organized schools be measured?*

It is important to answer this question because measurement makes it possible to relate innovative learning environments to the capabilities of self-organized schools and, specifically, to verify whether the perspective of self-organization can give an interpretative key to the development of innovative learning environments.

The third research question was therefore:

3. *Does a high degree of self-organized capability favor the development of innovative learning environments?*

The Research Project

The research project has a theoretical component (the study of the literature) and an empirical component (the study of Italian schools).

The first step is the analysis of the literature: the literature on innovative learning environments, Self-Organized Learning Environments and everything that is related to these aspects was taken into consideration – emergence and complexity in learning (see Sections 2.2 to 2.16). The analysis made a first identification of the research gaps possible.

Relatively dissatisfied with the literature on learning environments, international case studies were explored (see Section 2.17) – available only on the corresponding websites – which revealed realities in which there was innovation and self-organization on the part of students, teachers and networks of teachers, parents, schools and networks of schools, and the local community.

The study of the literature on learning environments and international case studies led to the construction of a framework with variables for measuring Learning Environments (see Section 2.18).

Thus, comparing the literature on self-organization in schools and organizations, a second framework emerged with the variables for the description of the capabilities of self-organized schools (see Section 5.5).

The empirical study therefore focused on 14 Italian schools, in which the variables of the framework for innovative learning environments and

the framework of the variables of the typical capabilities of self-organized schools were measured.

The Methodology of the Research

Table G.1shows the type of research, the variables examined, the case studies and the tools used, listed separately for each of the three research questions.

The case study method is generally used for:

- Exploring, or for generating ideas and research questions. Innovative learning environments are a subject that is yet today investigated very little and is not very well conceptualized. An exploration is needed for new investigations (Eisenhardt, 1989), to identify the crucial variables (Yin, 1994), to observe a phenomenon in its complexity (McCutcheon and Meredith, 1993; Yin, 1994). The case studies in the Italian realities allow us to discover the first elements of innovations, still little known, and to make the first hypotheses regarding the context of their realization, on their relationships, so as to be able to formulate significant research questions;
- Building a theory, or identifying and describing key variables, the field of application, possible relationships and forecasts. The case studies make it possible to discover some significant variables of innovative learning environments, as well as to hypothesize relationships with the capabilities of self-organized schools;
- Testing a theory, or providing empirical data to prove the hypotheses that were formulated. The data collected allowed us to measure learning environments and capabilities, and to check whether there were any relationships between them.

The survey followed the methodological phases of the research on case studies, as suggested by Voss *et al.* (2002).

Development of the Framework, Constructs and Questions

The starting point of the research was the framework and the research questions. In the construction of the theory, it was necessary to have "a first vision of the general constructs or categories that we intend to study and their relationships" (Voss *et al.*, 2002, 199). Miles and Huberman (1994) suggest the use of frameworks that identify key factors, constructs (concepts) and related variables.

In our research we hypothesized a link between the innovativeness of learning environments and the capabilities of self-organization. For each of the two elements a framework was identified divided into:

- actors, organization, learning and tools for innovative learning environments (Chapter 2);

Table G.1 The methodology of research

Type		*Variables*	*Selection of the Cases*	*Tools of Research*
Research question 1: *How can the levels of innovation of the learning environments be measured?*	Multiple case study for: • Exploration • Construction of the theory • Testing the theory	• Actors • Organization • Learning • Tools	14 cases selected by means of the following criteria: • reputation (experts from MIUR, *Invalsi*, *Indire*, etc.) • popularity • geographical distribution • variety • availability • efficiency of the research	• Analysis of the literature • Semi-structured and structured multi-phase interviews of: – school principals – project directors, assistant directors – teachers, – administrative, technical and auxiliary (ATA) staff • Personal observation • Documents: – Internal (e.g., website, financial statement) – External (e.g., MIUR) => Learning Environment Questionnaire
Research question 2: *How can the capabilities typical of self-organized schools be measured?*		• Interconnection • Redundancy • Sharing • Restructuring		• Analysis of the literature • Interviews structured as a questionnaire: – school principals – project directors, assistant directors – teachers, – administrative, technical and auxiliary (ATA) staff
Research question 3: *Does a high degree of self-organized capability favor the development of innovative learning environments?*	Multiple case study for: • Exploration • Testing the theory	• Learning environments • Capabilities that are typical of self-organized schools		• Learning Environment Questionnaire • Capability Questionnaire

- interconnection, redundancy, sharing, restructuring for the capabilities of self-organized schools (Chapter 5).

Choice of the Cases

The traditional way of choosing case studies (sampling) is to identify a population and choose a random sample; in this case the choice was only focused on the cases identified as innovative.

The sample examined was selected by means of six criteria:

a) Reputation: Some of the most authoritative people in the scholastic field were contacted, including senior officials from the Ministry of Education, University and Research (Marco Rossi Doria, former Undersecretary of Education, Mario Fierli, former General Superintendent), from the National Institute for the Evaluation of the Educational System of Education and Training (Dino Cristanini, former superintendent), from the National Institute of Documentation, Innovation and Educational Research (Antonella Zuccaro, researcher); professors and researchers from the Catholic University of Milan (Professor Lucio Guasti), from the University of Cagliari (Professor Silvano Tagliagambe), from the Salesian Pontifical University of Rome (Michele Pellerey, former rector), of the Salesian University Institute of Venice (Arduino Salatin, principal), from the University of Padua (Professor Corrado Petrucco), from the "La Sapienza" University of Rome (Professor Anna Maria Aiello), from the University of Verona (Professor Maurizio Gentile); various experts from the world of the school such as the Democratic Teachers Initiative Center (Walter Moro), the Italian Teachers and Principals Association, the National Association of School Principals (Cinzia Mion, National Vice-President), the Centers for the Practice of Methods of Active Education (CEMEA), the Movement for Educational Cooperation, the Pegaso Study Center (Professor Franco Azzali).
b) Popularity: Some schools are known among the mass media (TG Dossier, Quark, Mtv, La Repubblica).
c) Geographical distribution: the realities chosen are mainly from northern Italy (10), Central Italy (2) and Southern Italy (2). Two associations are also described, both from the South (see Table 6.1).
d) Variety of schools: the sample examined (14 comprehensive institutes) represents all of the types of schools, with the exception of vocational schools, for a total of 26 schools (see Table 6.1): nursery schools (6), primary schools (6), junior high schools (5), high schools (5), technical institutes (3), professional institutes (0), international schools (1).
e) Availability: most of the schools were willing and available for observation, interviews and the completion of questionnaires.
f) Efficiency of the research: there are some more or less positive cases. According to Miles and Huberman (1994), there are three important

aspects in the research by case studies: to find (1) an exemplary case; (2) a negative case that falsifies the hypothesis; (3) an exceptional or a divergent case.

Development of the Research Tools and Protocols, and Carrying Out the Research

The reliability and validity of the research are improved through a well-designed research protocol: A protocol contains, in addition to the tools, also the procedures for the use of the tools (Yin, 1994).

In the first exploratory phase a procedure is used, common in these cases, called the "funnel" model (Voss *et al.*, 2002, 205): this starts with open questions – to allow the informant to tell stories and express opinions, and the researcher to collect multiple perspectives – and as the interview continues the questions become more and more focused. In the research at hand at first contact, we presented the objective of the research and what we mean by "innovative learning environment" referring to the OECD's definition (Istance, 2010); then we asked the interviewees to describe their learning environment, their history, the genesis of the idea, what aspects of the school stood out for their innovativeness; then, having identified the characteristics of the environments, we tried to identify the variables involved and the organizational conditions of their success.

In a second phase, the questions were detailed and with a yes-no answer. Two questionnaires were used:

1) The first questionnaire (in Appendix D) concerned learning environments and consisted of 51 questions that measured the 22 variables identified;
2) The second questionnaire (in Appendix F) concerned the measurement of self-organization capabilities and consisted of 40 questions that measured 4 macro-capabilities (interconnection, redundancy, sharing, restructuring) expressed in 19 meso-capabilities.

To avert the problem of objectivity and reliability of data, different sources were used: "A principle underlying the collection of data in case study research is triangulation, the use and combination of different study methods to study the same phenomenon" (Voss *et al.*, 2002, 206). These sources are described below:

- The above-mentioned questionnaires.
- Interviews with school principals, vice-principals, project leaders, teachers and non-scholastic staff. Regarding the framework on learning environments, at least two interviews were conducted face-to-face per case study: a principal and/or a teacher and/or a non-teaching staff member, for two reasons: 1) for some answers the principal did not have all the

required information; 2) there was the risk of the partial truthfulness/objectivity of the interviewees (Voss *et al.*, 2002, 205). Both during the unstructured and during the structured interviews the authors chose to fill out the questionnaires as the interviewees gave their answers in order to avoid misunderstanding the questions, underestimation and random filling-out.

- Documentary sources, of an internal nature, such as the school website, the budget for economic and financial data, the annual report (if drafted), various documents from the project leaders and administrative directors; of an external nature, for example the data available from the Ministry of Education; in some cases the local or national press was also considered.
- Personal observations, informal conversations and participation in events.

Data Documentation and Coding

The data were collected and codified, the interviews transcribed and the results of the survey were summarized in the tables of Appendix I (learning environments) and Appendix H (organizational capabilities).

Data Analysis, Development and Testing of the Hypotheses

The analysis was conducted following the indications of Eisenhardt (1989), Miles and Huberman (1994) and Voss *et al.* (2002). In particular, Eisenhardt (1989) suggests two phases of the analysis: within-case data analysis and cross-case analysis. The analysis of the correlation between the degree of innovativeness of learning environments and the self-organizing capabilities made it possible to carry out a comparative analysis of the cases.

Appendix H

Measurement of the Learning Environment and of the Capabilities for Each of the 14 Schools

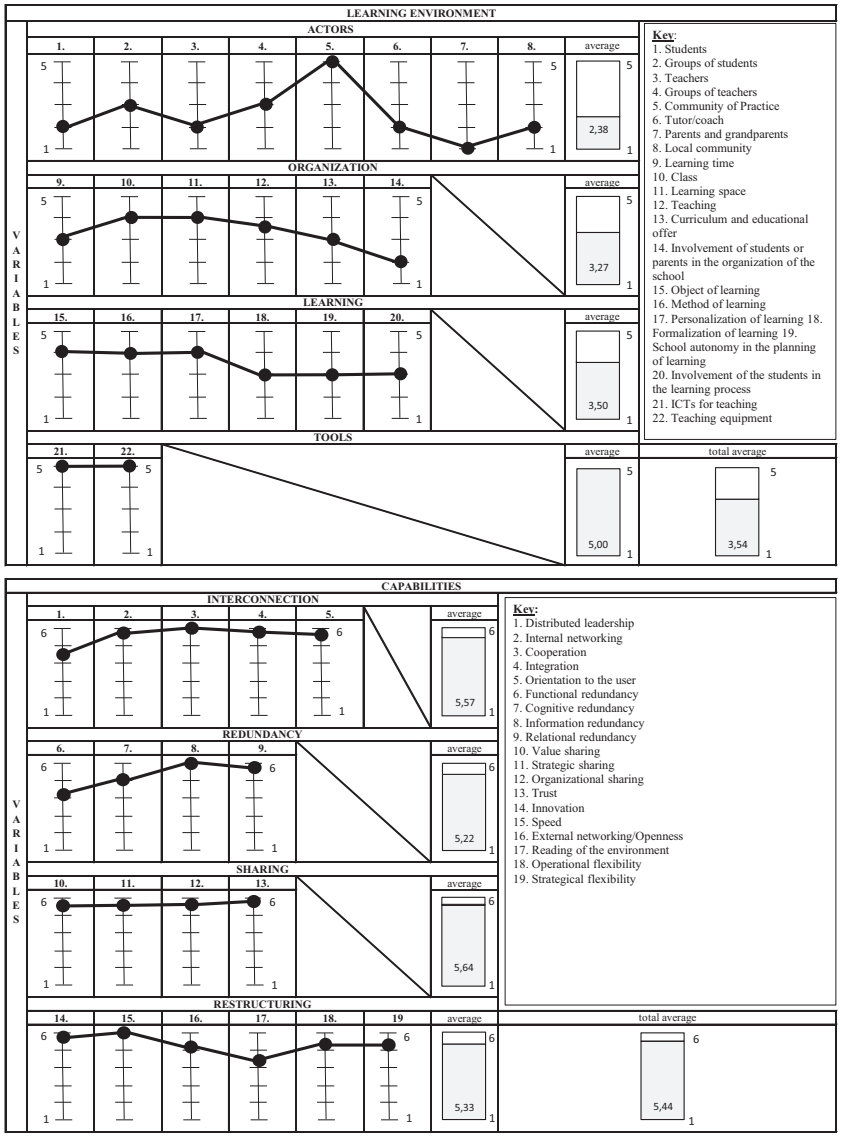

Figure H.1 The Learning Environment and the Capabilities of the "Majorana" State High School in Brindisi (case study no. 4)

