Digital Transformation projects for the future Digicircular Society

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Abstract. The rapid technological development leads us to identify innovation with technology itself. This becomes the core piece of the innovation process in all sectors. In reality, Digital Transformation has the power to change the meaning of things (Epifani, 2020) and therefore needs to cultivate a strategic vision of systems and scenarios that can be implemented only through creative design. Designers, thanks to their ability to see, show, predict (Zurlo, 2012), and design the future, have the role of meeting the challenges posed by digital evolution. This dichotomy between digital and sustainability is analyzed in the article thanks to the workshop "Space Transformation / Industrial Living Environment", a pilot project for the valorization of productivity in the Valdelsa Senese area that involves, in interdisciplinary groups, students from the various design fields of the School of Architecture of the University of Florence. Another example of planning is the project SMAG - SMArt Garden (Tuscany Region Call RSI - POR FESR 2014-2020), which develops a product-service system equipped with an advanced technological set-up able to control vital parameters of public or private green spaces, using the Internet of Things. These examples underline how the physical and digital worlds are interfacing more and more and getting closer. In this scenario, the role of the project is even more important because it allows to manage and direct the innovation and change processes in the direction of a "digicircular" transformation (Epifani, 2020).

Keywords: Digital transformation, circular environment, Service Design, Design for sustainability, interdisciplinary approach.

1 Introduction

The rapid technological development leads us to identify innovation with technology itself, wherein technology becomes the core piece of the innovation process in all sectors. But in reality, Digital Transformation is a process of radical redefinition of operational conditions both in technological systems and the social and economic ones. It has the power to change the meaning of things (Epifani, 2020) and for this precise reason must also be analyzed from the societal point of view, in order to understand both the positive and negative implications for the society, the ecosystem, and people.

It appears necessary to form a strategic vision of the system and potential scenarios, which can only be achieved through a creative process. The designers, thanks to their ability to see, show, foresee (Zurlo, 2012) and plan the future, will thus have the role of gathering all the challenges posed by the Digital Age, foreshadowing alternative scenarios, and creating new approaches to innovation capable of responding to the increasing demand for competitiveness and sustainable development.

[DA] This dichotomy between the digital world and sustainability, and the capacity to develop strategic projects precisely at the intersection between these two worlds was tested both in the "Space Transformation / Industrial Living Environment" workshop, supported by the School of Architecture at The University of Florence, as well as in the Research and Development project "SMAG - SMArt Garden", funded by the Region of Tuscany. These examples emphasize the interest in drafting a usable and replicable path - even in other territorial contexts - for the development of a future design that would be more thoughtful and sustainable.

2 Transformation of spaces in the industrial context: an interdisciplinary workshop between design, urban development, landscape design, urban planning, and architecture

Parting from the world of education, the "Space Transformation / Industrial Living Environment" workshop is a pilot project on productive area enhancement. In particular, the identified area is the Valdelsa in the Region of Siena.

Territorial competitiveness is increasingly tied to their ability to project a clear sense of identity to the outside world - easily communicable - and to reinforce the quality of its overall image, starting from the local identity in all its different forms. In this way, the Valdelsa represents a particular mixture between industrial areas and the agricultural-touristic, between construction and nature, with a high quality of spaces and images. It has thus become apparent that a strategic reinforcing of the area's image may be in order. An image tied to the aspect of urban development, the quality of constructions and green areas, to the furnishings' elements and communication. Furthermore, the close relationship between the urban and industrial contexts in this area has created a particular need for a reimagining of living conditions with more sustainability, inclusivity, and accessibility.

All these elements have led us to form an interdisciplinary workshop that would include students from various disciplines within The University of Florence: Design, Urban Development, Landscape Design, Urban Planning, and Architecture. The methodology used was one comparable to Design Thinking, which saw its first phase of Research-Action, characterized by a high level of the scientific method. The following phase was one of immersion within the territorial context, in order to analyze its various stakeholders and directly interact with the potential users, understanding their individual relationships, problems, and needs. Finally, we began the phase of converging design, which led to the development of interdisciplinary strategic projects.