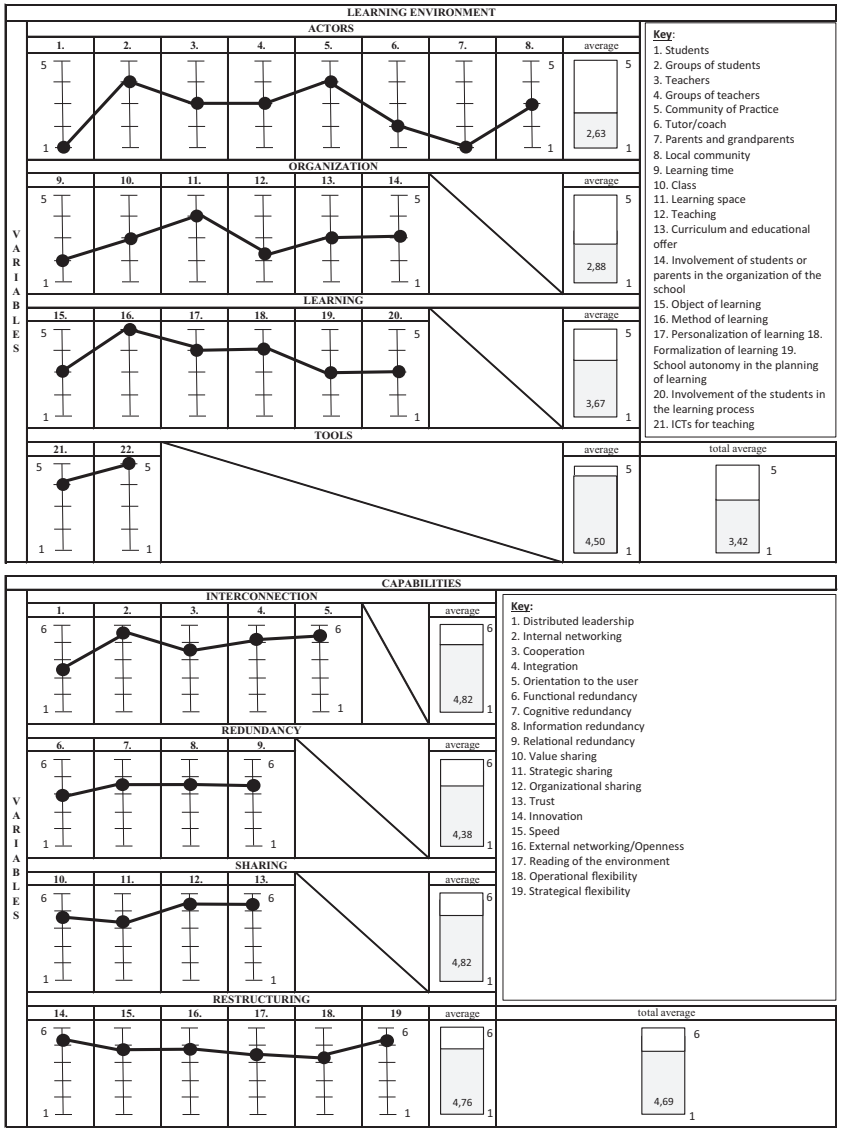

Figure H.2 The Learning Environment and the Capabilities of the "Fermi" State High School in Mantua (case study no. 5)

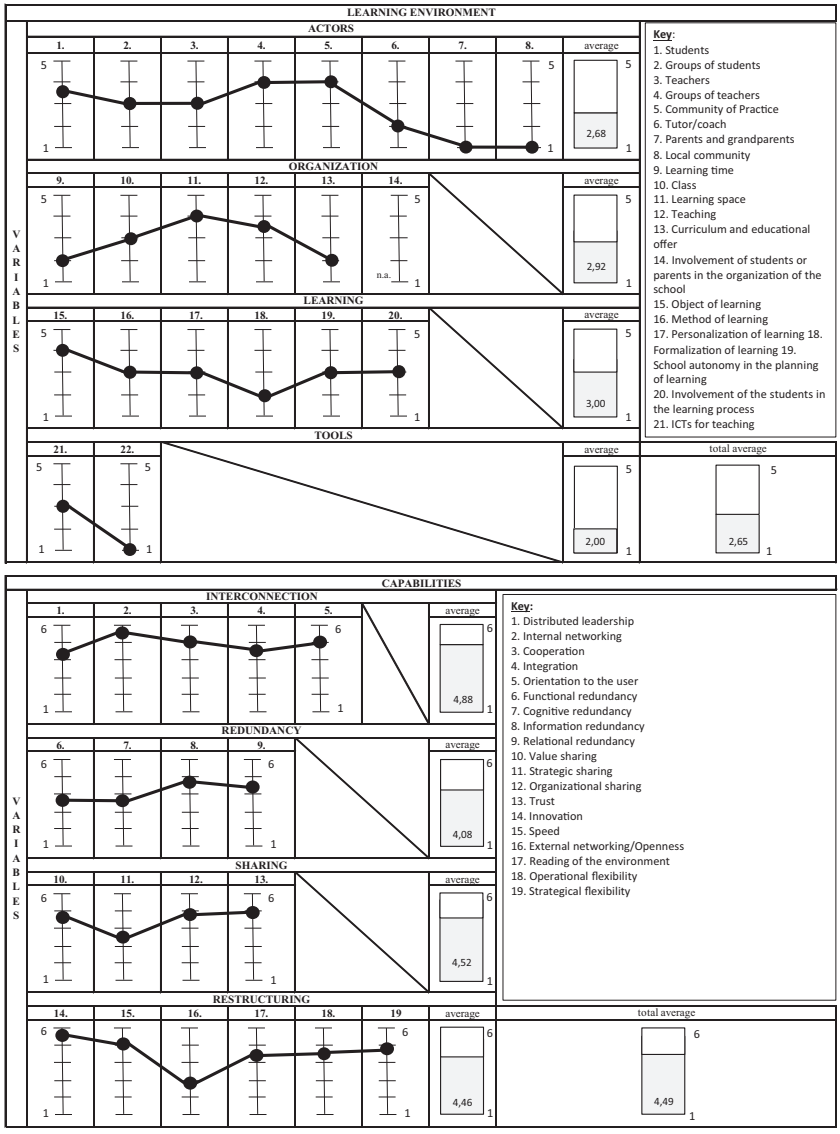

Figure H.3 The Learning Environment and the Capabilities of the "Gioia" State High School in Piacenza (case study no. 2)

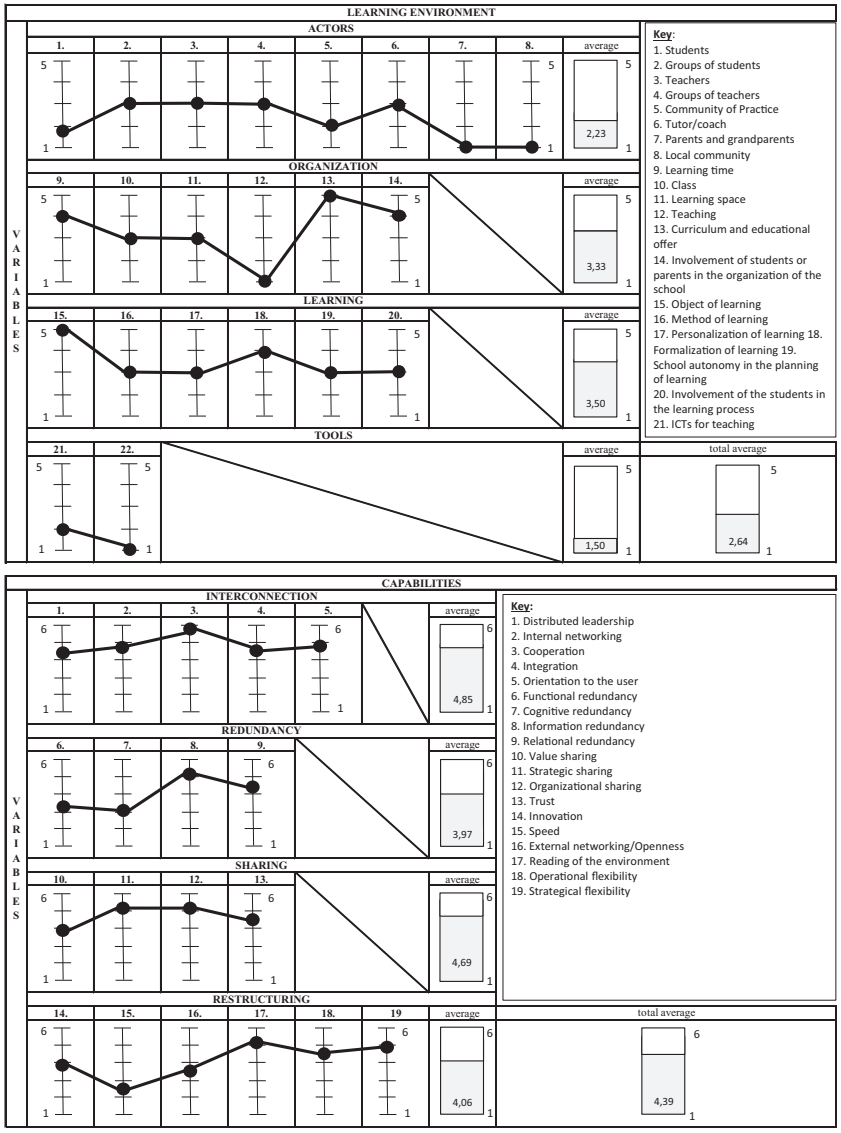

Figure H.4 The Learning Environment and the Capabilities of the "Collegio del Mondo Unito" (United World College) School in Duino (case study no. 7)

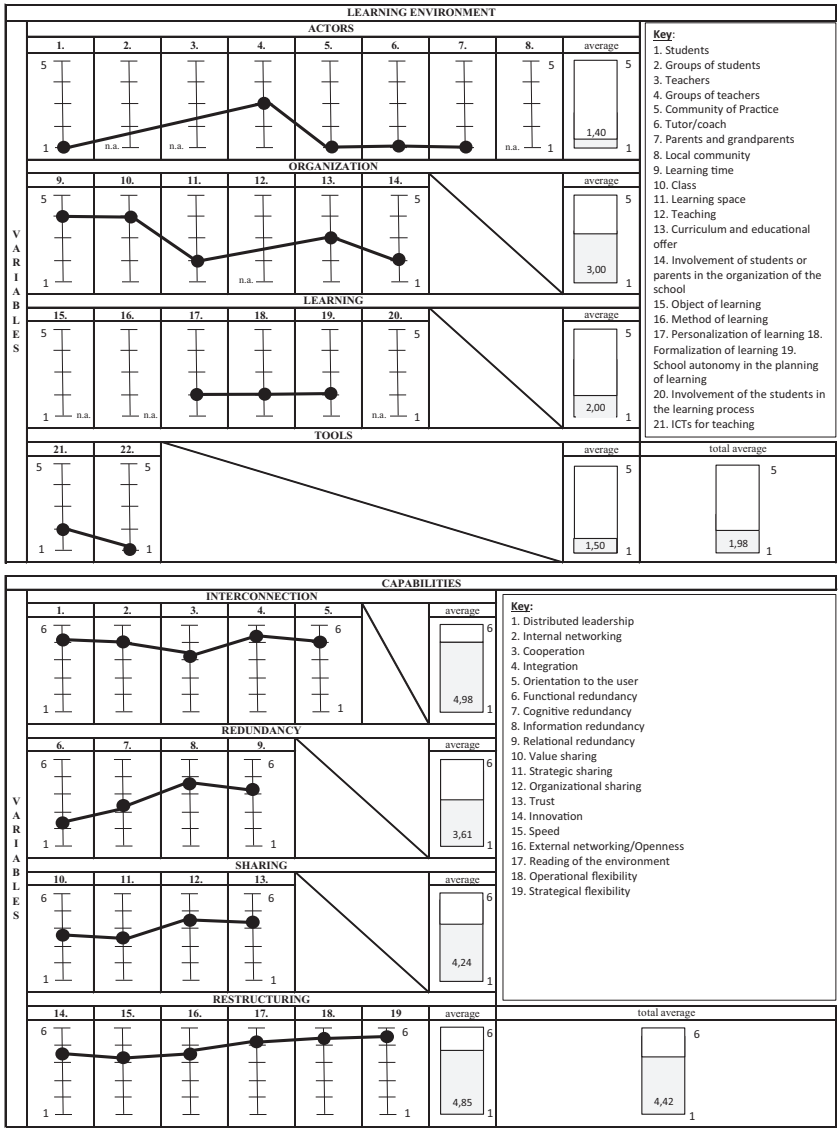

Figure H.5 The Learning Environment and the Capabilities of the "Russell" State High School in Cles (case study no. 3)

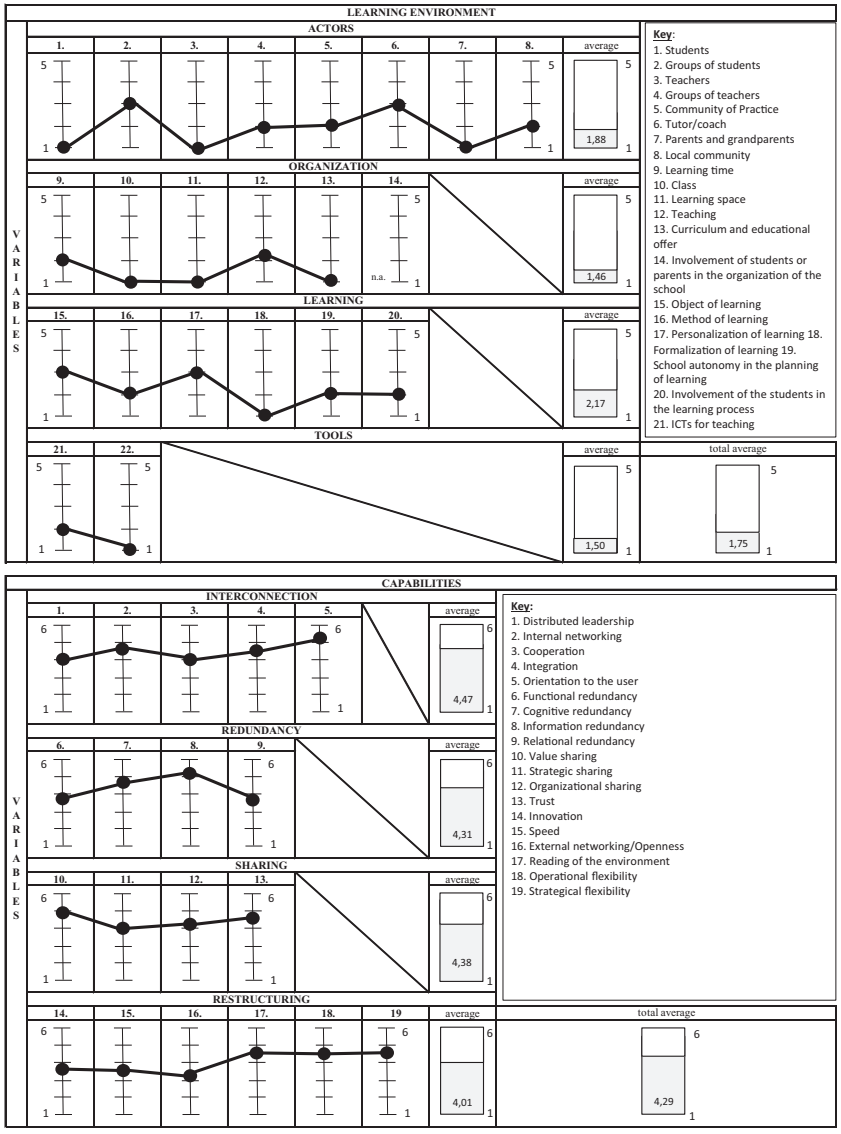

Figure H.6 The Learning Environment and the Capabilities of the "Piazzi Lena Perpenti" State High School in Sondrio (case study no. 1)

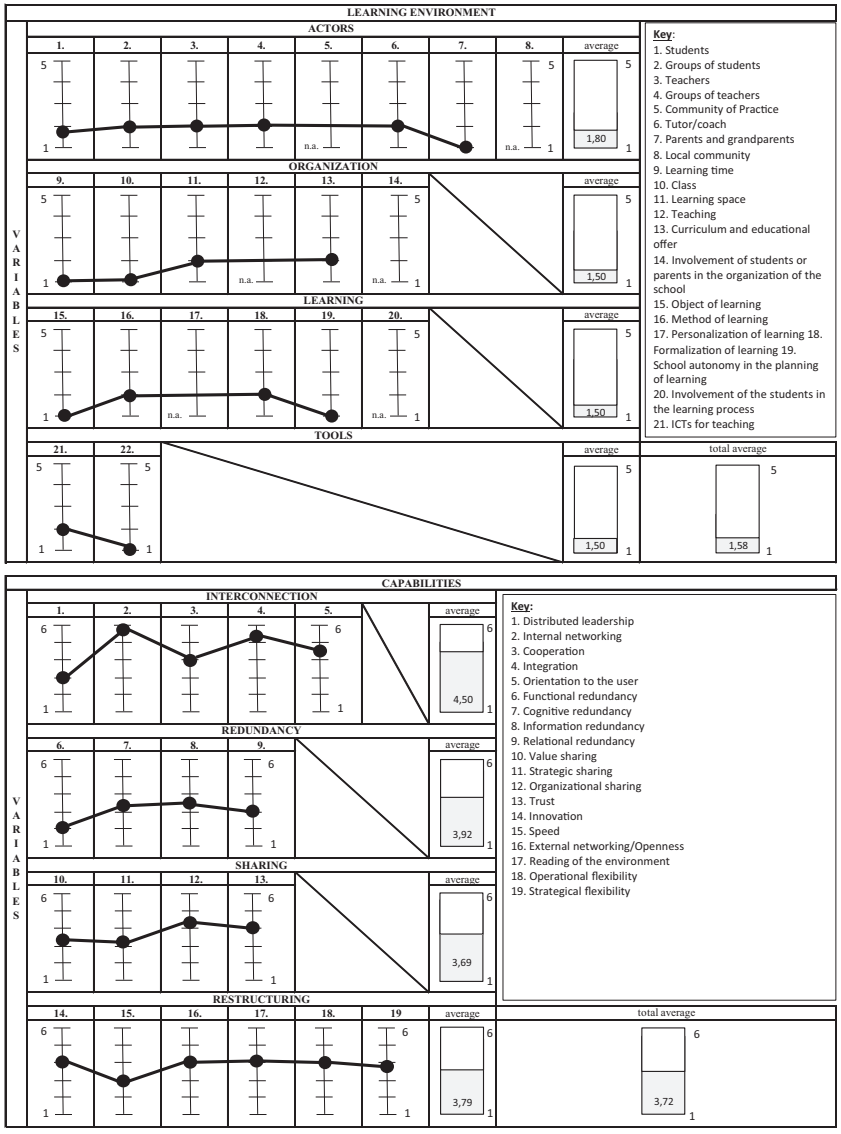

Figure H.7 The Learning Environment and the Capabilities of the "Barsanti" State Technological Institute in Castelfranco Veneto (case study no. 6)

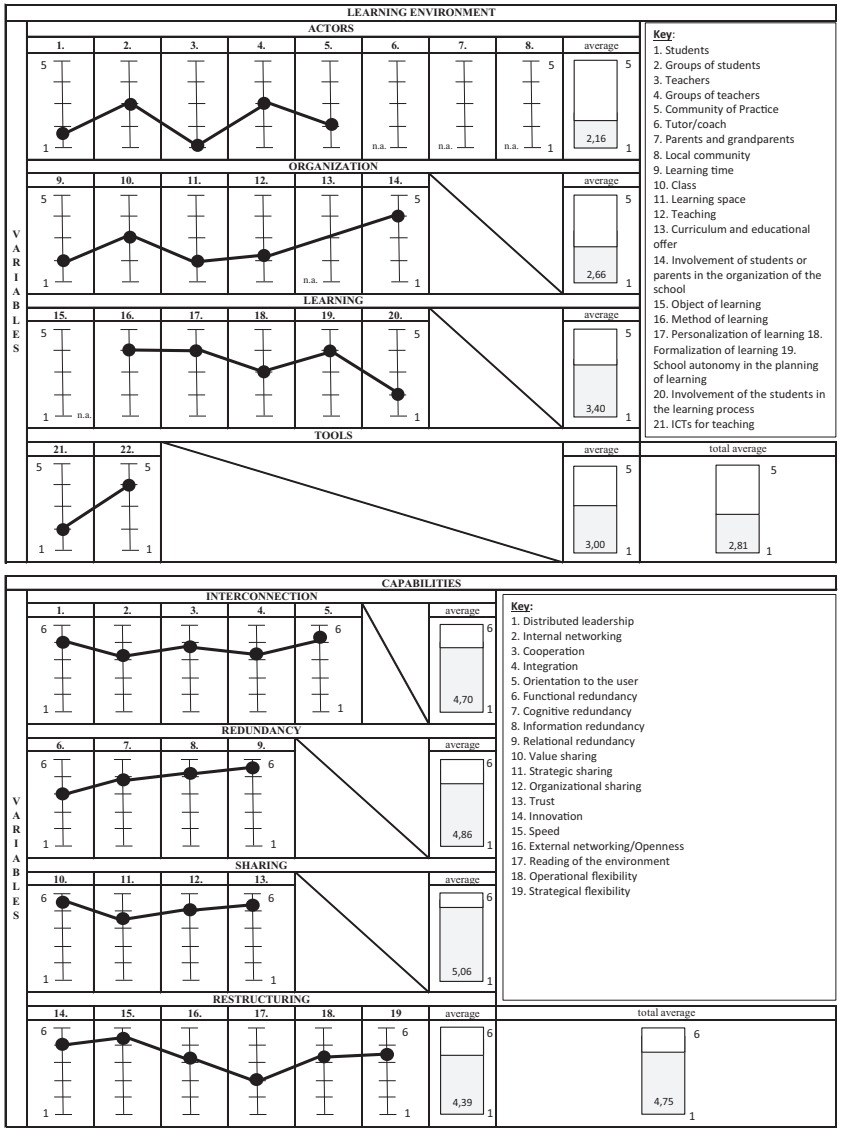

Figure H.8 The Learning Environment and the Capabilities of the "Randi" Comprehensive Institute in Ravenna (case study no. 13)

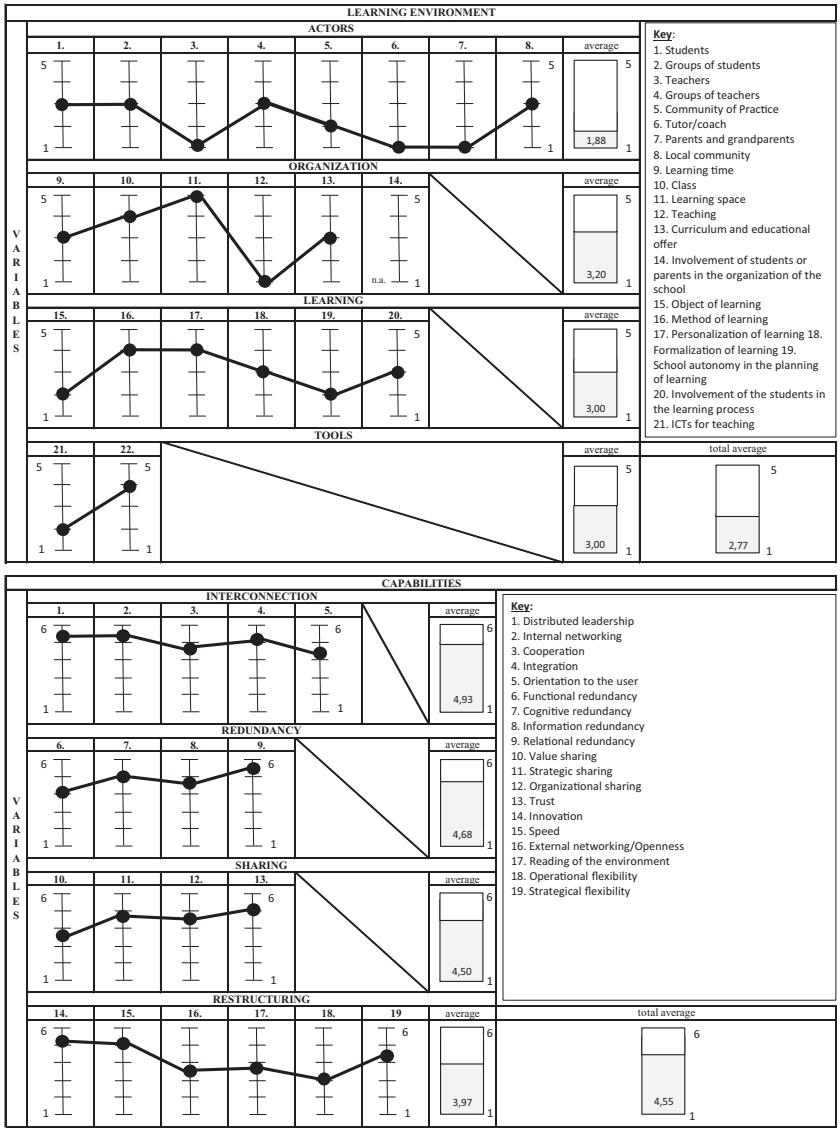

Figure H.9 The Learning Environment and the Capabilities of the Comprehensive Institute in Montespertoli (case study no. 10)

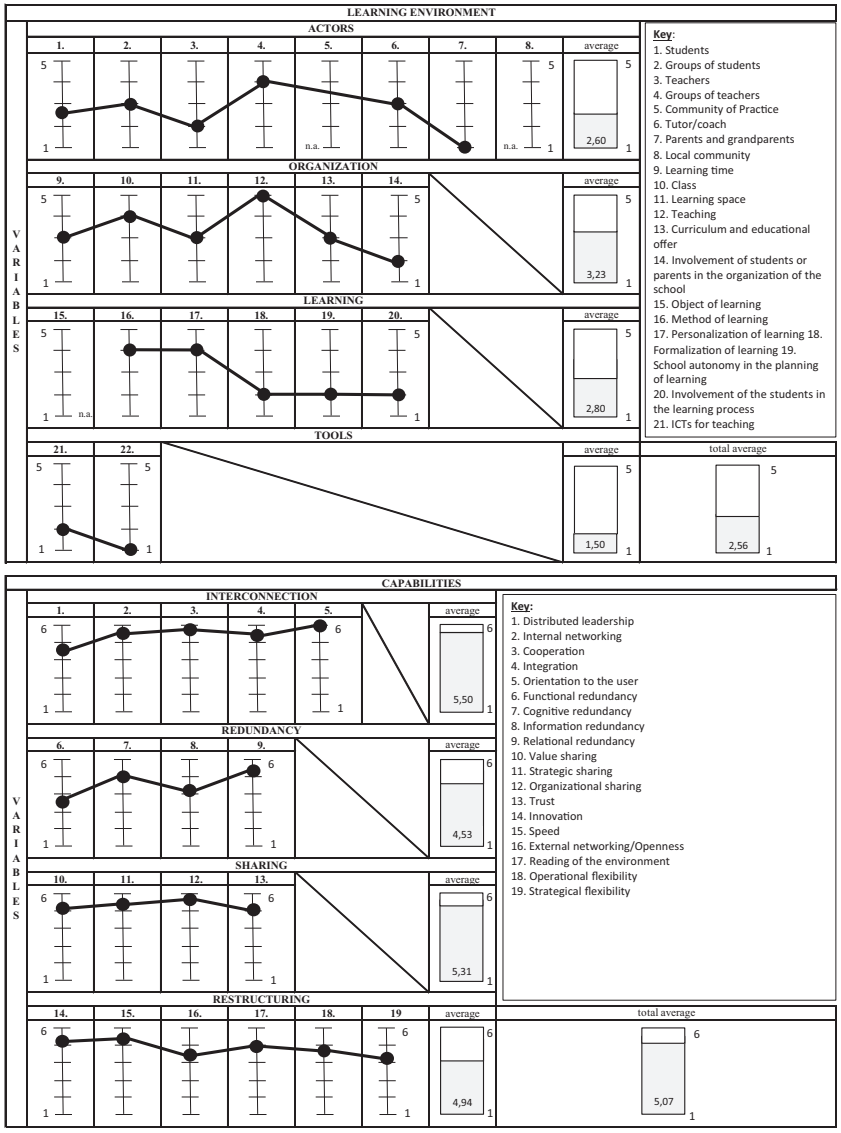

Figure H.10 The Learning Environment and the Capabilities of the "CEIS" School in Rimini (case study no. 14)