The groups of designers, each composed of at least one student from all of the participating disciplines (Design, Urban Development, Landscape Design, Urban Planning, and Architecture), had as their principal objective to support and assist in the evolution of the material and non-material assets of the Valdelsa in a direction that would reinforce this area's capacity to attract and maintain the essential components of the demands of the territory - said demands coming from both physical persons and economic organizations - for a sustainable development of the area itself. Five possible design trends have been developed, with various groupings therein, as detailed below:

1) Sharing territorial accessibility - "Valdelsa Unconventional", by Fabiana Sannino, Barsanti Mirko, Ann Kereselidze.

The project would broaden the traditional concept of tourism, forming unexplored ties with users of unconventional interests (film commission, urban exploration, wedding tourism). This would be achieved through an identification of alternative locations (thematic routes), where narrative and instructional devices (totems) would be installed, equipped with QR codes to access an application specially created for this

project.

The goal of the project is to create a network of routes throughout the Valdelsa territory, realized via resting spots, shaded areas, and panoramic points overlooking landscapes that would allow the public access to extraordinary views of a vast and varied landscape, while directing the visitors' means of access (no longer constraining them to the use of motor vehicles), simultaneously including and protecting the rural areas, farms, and any fauna present.

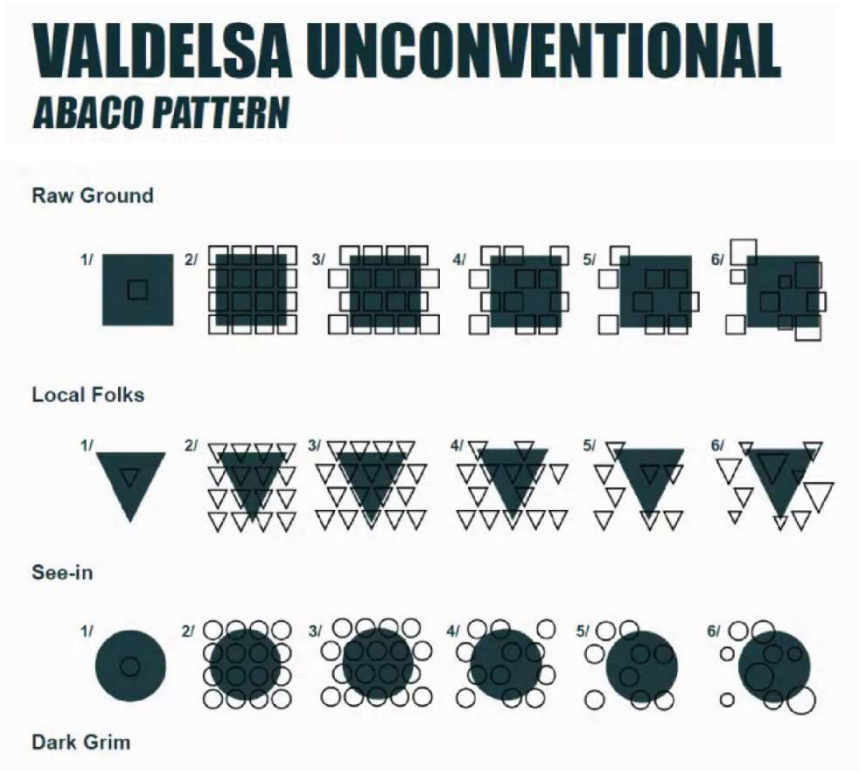

Fig. 1. Patterns used for the wayfinding of the project and its application (Sannino, Barsanti, Kereselidze, 2021)

2) Finding meeting points - “LOTTO”, by Valeria Labruna, Francesca Matteoni, Vittorio Scarnati.

This project aims to create meeting points for the employees of the companies and the local population, thus forming a meeting between people and nature. The name of the project is due to the shape of the trail that connects all the points of interest, which is shaped like the number 8 (OTTO in Italian). Nature, the sense of community, the union between business and territorial identities are some of the elements present in each meeting point, and together they aim to propose a route that would promote wellbeing and properly value the area.

Soundscape - translated into Italian to mean something closer to Sound Landscapes. The term was introduced in order to represent the sound environment which we are immersed in. Sound influences us psychologically, even when we don’t realize it, which is why introducing a sensory experience in a working context such as the one in the Valdelsa could improve the wellbeing of the worker, as well as representing a territorial value.

Fig. 2. Map with areas of design intervention in order to enhance green spaces (Labruna, Matteoni, Scarnati, 2021)

3) Nurturing healing processes - “Square Root”, by Elena Dionori, Qianwen Diao, Margherita Poli, Silvia Roseto.

There is an osmotic relationship of mutual contamination between all users of this space, a paritetic interaction between what is constructed and the land, where all that is taken from Nature is restored to it. A living Nature, which changes and grows without restrictions, colonizing space autonomously. Square Root is a project, which, like the elementary squared form, aims to make the area into a unified organism, where all composing parts collaborate and co-exist. Thus, it plans activities based on the design of the landscape, forming its fabric via small islands, which, placed within the system, form a park that adapts to the conforming of the territory and self-maintains over time. The phases of naturalization would be: planting of various arboreal essences, the phase of growth and flowering of the various trees and plants, creation of islands, defined natural points within the wooded areas, with the aim of maintaining equilibrium between the empty and populated areas within the fabric. The choice to insert nature within crevices of a densely populated and strongly compromised area would go beyond the limits of urban center/urban countryside, and would instead would put the two in a close union.

Fig. 3. Modular system of urban furniture for the industrial area of Casole d’Elsa and settings of some modules (Dionori, Diao, Poli, Roseto, 2021)

4) Narrating stories and emotions - “ConTact”, by Camilla Canessa, Martina Mastropietro, Alessia Pasqualetti.

The project was born with the aims to introduce the companies to the community by recreating a physical, multisensory, and tactile dimension of reality. This is why they have designed a festival inclusive to all, that would cover work, society, play, and respecting ourselves and the planet. The festival would consist of a collection of separate interventions that would serve as urban acupuncture, with the aim of promoting the wellbeing of the individual and the community, creating areas that make an industrial zone accessible to all, not just during the working hours. From tactile playgrounds where the youngest could find multi-sensory and creative stimulation, to areas both within and outside companies where workers (and not just them) could find areas to unplug and reconnect with themselves, or even socialize. Storytelling and emotions would be the key to a strategy of a meeting between territory and areas of productivity.

Fig. 4. Coordinated images of the Festival "contatto" visible in the poster and brochure on the right. At the top, a map with the points of intervention to redevelop the environments just in view of carrying out the activities of the festival (Labruna, Matteoni, Scarnati, 2021)

5) Weaving the web of the territory - “Textere”, by Asia Ferri, Ilaria Fiorentino, Giorgia Giovi, Antoine Tallarico.

The objective of this activity would be to mend and reinforce the system of connections and exchange between isolated areas of various natures that make up the land, aiming to contrast fragmentation and its negative effects on the landscape. The project is highly aware of the industrial nature of the place and does not aim to disturb it, but to enhance it, offering the possibility to broaden the feeling of belonging among all the stakeholders within the Valdelsa. The project for landscapes of limits does not aim to recreate the conditions of a closed city and its borders, but to instead revolutionize the concept of limits, wherein they would no longer be the separators of space, but generators of relations and opportunities. In this view, the landscape of limits becomes a point of interface and suturing between two opposing realities, a mediating space that takes the characteristics of both, and then constructs a third dimension in which the different identities overlap.