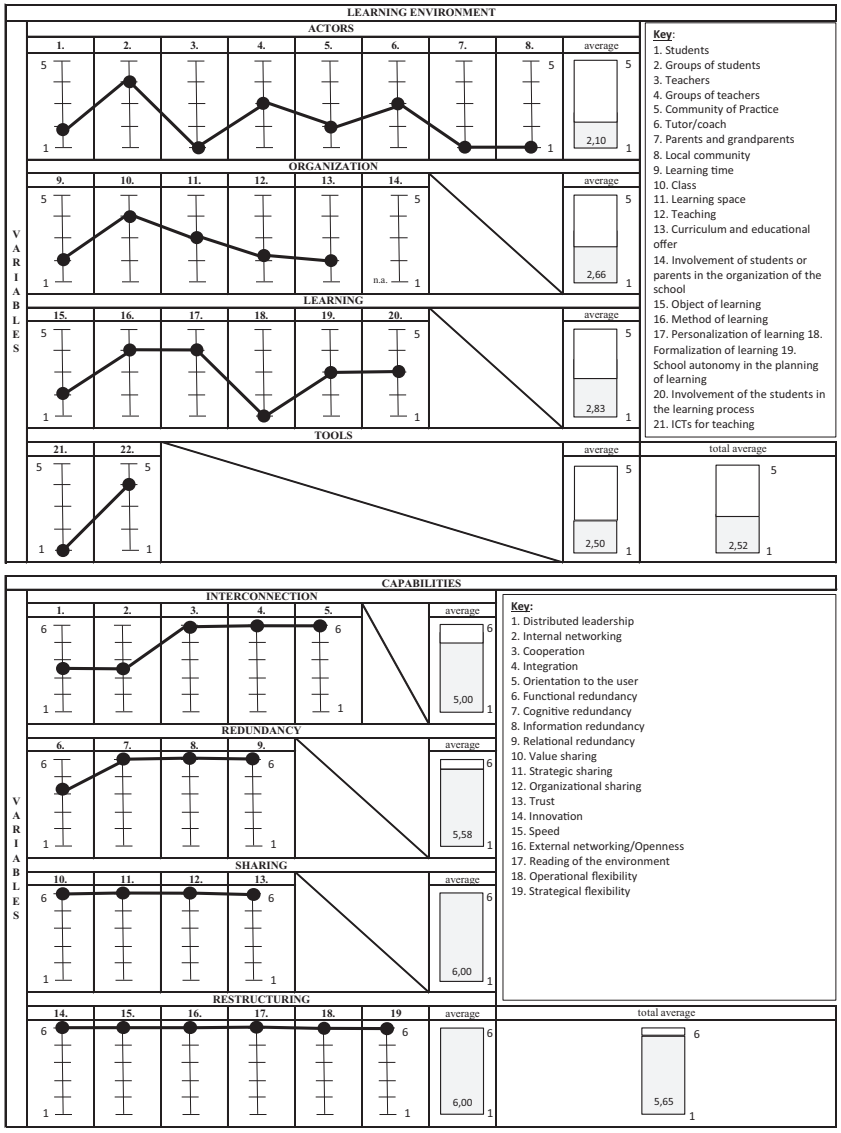

Figure H.11 The Learning Environment and the Capabilities of the "eSpazia" Comprehensive Institute in Monterotondo (case study no. 11)

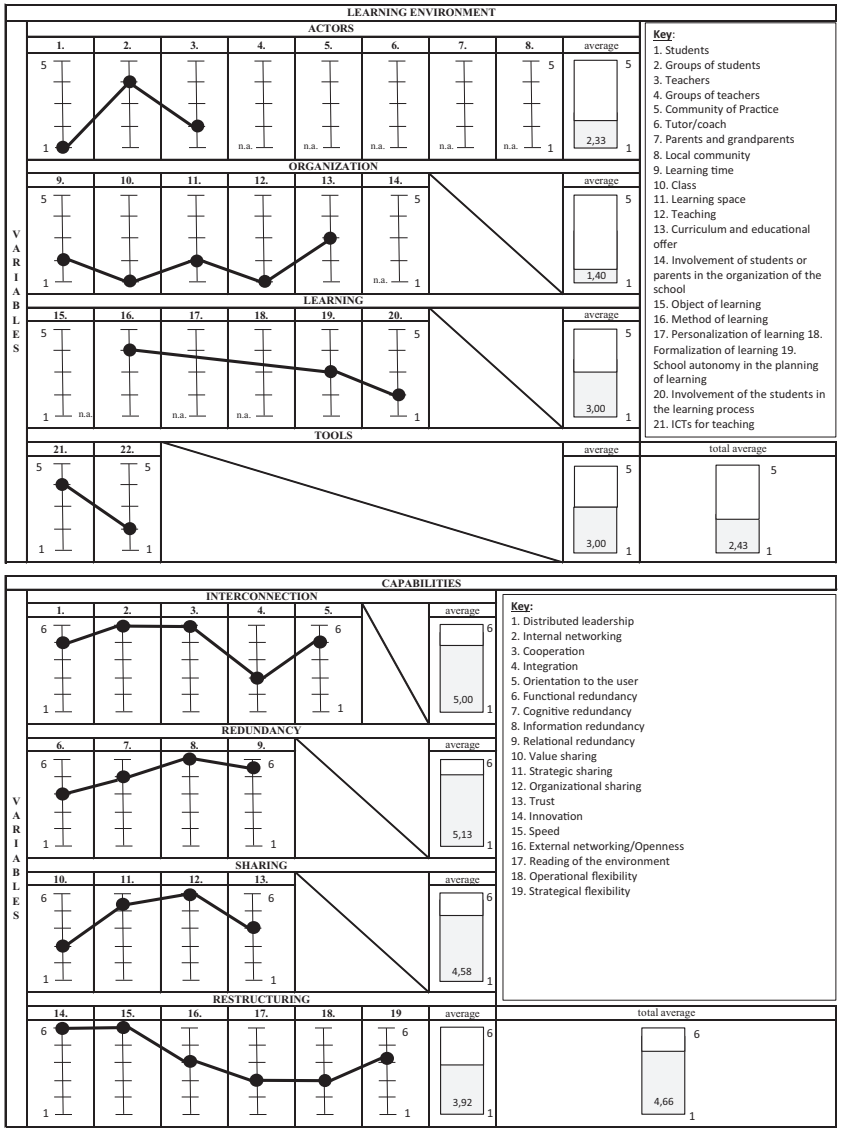

Figure H.12 The Learning Environment and the Capabilities of the "Marconi" Junior High School in Modena (case study no. 8)

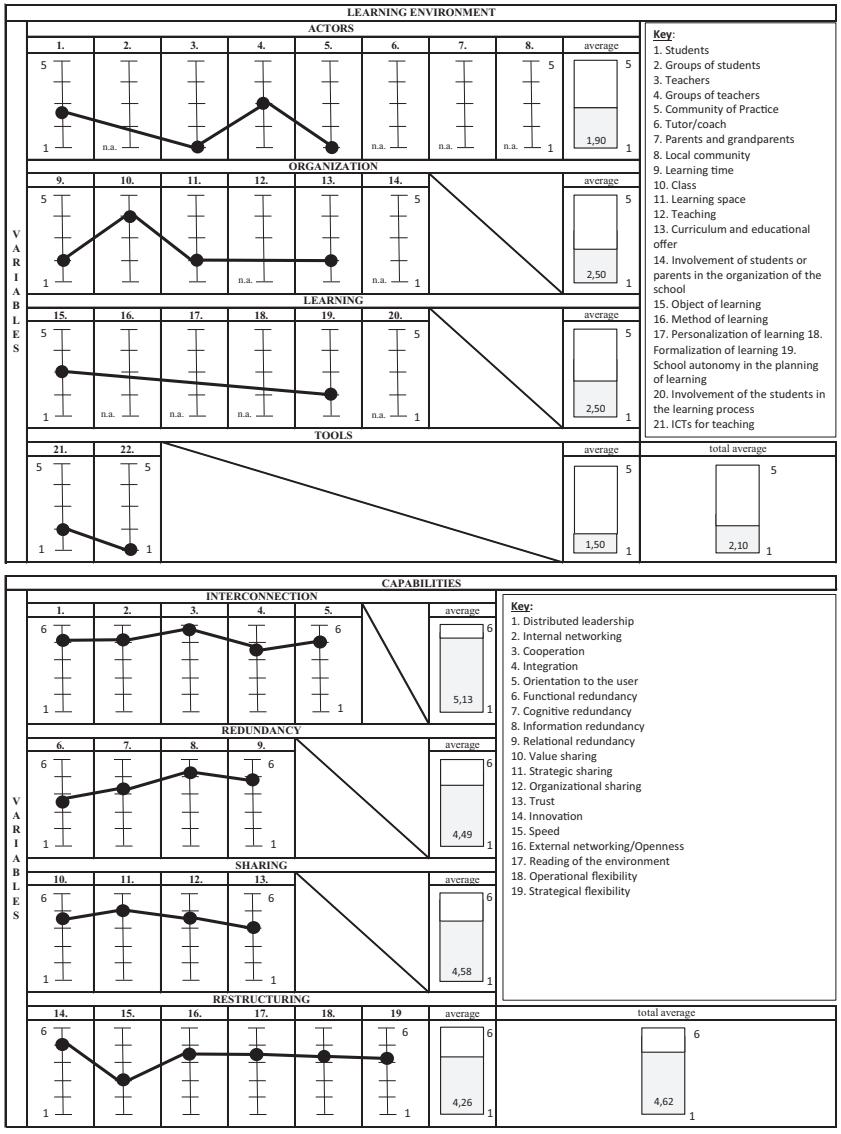

Figure H.13 The Learning Environment and the Capabilities of the "Giovanni XXIII" Comprehensive Institute in Tricesimo (case study no. 12)

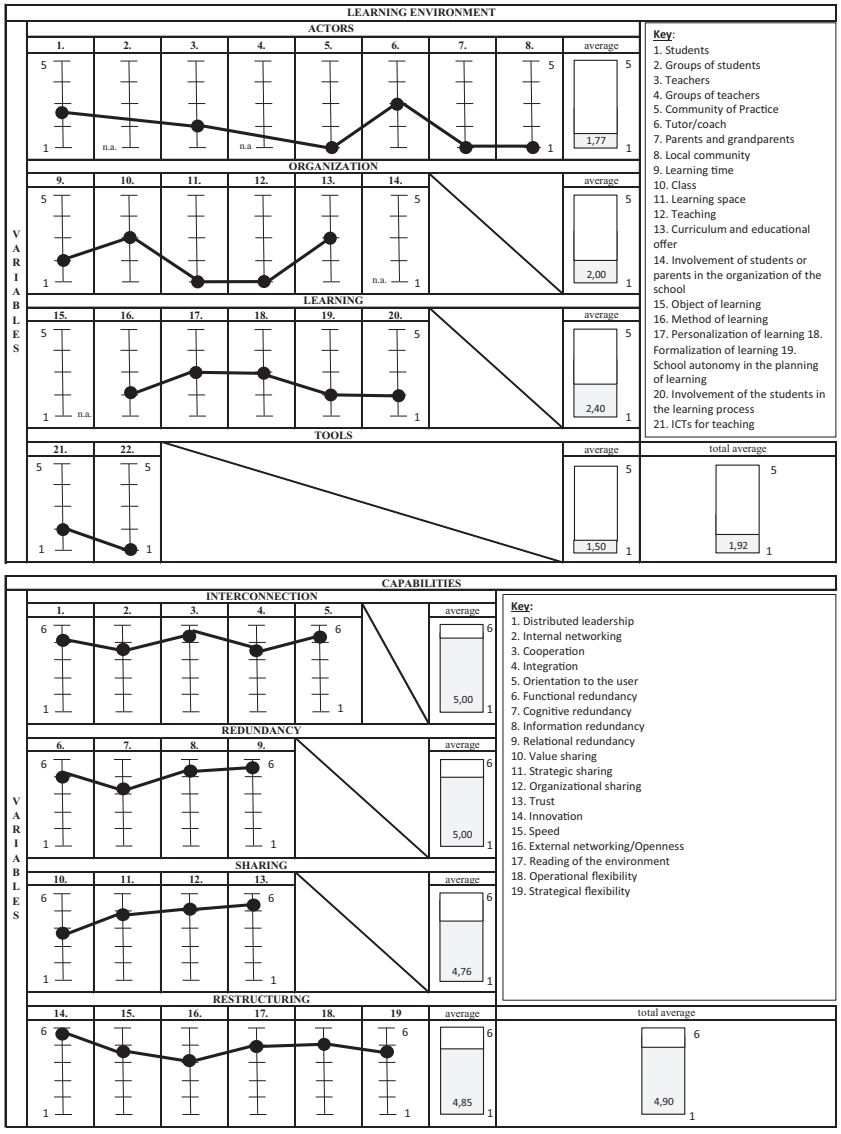

Figure H.14 The Learning Environment and the Capabilities of the "Ristori" Comprehensive Institute in Naples (case study no. 9)

Appendix I

Comparison of the Measurements of the Learning Environments in the 14 Schools

Table I.1 Average results of the measurement of the innovativeness of learning environments collected in the four categories

Case Study		*Actors*	*Organization*	*Learning*	*Tools*	*Total Average*
No.	*Name*					
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	1.88	1.46	2.17	1.50	1.75
2	**"Gioa" State High School in Piacenza**	2.68	2.92	3.00	2.00	2.65
3	**"Russell" State High School in Cles (Province of Trento)**	1.40	3.00	2.00	1.50	1.98
4	**"Majorana" State High School in Brindisi**	2.38	3.27	3.50	5.00	3.54
5	**"Fermi" State High School in Mantua**	2.63	2.88	3.67	4.50	3.42
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	1.80	1.50	1.50	1.50	1.58
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	2.23	3.33	3.50	1.50	2.64
8	**"Marconi" Junior High School in Modena**	2.33	1.40	3.00	3.00	2.43
9	**"Ristori" Comprehensive Institute in Naples**	1.77	2.00	.40	1.50	1.92
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	1.88	3.20	3.00	3.00	2.77
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	2.10	2.66	2.83	2.50	2.52
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	1.90	2.50	2.50	1.50	2.10
13	**"Randi" Comprehensive Institute in Ravenna**	2.16	2.66	3.40	3.00	2.81
14	**"CEIS" in Rimini**	2.60	3.33	2.80	1.50	2.56
	TOTAL AVERAGE OF THE 14 CASES	2.12	2.58	2.80	2.39	2.47

Table I.2 Results of the measurement of the eight variables in Category A: actors of learning