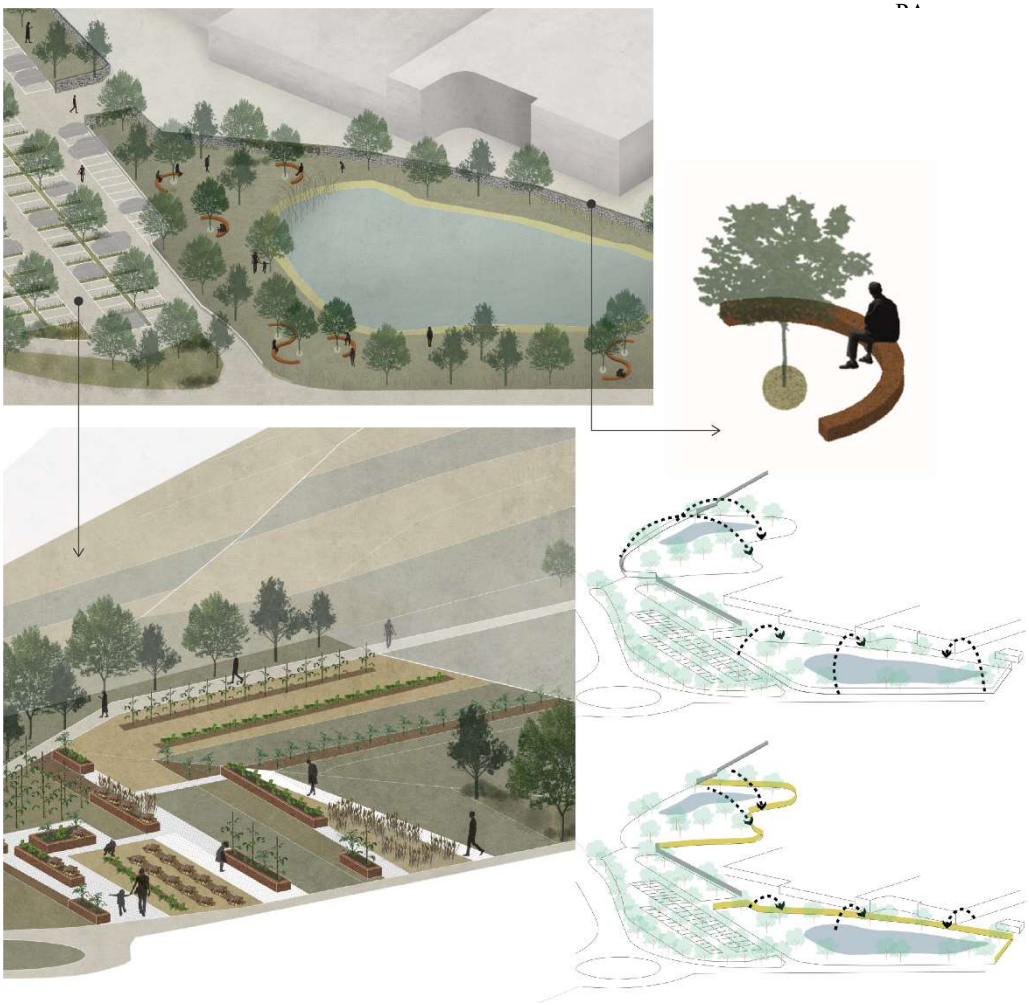

Fig. 5. Scheme of plant structure intervention: expanding public space (on the right), creating urban gardens and rain gardens (on the left) (Ferri, Fiorentino, Giovi, Tallarico, 2021)

Thus, the land becomes a design space, to represent the social relations of the various players, and as the engine for a network of interconnections between the places in which those players are found (G. De Matteis, V. Guarrasi, 1995). In the last few years, schools of thought have formed that have posed factors such as creativity, the arts - even artisanal ones - and the culture at the center of a possible new entrepreneurial development in the areas. In fact, culture is the engine of creativity, and creativity on the other hand is the basis of all social and economic innovation (W. Santagata, 2009) that could stimulate research and investment in the technological field. It is precisely this productive and creative regional network that led to that competitive national advantage termed Made in Italy, which is understood as a productive and creative capacity not exclusively identified in the production of material goods, but also in the socio-cultural systems tied to the historical-architectural beauty, cultural and environmental factors, such as the eno-gastronomic culture or the production of foodstuffs. This is an intangible heritage that doesn't find its roots in a single company, but in the totality of the territorial system (S. Maffei, G. Simonelli, 2002).

This is the reflection upon which the concept of territorial capital is based, defined as the system of elements - tangible and intangible ones - that a land has at its disposition, understood as elements of strength or true, actual bonds (G. Farrel et al., 1999). The territorial capital thus represents a departure point for territorial innovation processes, where starting from an analysis of territorial capital, one might begin to

promote developmental activities which would aim to design sharing spaces for the large group of political, economic, and social players which all act at the local level.