Case Study		*Actors*								
No.	***Name***	***1. Students*** *(Source: OECD, 2013)*	***2. Working groups of students*** *(Source: Istance, 2010; Mitra, 2005)*	***3. Teachers*** *(Source: OECD, 2013)*	***4. Working groups of teachers*** *(Wald and Castleber-ry, 2000; Istance, 2010; OECD, 2013)*	***5. Community of Practice*** *(Source: Wenger, 1998; Williams* et al.*, 2011)*	***6. Tutoring*** *(Source: Mitra, Dangwal, 2010; OECD, 2013)*	***7. Involvement of parents or grand-parents*** *(Source: Mitra, Dangwal, 2010; OECD, 2013)*	***8. Involvement of the local community*** *(Source: Scheerens, 2004; OECD, 2013)*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	1	3	1	2	2	3	1	2	1.88
2	**"Gioa" State High School in Piacenza**	3.4	3	3	4	4	2	1	1	2.68
3	**"Russell" State High School in Cles (Province of Trento)**	1	n.a.	n.a.	3	1	1	1	n.a.	1.40
4	**"Majorana" State High School in Brindisi**	1	3	2	3	5	2	1	2	2.38
5	**"Fermi" State High School in Mantua**	1	4	3	3	4	2	1	3	2.63
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	1.8	2	2	2	n.a.	2	1	n.a.	1.80
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	1.8	3	3	3	2	3	1	1	2.23
8	**"Marconi" Junior High School in Modena**	1	4	2	n.a.	n.a.	n.a.	n.a.	n.a.	2.33

9	**"Ristori" Comprehensive Institute in Naples**	2.6	n.a.	2	n.a.	1	3	1	1	1.77
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	1	3	1	3	2	1	1	3	1.88
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	1.8	4	1	3	2	3	1	1	2.10
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	2.6	n.a.	1	3	1	n.a.	n.a.	n.a.	1.90
13	**"Randi" Comprehensive Institute in Ravenna**	1.8	3	1	3	2	n.a.	n.a.	n.a.	2.16
14	**"CEIS" in Rimini**	2.6	3	2	4	n.a.	3	1	n.a.	2.60
	TOTAL AVERAGE OF THE 14 CASES	1.74	3.18	1.85	3.00	2.36	2.27	1.00	1.75	2.12

Table I.3 Results of the measurement of the six variables in Category B: organization of learning

Case Study		*Organization*						
No.	***Name***	***9. Learning time*** *(Source: Ramboll Management, 2004; OECD, 2013)*	***10. Class*** *(Source: OECD, 2013; Blended Learning; School of One)*	***11. Learning space*** *(Source: OECD, 2013; School of One)*	***12. Teaching*** *(Source: OECD, 2013)*	***13. Curriculum and Educational Offer*** *(Source: Self-managed High School in Paris, Homeschoo-ling)*	***14. Involvement of students or parents in the organization of the school*** *(Source: Self-managed High School in Paris)*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	2	1	1	2.3	1	n.a.	1.46
2	**"Gioa" State High School in Piacenza**	2	3	4	3.6	2	n.a.	2.92
3	**"Russell" State High School in Cles (Province of Trento)**	4	4	2	n.a.	3	2	3.00
4	**"Majorana" State High School in Brindisi**	3	4	4	3.6	3	2	3.27
5	**"Fermi" State High School in Mantua**	2	3	4	2.3	3	3	2.88
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	1	1	2	n.a.	2	n.a.	1.50
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	4	3	3	1	5	4	3.33
8	**"Marconi" Junior High School in Modena**	2	1	2	1	1	n.a.	1.40

9	**"Ristori" Comprehensive Institute in Naples**	2	3	1	1	3	n.a.	2.00
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	3	4	5	1	3	n.a.	3.20
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	2	4	3	2.3	2	n.a.	2.66
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	2	4	2	n.a.	2	n.a.	2.50
13	**"Randi" Comprehensive Institute in Ravenna**	2	3	2	2.3	n.a.	4,00	2.66
14	**"CEIS" in Rimini**	3	4	3	5	3	2	3.33
	TOTAL AVERAGE OF THE 14 CASES	2.43	3.00	2.71	2.31	2.54	2.83	2.58

Table I.4 Results of the measurement of the six variables in Category C: learning

Case Study		*Learning*						
No.	***Name***	***15. Object of learning*** *(Source: OECD, 2013)*	***16. Method of learning: Class time devoted to innovative teaching methods*** *(Source: OECD, 2013)*	***17. Personalization of learning: School time devoted to individualized and personalized teaching methods*** *(Source: Istance, 2010; Blended Learning; School of One; Homeschoo-ling)*	***18. Formalization of learning: School time devoted to either non-formal or informal contexts of learning*** *(Source: Istance, 2010; OECD, 2013; Mitra, 2010)*	***19. Scholastic autonomy in the planning of learning*** *(Source: Williams* et al.*, 2011)*	***20. Involvement of students in the process of learning*** *(Source: Mitra, 2010; Williams* et al.*, 2011; OECD, 2010a)*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	3	2	3	1	2	2	2.17
2	**"Gioa" State High School in Piacenza**	4	3	3	2	3	3	3.00
3	**"Russell" State High School in Cles (Province of Trento)**	n.a.	n.a.	2	2	2	n.a.	2.00
4	**"Majorana" State High School in Brindisi**	4	4	4	3	3	3	3.50
5	**"Fermi" State High School in Mantua**	3	5	4	4	3	3	3.67
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	1	2	n.a.	2	1	n.a.	1.50
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	5	3	3	4	3	3	3.50
8	**"Marconi" Junior High School in Modena**	n.a.	4	n.a.	n.a.	3	2	3.00

9	**"Ristori" Comprehensive Institute in Naples**	n.a.	2	3	3	2	2	2.40
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	2	4	4	3	2	3	3.00
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	2	4	4	1	3	3	2.83
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	3	n.a.	n.a.	n.a.	2	n.a.	2.50
13	**"Randi" Comprehensive Institute in Ravenna**	n.a.	4	4	3	4	2	3.40
14	**"CEIS" in Rimini**	n.a.	4	4	2	2	2	2.80
	TOTAL AVERAGE OF THE 14 CASES	3.00	3.42	3.45	2.50	2.50	2.55	2.80

Table I.5 Results of the measurement of the two variables in Category D: tools

Case Study		*Tools*		
No.	***Name***	***21. ICTs for teaching*** *(Source: OECD, 2013; Blended Learning; School of One; Homeschooling)*	***22. Teaching equipment*** *(Source: School of One)*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	2	1	1.50
2	**"Gioa" State High School in Piacenza**	3	1	2.00
3	**"Russell" State High School in Cles (Province of Trento)**	2	1	1.50
4	**"Majorana" State High School in Brindisi**	5	5	5.00
5	**"Fermi" State High School in Mantua**	4	5	4.50
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	2	1	1.50
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	2	1	1.50
8	**"Marconi" Junior High School in Modena**	4	2	3.00
9	**"Ristori" Comprehensive Institute in Naples**	2	1	1.50
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	2	4	3.00
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	1	4	2.50
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	2	1	1.50
13	**"Randi" Comprehensive Institute in Ravenna**	2	4	3.00
14	**"CEIS" in Rimini**	2	1	1.50
	TOTAL AVERAGE OF THE 14 CASES	2.50	2.29	2.39

Appendix J

Comparison of the Measurements of the Organizational Capabilities of the 14 Schools

Table J.1 Average results of the measurement of the organizational capabilities

Case Study		*Interconnection*	*Redundancy*	*Sharing*	*Restructuring*	*Total Average*
No.	*Name*					
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	4.47	4.31	4.38	4.01	4.29
2	**"Gioa" State High School in Piacenza**	4.88	4.08	4.52	4.46	4.49
3	**"Russell" State High School in Cles (Province of Trento)**	4.98	3.61	4.24	4.85	4.42
4	**"Majorana" State High School in Brindisi**	5.57	5.22	5.64	5.33	5.44
5	**"Fermi" State High School in Mantua**	4.82	4.38	4.82	4.76	4.69
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	4.50	2.92	3.69	3.79	3.72
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	4.85	3.97	4.69	4.06	4.39
8	**"Marconi" Junior High School in Modena**	5.00	5.13	4.58	3.92	4.66

Case Study		*Interconnection*	*Redundancy*	*Sharing*	*Restructuring*	*Total Average*
No.	*Name*					
9	**"Ristori" Comprehensive Institute in Naples**	5.00	5.00	4.76	4.85	4.90
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	4.93	4.78	4.50	3.97	4.55
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	5.00	5.58	6.00	6.00	5.65
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	5.13	4.49	4.58	4.26	4.62
13	**"Randi" Comprehensive Institute in Ravenna**	4.70	4.86	5.06	4.39	4.75
14	**"CEIS" in Rimini**	5.50	4.53	5.31	4.94	5.07
	TOTAL AVERAGE 14 CASES	4.95	4.49	4.77	4.54	4.69

Notes: *2 interviewees; **1 interviewee

Table J.2 Results of the measurement of the five variables of organizational capability: interconnection

Case Study		*Interconnection*					
No.	*Name*	*1. Distributed Leadership*	*2. Internal networking*	*3. Cooperation*	*4. Integration*	*5. Orientation to the users/ stakeholders*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	4.00	4.67	4.00	4.50	5.17	4.47
2	**"Gioa" State High School in Piacenza**	4.20	5.60	5.00	4.60	5.00	4.88
3	**"Russell" State High School in Cles (Province of Trento)**	5.13	5.00	4.25	5.50	5.00	4.98
4	**"Majorana" State High School in Brindisi**	4.50	5.83	6.00	5.83	5.67	5.57
5	**"Fermi" State High School in Mantua**	3.58	5.50	4.63	5.13	5.25	4.82
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	3.00	5.75	4.00	5.25	4.50	4.50
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	4.38	4.75	5.75	4.50	4.88	4.85
8	**"Marconi" Junior High School in Modena**	5.00	6.00	6.00	3.00	5.00	5.00
9	**"Ristori" Comprehensive Institute in Naples**	5.17	4.67	5.33	4.50	5.33	5.00
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	5.33	5.33	4.67	5.17	4.17	4.93
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	3.50	3.50	6.00	6.00	6.00	5.00
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	5.17	5.17	5.83	4.50	5.00	5.13
13	**"Randi" Comprehensive Institute in Ravenna**	5.00	4.17	4.83	4.17	5.33	4.70
14	**"CEIS" in Rimini**	4.67	5.67	5.83	5.33	6.00	5.50
	TOTAL AVERAGE OF THE 14 CASES	4.47	5.11	5.15	4.86	5.16	4.95

Notes: *2 interviewees; **1 interviewee

Table J.3 Results of the measurement of the four variables of organizational capability: redundancy

Case Study		*Redundancy*				
No.	*Name*	*6. Functional redundancy*	*7. Cognitive redundancy*	*8. Information redundancy*	*9. Relational redundancy*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	3.72	4.67	5.08	3.75	4.31
2	**"Gioa" State High School in Piacenza**	3.67	3.65	4.80	4.20	4.08
3	**"Russell" State High School in Cles (Province of Trento)**	2.28	3.31	4.63	4.25	3.61
4	**"Majorana" State High School in Brindisi**	4.22	5.00	6.00	5.67	5.22
5	**"Fermi" State High School in Mantua**	3.97	4.50	4.54	4.50	4.38
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	2.00	3.17	3.50	3.00	2.92
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	3.33	3.14	5.08	4.33	3.97
8	**"Marconi" Junior High School in Modena**	4.00	5.00	6.00	5.50	5.13
9	**"Ristori" Comprehensive Institute in Naples**	4.94	4.22	5.33	5.50	5.00
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	4.11	5.00	4.67	5.33	4.78
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	4.33	6.00	6.00	6.00	5.58
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	3.56	4.22	5.33	4.83	4.49
13	**"Randi" Comprehensive Institute in Ravenna**	4.00	4.78	5.17	5.50	4.86
14	**"CEIS" in Rimini**	3.78	5.00	4.17	5.17	4.53
	TOTAL AVERAGE OF THE 14 CASES	3.71	4.40	5.02	4.82	4.49

Notes: ⋆2 interviewees; ⋆⋆1 interviewee

Table J.4 Results of the measurement of the four variables of organizational capability: sharing

Case Study		*Sharing*				
No.	*NAME*	*10. Value sharing*	*11. Strategical sharing*	*12. Organizational sharing*	*13. Trust*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	4.92	4.00	4.11	4.50	4.38
2	**"Gioa" State High School in Piacenza**	4.70	3.67	4.78	4.93	4.52
3	**"Russell" State High School in Cles (Province of Trento)**	3.79	4.50	4.42	4.25	4.24
4	**"Majorana" State High School in Brindisi**	5.50	5.56	5.67	5.83	5.64
5	**"Fermi" State High School in Mantua**	4.67	4.25	5.19	5.17	4.82
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	3.25	3.17	4.33	4.00	3.69
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	3.88	5.03	5.25	4.63	4.69
8	**"Marconi" Junior High School in Modena**	3.00	5.33	6.00	4.00	4.58
9	**"Ristori" Comprehensive Institute in Naples**	3.83	4.78	5.11	5.33	4.76
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	3.67	4.78	4.56	5.00	4.50
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	6.00	6.00	6.00	6.00	6.00
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	4.67	5.00	4.67	4.00	4.58
13	**"Randi" Comprehensive Institute in Ravenna**	5.42	4.67	5.00	5.17	5.06
14	**"CEIS" in Rimini**	5.17	5.39	5.67	5.00	5.31
	TOTAL AVERAGE OF THE 14 CASES	4.46	4.72	5.05	4.84	4.77

Notes: ⋆2 interviewees; ⋆⋆1 interviewee

Table J.5 Results of the measurement of the six variables of organizational capability: restructuring

Case Study		*Restructuring*						
No.	*Name*	*14. Innovation*	*15. Speed*	*16. External networking*	*17. Reading of the environment*	*18. Operational flexibility*	*19. Strategical flexibility*	*Average*
1	**"Piazzi Lena Perpenti" State High School in Sondrio**	3.75	3.50	3.25	4.50	4.50	4.58	4.01
2	**"Gioa" State High School in Piacenza**	5.50	5.00	2.88	4.30	4.40	4.70	4.46
3	**"Russell" State High School in Cles (Province of Trento)**	4.38	4.25	4.50	5.17	5.33	5.50	4.85
4	**"Majorana" State High School in Brindisi**	5.83	6.00	5.17	4.33	5.33	5.33	5.33
5	**"Fermi" State High School in Mantua**	5.13	4.75	4.75	4.54	4.25	5.13	4.76
6	**"Barsanti" State Technological Institute in Castelfranco Veneto (Province of Treviso)**	4.00	3.00	4.00	4.00	4.00	3.75	3.79
7	**"Collegio del Mondo Unito" (United World College) in Duino (Province of Trieste)**	3.79	2.50	3.50	5.25	4.50	4.83	4.06
8	**"Marconi" Junior High School in Modena**	6.00	6.00	4.00	3.00	3.00	1.50	3.92
9	**"Ristori" Comprehensive Institute in Naples**	5.83	4.67	4.08	4.83	5.00	4.67	4.85
10	**Comprehensive Institute in Montespertoli (Province of Florence)**	5.33	5.00	3.42	2.83	3.00	4.25	3.97
11	**"eSpazia" Comprehensive Institute in Monterotondo (Province of Rome)**	6.00	6.00	6.00	6.00	6.00	6.00	6.00
12	**"Giovanni XXIII" Comprehensive Institute in Tricesimo (Province of Udine)**	5.00	3.00	4.50	4.50	4.33	4.25	4.26
13	**"Randi" Comprehensive Institute in Ravenna**	5.00	5.33	4.17	3.00	4.33	4.50	4.39
14	**"CEIS" in Rimini**	5.17	5.33	4.42	4.92	4.67	5.17	4.94
	TOTAL AVERAGE OF THE 14 CASES	5.05	4.60	4.19	4.37	4.47	4.58	4.54

Notes: ⋆2 interviewees; ⋆⋆1 interviewee

Appendix K

The Movement of the Educational Avant-gardes http://avanguardieeducative.indire.it/

Indire – the National Institute of Documentation, Innovation and Educational Research – in November 2014 gave birth to the Movement of the Educational Avant-gardes – a network made up of 22 Italian schools, now 594 – whose aim is to make the most significant experiences of transformation of the Italian school become part of the system.

It offers and feeds a gallery of ideas that arise from the experiences of schools. Each idea represents one piece in the mosaic to revolutionize the time, space and organization of approaching the art of teaching and learning.

The Manifesto of the Educational Avant-gardes anticipates seven horizons for:

1. Transforming the school's communication model
2. Exploit the opportunities offered by ICTs and by digital languages to support new ways of teaching, learning and evaluating
3. Creating new spaces for learning
4. Reorganizing time for teaching and learning
5. Reconnecting the school-acquired knowledge and the knowledge of the society of knowledge
6. Investing in "human capital" rethinking relationships (inside/outside, traditional, lecture-type teaching/peer learning, school/company, etc.)
7. Promoting innovation so that it is sustainable and transferable.

The schools that adhere to the Manifesto of the Educational Avant-gardes decide to change the school by realizing one or more of the horizons of the Network.

The principles expressed in the Manifesto find concrete expression in the Gallery of ideas that hosts innovative proposals of the schools tested and verified in the field. Each of them acts on the organization of the three fundamental dimensions of the art of teaching and learning: teaching, time and space.[1] The original ideas proposed in the Gallery are 12:

1. Laboratory classrooms designed for school subjects. The classrooms are assigned according to the subjects that will be taught in them, so they

can be redesigned and arranged in a setting that is functional to the peculiarities of the subject itself. The teacher no longer has an undifferentiated environment to share with colleagues from other subjects, but he/she can adapt it to active laboratory-type teaching, arranging the furnishings, materials, books, tools, devices and software.

2. Failed with credit. To address the problem of the demotivation of students and their scholastic failure, the proposal states that all the disciplines for which the young person has achieved a judgment of sufficiency are registered as "formative credit" in his curriculum. The following year, in the event of repetition, the Teacher-Parent-Student Meeting of the Class will take note of any positive results achieved (despite the overall negative outcome) and will record them as a starting point for the construction of the curriculum and the commitments to be proposed to the student.
3. Compaction of the school calendar. This consists of a non-homogeneous distribution of the number of annual hours of a subject during the school year. Reorganizing the school timetable on the basis of temporal blocks longer than the traditional ones implies a search for a new way of teaching.
4. *Debate*. This consists of a contest in which two teams made up of students support and counter a statement or a topic given by the teacher, placing themselves in one field (pro) or another (against). It helps to acquire transversal skills (life skills), dismantles some traditional paradigms and promotes cooperative learning and peer education not only among students but also among teachers and between teachers and students.
5. *Flexible space* (Classroom 3.0). Digital technologies make it possible to overcome the physical dimension of the classroom itself and to access work environments located in the virtual space. Compared to the traditional classroom, "Classroom 3.0" restructures both its organization in terms of openness to the outside, and its structure in a strictly physical sense, through obvious changes in the arrangement of the furnishings. All of this is done to encourage innovative teaching, which favors laboratory and collaborative approaches.
6. *Spaced learning*. This is a particular division of the lesson time which includes three moments of input and two intervals. The students will be asked to demonstrate that they have acquired the shared content given during the first moments of input by applying the knowledge in practice contexts or problem situations. At the end, the teacher will verify the actual understanding of the content of the lesson.
7. TEAL (*Technology Enhanced Active Learning*). This is a teaching methodology that combines traditional lecture-type lessons, simulations and computer laboratory activities, for a rich learning experience based on collaboration. It calls for a classroom with a central location for the teacher; arranged around that station are some round tables where

odd-numbered groups of students sit. The classroom has some projection points on the walls for use by the groups of students.

8. Inside/outside of the school. Through a number of actions, it relaunches the function of the school as an environment for socialization, as an agency capable of training children and encouraging the acquisition of competences, knowledge and skills necessary to live one's life and to interact in a society of information and knowledge. It intends to give educational institutions a higher value as active communities, open to the territory and able to develop and increase interaction with families, with the local community, with the third sector and with businesses.
9. Methodology by scenarios. This is an approach that aims to introduce innovative teaching practices, enhanced by the effective use of new technologies. Starting points are the "scenarios", that is, descriptions of teaching/learning contexts that incorporate a vision of pedagogical innovation centered on the acquisition – on the part of the students – of the so-called "skills for the 21st century". Each scenario incorporates a different vision and provides a different set of indications for learning activities, through which the teacher and the school come to write and implement a real educational project: the learning story.
10. *ICT Lab*. This refers to three technological themes: digital craftsmanship, coding and physical computing. Digital craftsmanship is what leads to the creation of an object through technology, then from CAD and 3D design, on to 3D printing. Activities are defined as coding activities if they are activities aimed at the acquisition of computational thinking, and which enable the student to instruct the machine to "do things" instead of resorting to other things already created and available. Physical computing means the possibility of creating programmable objects that interact with reality; the most well-known field of application is that of robotics.
11. *Flipped classroom*. The lesson becomes homework while class time is used for collaborative activities, experiences, debates and workshops. In this context, the teacher does not assume the role of leading player, but instead, he/she becomes a sort of facilitator, the director of the didactic action. Over time, at home, video and other digital resources are widely used as contents to be studied, while in the classroom the students experiment, collaborate and carry out laboratory activities.
12. DTC Integration (Digital Teaching Contents)/textbooks. The law states that "starting from the 2014–2015 school year, schools may develop digital teaching material for specific school subjects to be used as textbooks and teaching tools for the specific subject". The school is transformed into an immense laboratory where the process of knowledge construction is learned through the planning (involving teachers and students) of textbooks and teaching materials that are both tools and products of training paths.

Three new ideas were added in 2017:

13. Differentiated learning. The idea, proposed by the "G. Mariti" Comprehensive Institute in Fauglia, in the province of Pisa, was the result of a consolidated experience, that of the "*Schools Without a Backpack*", with the aim of guaranteeing students an individualized and motivating course of formation. The space and time of teaching are completely revolutionized to favor moments of sharing, discussion and thought-provoking meditation in children and teachers. Students are called upon to play an active role in planning their daily activities and participating in school activities in general. Classroom activity is organized into "work tables", with different tasks, in rotation.
14. Autonomous study and tutoring. This is the idea presented by the "Pestalozzi City School" of the Comprehensive Institute in the Historical Center of Florence, in line with the work carried out on affective education. Autonomous study includes an hourly organization that grants students individual space to refine their ability to study and delve deeply into their learning. For this activity, the student is supported by a tutor who can be a teacher (who does not evaluate, but becomes "an older friend") or a class companion who helps him by working closely with him.
15. Beyond the subjects. This is the idea proposed by the "G. Falcone" Comprehensive Institute in Copertino, in the province of Lecce. With this proposal, it is intended to overcome the rigidity and fragmentation of the school subjects, in order to strengthen the curricular teaching by competences. To this end, the school implements what it indicates as the "packaging of the timetable", dividing the activities of each teacher between those relating to the "technical lessons" and those devoted to the development of skills on transversal themes, according to the founding nuclei of the subjects as identified during the planning phase.

How can you join the Movement of the Avant-gardes? There are two ways:

- By adopting an idea: that is, choose one of the ideas of the Gallery to introduce it into your school and start the process of coaching.
- By proposing a new experience of innovation by describing its implementation (the proposal will be evaluated by *Indire* in collaboration with the 22 founding schools and, if deemed appropriate, it will be added to the Gallery of ideas).

Note

1. Rudi Bartolini (Indire researcher), http://nextlearning.it/2017/03/30/877/.

Bibliography

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Ackoff R.L. (1989), The circular organization: an update, *The Academy of Management Executive*, 3 (1), pp. 11–16.

Alexander P.A. (2003), The development of expertise: The journey from acclimation to proficiency, *Educational Researcher*, 32 (8), pp. 10–14.

Anderson A., Cheyne W., Foot H., Howe C., Low J., Tolmie A. (2000), Computer support for peer-based methodology tutorials, *Journal of Computer Assisted Learning*, 16, pp. 41–53.

Anderson D., Anderson L.A. (2001), *Beyond Change Management: Advanced Strategies for Today's Transformational Leaders*, San Francisco, Jossey-Bass/Pfeiffer.

Anderson P.W. (1972), More is different, *Science*, CLXXVII, pp. 393–396.

Anderson P.W. (1999), Complexity theory and organization science, *Organization Science*, 10 (3), May–June, pp. 216–232.

Arendt H. (1964), *Vita activa*, Milano, Bompiani (trad. it. di *The Human Condition*, Garden City, NY, Doubleday, 1958).

Bain A. (2007), *The Self-Organizing School: Next-Generation Comprehensive School Reforms*, Lanham, MD, Rowman & Littlefield Publishers.

Bain A., Walker A., Chan A. (2011), Self-organisation and capacity building: Sustaining the change, *Journal of Educational Administration*, 49 (6), pp. 701–719.

Barabasi A. (2002), *Linked: The New Science of Networks*, New York, Perseus Books.

Barnes C., Tynan B. (2007), The adventures of Miranda in the brave new world: Learning in a Web 2.0 millennium, *Research in Learning Technology*, 15 (3).

Bartezzaghi E. (2010), *L'organizzazione dell'impresa. Processi, Progetti, Conoscenza, Persone*, Milano, Etas.

Bartezzaghi E. (2011), Auto-organizzazione e nuovi modelli organizzativi, in Postfazione in De Toni A.F., Comello L., Ioan L. (Eds.), *Auto-organizzazioni. Il mistero dell'emergenza dal basso nei sistemi fisici, biologici e sociali*, Venezia, Marsilio.

Biondi G., Borri S., Tosi L. (2016), *Dall'aula all'ambiente di apprendimento*, Firenze, Altralinea Edizioni.

Bocconi S., Kampylis P., Punie Y. (2014), Creative Classrooms: a systemic approach for mainstreaming ICT-enabled innovation for learning in Europe, in *International Conference on Software Engineering and Formal Methods*, Berlin-Heidelberg, Springer, pp. 104–120.

Boersma A., ten Dam G., Wardekker W., Volman M. (2016), Designing innovative learning environments to foster communities of learners for students in initial vocational education, *Learning Environments Research*, 19 (1), pp. 107–131.

Bonazzi G. (1993), *Il tubo di cristallo. Modello giapponese e fabbrica integrata alla Fiat Auto*, Bologna, Il Mulino.

Bottani N. (2009), *Il difficile rapporto fra politica e ricerca scientifica sui sistemi scolastici*, Fondazione Giovanni Agnelli, Working Paper, 17, Torino, Fondazione Giovanni Agnelli.

Bower D.F. (2003), *Leadership and the Self-Organizing School*, Dissertation topic, Albuquerque, University of New Mexico.

Bower D.F. (2006), Sustaining school improvement, *Complicity: An International Journal of Complexity and Education*, 3 (1).

Bower D.F. (2007), Leadership and the self-organizing school, in Despres B. (Ed.), *Systems Thinkers in Action: A Field Guide for Effective Change Leadership in Education*, Lanham, MD, Rowman & Littlefield Publishing Group.

Boyd A.M., Jackson M.L. (2004), An effective model for rapid skills acquisition through a simulation-based integrated learning environment, *Journal of Educational Computing Research*, 30 (1), pp. 1–21.

Brookover W.B., Brady C., Flood P., Schweigen J., Wisenbater J. (1979), *School Social Systems and Student Achievement: Schools Can Make a Difference*, New York, Praeger Publishers.

Brooks M., Holmes B. (2014), Equinox blueprint for learning 2030, *A Report on the Outcomes of the Equinox Summit: Learning, 2030*. Convened by the Waterloo Global Science Initiative, Waterloo, Ontario, Canada.

Bush T. (2003), *Theories of Educational Management*, 3rd ed., London, Sage.

Butera F., Coppola B., Fasulo A., Nunziata E. (2002), *Organizzare le scuole nella società della conoscenza*, Roma, Carocci Editore.

Carlone C., Francia M., Fuschini S., Gamberini F. (a cura di) (2012), CorpoGiochi a scuola: progetto di espressione corporea e educazione emozionale per sezioni di Scuola dell'Infanzia, classi di Scuola Primaria e Secondaria di Primo Grado, *Quaderno di Lavoro*, anno IX.

Carlone C., Fuschini S., Gamberini F. (a cura di) (2003), *La pagina, Il sito, La scena: sintesi di un progetto dalla prima alla quinta classe di scuola elementare*, IX Circolo Didattico di Ravenna, Scuola elementare di Ponte Nuovo.

Casey E.S. (1997), *The Fate of Place: A Philosophical History*, Berkeley, University of California Press.

Casey G., Evans T. (2011), Designing for learning: Online social networks as a classroom environment, *International Review of Research in Open and Distance Learning*, 12 (7 Special Issue), pp. 1–26.

Castoldi M. (2012), *Valutare a scuola. Dagli apprendimenti alla valutazione di sistemi*, Roma, Carocci Editore.

Chang C.Y., Lee G. (2010), A Major E-Learning Project to renovate science learning environment in Taiwan, *Turkish Online Journal of Educational Technology-TOJET*, 9 (1), pp. 7–12.

Child J., McGrath R.G. (2001), Organizations unfettered: Organizational form in an information intensive economy, *Academy of Management Journal*, XLIV (6), pp. 1135–1148.

Chow J.Y., Davids K., Hristovski R., Araújo D., Passos P. (2011), Nonlinear pedagogy: Learning design for self-organizing neurobiological systems, *New Ideas in Psychology*, 29 (2), pp. 189–200.

Cilliers P. (2005), Complexity, deconstruction and relativism, *Theory, Culture & Society*, 22 (5), pp. 255–267.

Cilliers P. (2010), The value of complexity: A response to Elizabeth Mowat & Brent Davis, *Complicity: An International Journal of Complexity and Education*, 7 (1), pp. 39–43.

Cole R., Kemple J.J., Segeritz M.D. (2012), *Assessing the Early Impact of School of One: Evidence from Three School-Wide Pilots*, New York, The Research Alliance for New York City Schools (published: June 2012; accessed on 8th October 2014).

Collins A., Halverson R. (2010), The second educational revolution: Rethinking education in the age of technology, *Journal of Computer Assisted Learning*, 26 (1), pp. 18–27.

Comfort L.K. (1994), Self-organization in complex systems, *Journal of Public Administration Research and Theory*, 4 (3), pp. 393–411.

Comoglio M. (2002), Preface of the Italian translation of Sergiovanni T.J. (Ed.), *The Principalship. A Reflective Practice Perspective*, Boston, Allyn and Bacon, 2001 (*Dirigere la scuola comunità che apprende*, Roma, LAS).

Comoglio M. (2010), Preface of the Italian translation of Wald P.J., Castleberry M.S. (Eds.), *Educators as Learners: Creating a Professional Learning Community in Your School*, Alexandria, ASCD, 2000 (*Insegnanti che apprendono. Costruire una comunità professionale che apprende*, Roma, LAS).

Coppola P. (2010), Istruzione in proprio: all'estero è boom. E l'Italia segue l'esempio, *la Repubblica*, 6th April.

Costa M. (1999), *Dirigere la scuola dell'autonomia*, Torino, ISEDI.

Creemers B. (1996), The school effectiveness knowledge base, in Reynolds D. et al. (Eds.), *Making Good Schools. Linking School Effectiveness and School Improvement*, London, Routledge.

Daft R., Lewin A.Y. (1993), Where are the theories for the new organizational forms?, *Organization Science*, IV (4), pp. I–VI.

De Guibert J. (S.J.) (1964), *The Jesuits: Their Spiritual Doctrine and Practice. A Historical Study*, Chicago, Institute of Jesuits Sources.

De Kock A. (2004), New learning and the classification of learning environments in secondary education, *Review of Educational Research*, 74, pp. 141–170.

De Toni A.F. (2016), *Processo al liceo classico. L'accusa*, Udine, Forum Edizioni.

De Toni A.F., Barbaro A. (2010), *Visione evolutiva. Un viaggio tra uomini e organizzazioni, management strategico e complessità*, Milano, Etas.

De Toni A.F., Comello L. (2009), *Prede o ragni. Uomini e organizzazioni nella ragnatela della complessità*, Torino, Utet Università.

De Toni A.F., Comello L., Ioan L. (2011), *Auto-organizzazioni. Il mistero dell'emergenza dal basso nei sistemi fisici, biologici e sociali*, Venezia, Marsilio.

De Toni A.F., De Zan G. (2015), *Il dilemma della complessità*, Venezia, Marsilio.

De Toni A.F., Dordit L. (2015), *Il cannocchiale di Galileo: integrazione delle scienze e didattica laboratoriale*, Trento, Erickson.

De Toni A.F., Fornasier A. (2012), *La guida del Sole 24 Ore al Knowledge Management*, Milano, Gruppo 24 Ore.

De Toni A.F., Panizzolo R., Villa A. (2013), *Gestione della produzione*, Torino, ISEDI.

Docherty P., Kira M., Shani A.B. (Rami) Shani (Eds.). (2008), *Creating Sustainable Work Systems. Developing Social Sustainability*, London, Routledge.

Doz Y.L., Kosonen M. (2010), Embedding strategic agility. A leadership agenda for accelerating business model renewal, *Long Range Planning*, 43, pp. 370–382.

DuFour R., DuFour R., Eaker R., Many T. (2006), *Learning by Doing. A Handbook for Professional Learning Communities at Work*, Bloomington, Solution Tree.

DuFour R., Eaker R. (1998), *Professional Learning Communities at Work: Best Practices for Enhancing Student Achievement*, Bloomington, National Educational Service.

Edmonds R.R. (1979), Effective schools for the urban poor, *Educational Leadership*, 37 (10), pp. 15–24.

Eisenhardt K. (1989), Building theories from case-study research, *Academy of Management*, 14 (4), pp. 532–550.

Ellinor L., Gerard G. (1998), *Dialogue: Rediscover the Transforming Power of Conversation*, New York, John Wiley & Sons Inc.

Fantuzzo J.W., Riggio R.E., Connelly S., Dimeff L.A. (1989), Effects of reciprocal peer tutoring on academic achievement and psychological adjustment: A component analysis, *Journal of Educational Psychology*, 81, pp. 173–177.

Foss N.J. (2003), Selective intervention and internal hybrids: Interpreting and learning from the rise and decline of the Oticon Spaghetti organization, *Organization Science*, XIV (3), pp. 331–349.

Francia M., Carlone C. (2007), *CorpoGiochi a scuola: progetto di espressione corporea e educazione emozionale per sezioni di Scuola dell'Infanzia e classi di Scuola Primaria*, Milano, Mimesis Edizioni.

Gharajedaghi J. (1999), *Systems Thinking: Managing Chaos and Complexity*, Boston, Butterworth-Heinemann.

Gleick J. (1997), *Chaos: Making a New Science*, New York, Penguin.

Gloeckner G.W., Jones P. (2013), Reflections on a decade of changes in homeschooling and the homeschooled into higher education, *Peabody Journal of Education*, 88 (3), pp. 309–323.

Goldspink C. (2007), Rethinking educational reform: A loosely coupled and complex systems perspective, *Educational Management Administration and Leadership*, 35 (1), pp. 27–50.

Gortan M.J. (1999), Consuming Jesuits science, 1600–1655, in O'Malley J.W. (S.J.), Bailey G.A., Harris S.J., Kennedy T.F. (S.J.) (Eds.), *The Jesuits. Cultures, Sciences, and the Arts, 1540–1773*, Toronto, University of Toronto Press, p. 172.

Greiner L.E. (1972), Evolutions and revolutions as organizations grow, *Harvard Business Review*, July–August 1972.

Groff J. (2013), *Technology-Rich Innovative Learning Environments*, OECD-CERI Working Paper.

Guasti L. (a cura di). (2011), *Competenze e unità didattiche: esperienze a confronto*, Piacenza, Provincia di Piacenza/Università Cattolica del Sacro Cuore-Piacenza.

Guerra L. (2006), *Individualizzazione e personalizzazione*, Istituto Pedagogico di Bolzano, www.ipbz-corsi.it.

Gyanani T.C., Pahuja P. (1995), Effects of peer tutoring on abilities and achievement, *Contemporary Educational Psychology*, 20, pp. 469–475.

Harris A. (2004), Distributed leadership and school improvement leading or misleading?, *Educational Management Administration & Leadership*, 32 (1), pp. 11–24.

Hopkins D., Ainscow M., West M. (1997), A case of the "Improving the quality of education for All" school improvement project, in Harris A. (Ed.), *Organisational Effectiveness and Improvement in Education*, Buckingham, Open University Press.

Inamdar P. (2004), Computer skills development by children using "hole in the wall" facilities in rural India, *Australasian Journal of Educational Technology*, 20 (3), pp. 337–350.

Invalsi (2007) (edited by Paletta A.), *Prime riflessioni sugli aspetti organizzativi della scuola italiana*, Invalsi Report, www.invalsi.it.

Istance D. (2010), A new international OECD Project on learning: "Innovative learning environments", *International Journal of Learning*, 16 (12), pp. 479–485.

Istance D., Kools M. (2013), Innovative learning environments as an integrating framework for technology in education, *European Journal of Education*, 48 (1), pp. 43–57.

Jonassen D.H, Peck K.L., Wilson G.B. (1999), *Learning With Technology. A Constructivist Perspective*, Upper Saddle River, NJ, Merrill/Prentice Hall.

Kaplan R.S., Norton D.P. (2004), Measuring the strategic readiness of intangible assets, *Harvard Business Review*, 82 (2), pp. 52–63.

King A., Staffieri A., Adelgais A. (1998), Mutual peer tutoring: Effects of structuring tutorial interaction to scaffold peer learning, *Journal of Educational Psychology*, 90, pp. 134–152.

Koper R., Giesbers B., Van Rosmalen P., Sloep P., Van Bruggen J., Tattersall C., Brouns F. (2005), A design model for lifelong learning networks, *Interactive Learning Environments*, 13 (1–2), pp. 71–92.

Kozlov A. (1998), Aristotile in the fast lane, *Discovery*, 9 (7), pp. 77–78.

Laferrière T., Law N., Montané M. (2012), An international knowledge building network for sustainable curriculum and pedagogical innovation, *International Education Studies*, 5 (3), pp. 148–160.

Leavitt H.J. (2005), *Top-Down. Why Hierarchies Are Here to Stay and How to Manage Them More Effectively*, Boston, Harvard Business School Press.

Levine A. (2012), *School of One*, New York, New York City Department of Education, schools.nyc.gov (accessed: 8th October 2014).

Liening A., Mittelstaedt E. (2009), Intellectual capital reporting in schools: A complexity-scientific approach to educational management, *International Journal of Learning*, 16 (7), pp. 15–26.

Loiero S. (2008), Ambiente di apprendimento, *Voci della scuola*, July.

Louys A., Leo D.H., Schoonenboom J., Lemmers R., Pérez-Sanagustín M. (2009), Self-development of competences for social inclusion using the TENCompetence infrastructure, *Educational Technology & Society*, 12 (3), pp. 70–81.

Lowney C. (2003), *Heroic Leadership. Best Practices from a 450-Year-Old Company that Changed the World*, Chicago, Loyola Press.

Maccoby M. (1998), The human side: Making values work, *Research-Technology Management*, 41 (5), pp. 55–57.

March J.G., Olsen J.P. (1975), *Choice Situations in Loosely Coupled Worlds*, manuscript not published, Stanford University, p. 123.

Marconato G. (2013), *Ambienti di apprendimento per la formazione continua*, Rimini, Guaraldi, pp. 281–290.

Mariotti S. (1994), *Verso una nuova organizzazione della produzione. Le frontiere del post-fordismo*, Milano, Etas Libri.

Mason L. (2006), *Psicologia dell'apprendimento e dell'istruzione*, Bologna, Il Mulino.

Mason M. (2008a), *Complexity Theory and the Philosophy of Education*, Oxford, Wiley-Blackwell.

Mason M. (2008b), What is complexity theory and what are its implications for educational change?, *Educational Philosophy and Theory*, 40 (1), pp. 35–49.

Mayer R.E. (2010), Learning with technology, in *The Nature of Learning: Using Research to Inspire Practice*, Paris, OECD Publishing.

McCutcheon D.M., Meredith J.R. (1993), Conducting case study research in operations management, *Journal of Operations Management*, 11 (3), pp. 239–256.

McHugh P., Merli G., Wheeler III A. (1995), *Beyond Business Process Reengineering. Towards the Holonic Enterprise*, Chichester, Wiley.

McKinsey & Company Report. (2010), *How the World's Most Improved School Systems Keep Getting Better* (edited by Mourshed M., Chijioke C., Barber M.), mckinsey.com.

McMaster M.D. (1996), *The Intelligence Advantage: Organizing for Complexity*, Boston, Butterworth-Heinemann.

Meissner W.W. (1992), *S.J. Ignatius of Loyola: The Psychology of a Saint*, New Haven, Yale University Press.

Merry U., Kassavin N. (1995), *Coping With Uncertainty: Insights From the New Sciences of Chaos, Self-Organization, and Complexity*, Westport, Praeger Publishers/Greenwood Publishing Group.

Miles M.B., Huberman A.M. (1994), *Qualitative Data Analysis: An Expanded Source Book*, 2nd ed., London, Sage Publications.

Miles R.E., Snow C.C. (1995), The new network firm: A spherical structure built on a human investment philosophy, *Organizational Dynamics*, 23 (4), pp. 5–18.

Miles R.E., Snow C.S., Mathews J.A., Miles G., Coleman H.J. (1997), Organizing in the knowledge age: Anticipating the cellular form, *The Academy of Management Executive*, 11 (4), pp. 7–20.

Miller R. (2008), *The Self-Organizing Revolution: Common Principles of the Educational Alternatives Movement*, Brandon, Holistic Education Press.

Miller R., Bentley T. (2003), *Possible Futures: Four Scenarios for Schooling in 2030*, Nottingham, National College for School Leadership.

Milrad M. (2002), Using construction kits, modeling tools and system dynamics simulations to support collaborative discovery learning, *Educational Technology & Society*, 5 (4), pp. 76–87.

Mintzberg H. (1980), Structure in 5's: A synthesis of the research on organization design, *Management Science*, XXVI (3), pp. 322–341.

Mintzberg H. (1995), Musings on management. Ten ideas designed to rile everyone who cares about management, *Harvard Business Review*, 74 (4), pp. 61–67.

Mitra S. (2003), Minimally invasive education: A progress report on the "hole in the wall" experiments, *British Journal of Educational Technology*, 34 (3), pp. 367–371.

Mitra S. (2004), The hole in the wall, *Dataquest*, 23rd September.

Mitra S. (2005), Self organising systems for mass computer literacy: Findings from the "hole in the wall" experiments, *International Journal of Development Issues*, 4 (1), pp. 71–81.

Mitra S. (2010), *The Child-driven Education*, TED Ideas Worth spreading, September, New York, TED Conferences LLC.

Mitra S., Dangwal R. (2010), Limits to self-organising systems of learning. The Kalikuppam experiment, *British Journal of Educational Technology*, 41 (5), pp. 672–688.

Mitra S., Dangwal R., Chatterjee S., Jha S., Bisht R.S., Kapur P. (2005), Acquisition of computing literacy on shared public computers: Children and the "hole in the wall", *Australasian Journal of Educational Technology*, 21 (3), pp. 407–426.

Mitra S., Rana V. (2001), Children and the Internet: Experiments with minimally invasive education in India, *British Journal of Educational Technology*, 32 (2), pp. 221–232.

Mitra S., Tooley J., Inamdar P., Dixon P. (2003), Improving English pronunciation: An automated instructional approach, *Information Technologies & International Development*, 1 (1), pp. 75–84.

Molino D. (2011), Dimensioni organizzative della scuola italiana e apprendimenti degli studenti, in *Paper per la Espanet Conference "Innovare il welfare. Percorsi di trasformazione in Italia e in Europa"*, Milano, 29 settembre–1 ottobre 2011.

Morgan G. (1986), *Images of Organization*, Beverly Hills, Sage Publications.

Morrison K. (2001), Simplicity and complexity in contemporary school leadership: A response to Grace, *British Journal of Educational Studies*, 49 (4), pp. 379–385.

Morrison K. (2010), Complexity theory, school leadership and management: Questions for theory and practice, *Educational Management Administration and Leadership*, 38 (3), pp. 374–393.

Mortimore P. (1998), *The Road to Improvement*, Lisse, Swets and Zeitlinger.
Mosa E., Tosi L. (2016), Ambienti di apprendimento innovativi. Una panoramica tra ricerca e casi di studio, *Bricks*, anno 6, n. 1.
Mottana P., Campagnoli G. (2017), *La città educante. Manifesto della educazione diffusa*, Trieste, Asterios.
Munari A. (2012), Cambiare l'educazione, *Riflessioni Sistemiche*, 6, pp. 119–129.
Nassr N. (2016), Reinventare l'istruzione attraverso il gioco. La scuola Quest to Learn di Chicago, in *Proceedings of the International Seminar "Big Bang: Viaggio tra le scuole più creative del mondo"*, https://adiscuola.it/.
Nicaud J.F., Bittar M., Chaachoua H., Inamdar P., Maffei L. (2006), Experiments with Aplusix in four countries, *International Journal for Technology in Mathematics Education*, 13 (2).
Nonaka I. (1994), A dynamic theory of organizational knowledge creation, *Organization Science*, 5 (1), pp. 14–37.
Nonaka I., Konno N. (1998), The concept of "Ba": Building a foundation for knowledge creation, *California Management Review*, 40 (3), pp. 40–54.
Nonaka I., Takeuchi H. (1997), The knowledge-creating company: creare le dinamiche dell'innovazione, Milano, Guerini (trad. it. di), *The Knowledge-Creating Company*, New York, Oxford University Press, 1995.
Nonaka I., Toyama R., Konno N. (2000), Seci, Ba, and leadership: A unified model of dynamic knowledge creation, *Long Range Planning*, 33 (1), pp. 5–34.
OECD (2001), *What Schools for the Future*, Educational Research and Innovation, Paris, OECD Publishing, pp. 77–98, 231–242.
OECD (2008), *Improving School Leadership*, vol. I: Policy and Practice, Educational Research and Innovation, Paris, OECD Publishing.
OECD (2009), *Beyond Textbooks: Digital Learning Resources as Systemic Innovation in the Nordic Countries*, Paris, OECD Publishing.
OECD (2010a), *The Nature of Learning: Using Research to Inspire Practice*, Educational Research and Innovation, Paris, OECD Publishing.
OECD (2010b), *Recognition of Non-Formal and Informal Learning: Country Practices*, Paris, OECD Publishing.
OECD (2013), *Innovative Learning Environments*, Educational Research and Innovation, Paris, OECD Publishing.
OECD (2015), *Schools for 21st-Century Learners: Strong Leaders, Confident Teachers, Innovative Approaches* (edited by Schleicher A.), International Summit on the Teaching Profession, Paris, OECD Publishing.
Ohno T. (1988), *Toyota Production System. Beyond Large-scale Production*, Portland, Productivity Press.
O'Malley J.W. (1984), To travel to any part of the world. Jeronimo Nadal and the Jesuit vocation, *Studies in the Spirituality of Jesuits*, 16 (2), pp. 1–20.
Paletta A. (2011), *Scuole responsabili dei risultati: accountability e bilancio sociale*, Bologna, Il Mulino.
Palmarini N. (2012), *Lavorare o collaborare? Networking sociale e modelli organizzativi del futuro*, Milano, EGEA.
Palmer I., Benveniste J., Dunford R. (2007), New organizational forms: Towards a generative dialogue, *Organization Studies*, XXVIII (12), pp. 1829–1847.
Pascale R.T., Milleman M., Gioja L. (2000), *Surfing the Edge of Chaos: The Laws of Nature and the New Laws of Business*, New York, Crown Business.
Paulson J., Rappleye J. (2007), Education and conflict, *International Journal of Educational Development*, 27 (3), pp. 340–347.

Pepe I., Strano G. (2016), *Concorso Dirigente Scolastico*, 3a ed., Napoli, Edizioni Simone.

Perkins D.N. (1991), Technology meets constructivism: Do they make a marriage?, *Educational Technology*, pp. 18–23.

Petrucco C., De Rossi M. (2011), *Web 2.0, scuola e comunità territoriali. Il progetto "didaduezero" della Provincia di Trento*, Lecce, Pensa Multimedia Editore.

Piccinini N., Scollo G. (2006), Cooperative project-based learning in a web-based software engineering course, *Educational Technology and Society*, 9 (4), pp. 54–62.

Pigmei V. (2016), In Italia ci sono anche scuole a casa e asili nei boschi, *Internazionale*, 27th February.

Radford M. (2007), Action research and the challenge of complexity, *Cambridge Journal of Education*, 37 (2), pp. 263–278.

Radford M. (2008), Prediction, control and the challenge to complexity, *Oxford Review of Education*, 34 (5), pp. 505–520.

Ramboll Management (2004), *Study on Innovative Learning Environments in School Education*, European Commission DG Education and Culture, Final Report, September.

Rebora G. (2016), Ripensare l'impresa per ripensare l'economia?, *Sviluppo & Organizzazione*, n. 268, January/February, pp. 32–36.

Repenning A., Ioannidou A., Phillips J. (1999), Collaborative use & design of interactive simulations, in Hoadley C.M., Roschelle J. (Eds.), *Proceedings of the 1999 Conference on Computer Support for Collaborative Learning*, Palo Alto, CA, International Society of the Learning Sciences, pp. 475–487.

Reynolds D., Stoll L. (1996), Merging school effectiveness and school improvement: The knowledge bases, in Reynolds D., et al. (Eds.), *Making Good Schools*, London, Routledge.

Ricci C. (2011), Emergent, self-directed, and self-organized learning: Literacy, numeracy, and the iPod touch, *International Review of Research in Open and Distance Learning*, 12 (7 Special Issue), pp. 135–146.

Robinson K. (1999), *All Our Futures: Creativity, Culture and Education*, National Advisory Committee on Creative and Cultural Education, http://sirkenrobinson.com.

Rouwette E.A., Vennix J.A., Thijssen C.M. (2000), Group model building: A decision room approach, *Simulation & Gaming*, 31 (3), pp. 359–379.

Sammons P. (1999), *School Effectiveness: Coming of Age in the Twenty-First Century*, Lisse, Swets and Zeitlinger.

Scardamalia M., Bereiter C. (2004), *Knowledge Building, in Encyclopedia of Education*, 2nd ed., New York, Macmillan Reference.

Scardamalia M., Bereiter C. (2006), Knowledge building: Theory, pedagogy and technology, in Sawyer R.K. (Ed.), *The Cambridge Handbook of Learning Sciences*, New York, Cambridge University Press, pp. 97–115, 254

Scheerens J. (2004), The conceptual framework for measuring quality, in Paper for the *EFA Global Monitoring Report*, downloaded from: http://lascuolachefunziona.pbworks.com/f/An%20input-processoutcome%20framework%20for%20assessing%20education%20quality.pdf.

Scheerens J., Bosker R. (1997), *The Foundations of Educational Effectiveness*, Oxford, Pergamon Press.

Schmidt J.P., Geith C., Håklev S., Thierstein J. (2009), Peer-to-peer recognition of learning in open education, *The International Review of Research in Open and Distributed Learning*, 10 (5).

Schön D.A. (1983), *The Reflective Practitioner: How Professionals Think in Action*, New York, Basic Books.

Scott G.P. (1991), *Time, Rhythm, and Chaos: In the New Dialog With Nature*, Ames, Iowa State University Press.

Scott G.P., Castañeda L., Quick K., Linney J. (2009), Synchronous symmetrical support: A naturalistic study of live online peer-to-peer learning via software videoconferencing, *Interactive Learning Environments*, 17 (2), pp. 119–134.

Semetsky I. (2005), Not by breadth alone: Imagining a self-organized classroom, *Complicity: An International Journal of Complexity and Education*, 2 (1).

Sergiovanni T.J. (1992), *Moral Leadership: Getting to the Heart of School Improvement*, New York, Maxwell Macmillan International Publishing Group.

Sergiovanni T.J. (2001), *The Principalship. A Reflective Practice Perspective*, Boston, Allyn and Bacon.

Siemens G. (2005), *Connectivism: A Learning Theory for the Digital Age*, www.elearnspace.org.Articles/connectivism.htm (accessed on 19th July 2016).

Smitherman S. (2005), Chaos and complexity theories: A conversation, in Doll W., Fleener J., St. Julien J. (Eds.), *Chaos, Complexity, Culture, and Curriculum*, New York, Peter Lang, pp. 153–180.

Snowden D.J., Boone M.E. (2007), A leader's framework for decision making, *Harvard Business Review*, 85 (11), p. 68.

Stella G. (2016), *Tutta un'altra scuola! Quella di oggi ha i giorni contati*, Firenze, Giunti Editore.

Sugrue C. (Ed.). (2008), *The Future of Educational Change: International Perspectives*, London, Routledge.

Taylor F.W. (1911), *The Principles of Scientific Management*, New York, The Norton Library.

Teddlie C., Reynolds D., Sammons P. (2000), The methodology and scientific properties of school effectiveness research, in Teddlie C., Reynolds D. (Eds.), *The International Handbook of School Effectiveness Research*, London, Routledge.

Teddlie C., Stringfield S. (1993), *Schools Do Make a Difference: Lessons Learned from a 10-Year Study of School Effects*, New York, Teachers College Press.

Teece D.J. (1997), Explicating dynamic capabilities: The nature and microfoundations of (sustainable) enterprise performance, *Strategic Management Journal*, 18 (7), pp. 509–533.

Toh Y., So H.-J. (2011), ICT reform initiatives in Singapore schools: A complexity theory perspective, *Asia Pacific Education Review*, 12 (3), pp. 349–357.

Ulrich D., Smallwood N. (2004), Capitalizing on capabilities, *Harvard Business Review*, 82 (6), June, p. 120.

Untiet-Kepp S.-J. (2010), Adaptive support for computer-supported collaborative learning. The State of the Art [Adaptive Unterstützung für das computergestützte kollaborative Lernen. Der Stand der Forschung], *Information-Wissenschaft und Praxis*, 61 (6–7), pp. 397–406.

VALes (2012–2015), *Valutazione e sviluppo della scuola*, www.invalsi.it/invalsi/ri/vales/.

Vannucci G. (2014), *Da una rivolta scolastica a una scuola di rivolta. Il Liceo autogestito di Parigi*, www.educareallalibertà.org (accessed on 14th October 2014).

Vicari S. (1998), *La creatività dell'impresa. Tra caso e necessità*, Milano, Etas.

Voss C., Tisikriktsis N., Frohlich M. (2002), Case research in operations management, *International Journal of Operations & Production Management*, 22 (2), pp. 195–219.

Wald P.J., Castleberry M.S. (2000), *Educators as Learners: Creating a Professional Learning Community in Your School*, Alexandria, ASCD.

Weick K.E. (1976), Educational organizations as loosely coupled systems, *Administrative Science Quarterly*, pp. 1–19.

Wenger E. (1998), *Communities of Practice: Learning, Meaning, and Identity*, Cambridge, Cambridge University Press.

Westera W., de Bakker G., Wagemans L. (2009), Self-arrangement of fleeting student pairs: A web 2.0 approach for peer tutoring, *Interactive Learning Environments*, 17 (4), pp. 341–349.

Wheatley M.J. (1992), *Leadership and the New Science*, San Francisco, Berrett-Koehler.

Whittington R., Pettigrew P.A., Fenton E., Conyon M. (1999), Change and complementarities in the new competitive landscape: A European panel study 1992–1996, *Organization Science*, X (5), pp. 583–600.

Williams, R., Karousou, R., Mackness, J. (2011), Emergent learning and learning ecologies in Web 2.0, *The International Review of Research in Open and Distance Learning*, 12 (3), pp. 39–59.

Wilson, G.B. (1996), *Constructivist Learning Environments: Case Studies in Instructional Design*, Englewood Cliffs, Educational Technology Publications.

Wong W.K., Chan T.W., Chou C.Y., Heh J.S., Tung S.H. (2003), Reciprocal tutoring using cognitive tools, *Journal of Computer Assisted Learning*, 19, pp. 416–428.

Yin R. (1994), *Case Study Research: Design and Methods*, Beverly Hills, Sage Publications.

Young W.J. (S.J.) (Ed.). (1959), *Letters of Saint Ignatius of Loyola*, Chicago, Loyola Press.

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