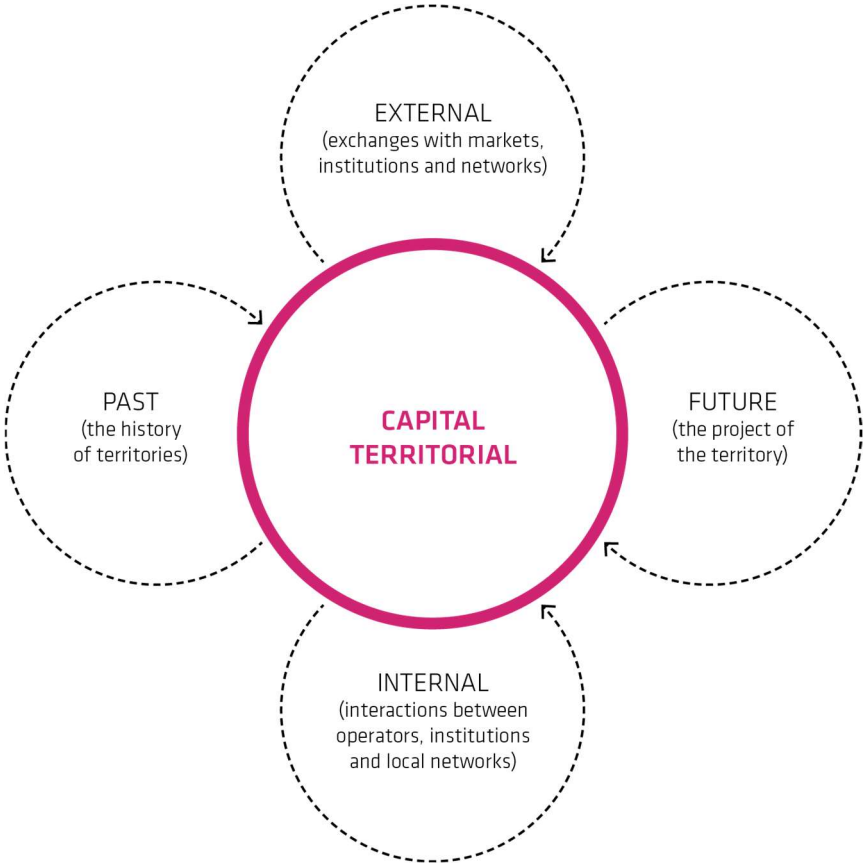

Fig. 6. Representation of territorial capital (Farrel et al., 1999)

Today we talk about a territorial management style that would put together decisions aimed at empowering infrastructure and general territorial services, so as to favor industrial and agricultural development and new seats of productivity and tourism, without harming the environment. Consequently, we are developing a new economic model that aims to internalize the demands coming from the ground up, moved by strong ethical motivations and the awareness that certain practices need to change. The green economy seems to be a good response to the demands for change. This economy would need to both reduce the environmental impact of production and increase the level of employment. For this, the economy must become an intelligent one, that produces goods and services which could improve the quality of life and have a lower impact on the environment because they were produced mindfully, taking into account their full life cycle.

"The new politics would need to have the characteristics of systems that fulfill operativity and productive as well as infrastructural investments on a local, urban, regional, national, and international level; complementary contributions from the systems of SMEs and large company campuses connected by networks of innovators; an increasing role of universities and public research on large projects based on the social, cultural, and economic peculiarities of the territories." (R. Cappellin et al., 2017, p. 41). We presuppose an environment of cultural integration and economic collaboration in which we might assert innovative practices for the process and transformation of said environment, which would be founded on a kind of multisectorial, integrated, and interdisciplinary approach (N. Morelli, M. A. Sbordone, 2018).

3 A smart system for a dialogue with the vegetation of the cities: the smag research project

The research project used as a case study is SMAG - SMArt Garden (Regione Toscana Bandi RSI - POR FESR 2014-2020). The partnership is made up of Nuvap (project leader), UpGroup and Travertino Sant'Andrea, Arredo di Pietra; as scientific partners from the University of Florence - DIDA Department of Architecture of the University of Florence and GESAAF Department of Forest Sciences, Consortium Ubiquitous Technologies - Cubit, Co-Robotics.

The project develops a system based on products and services equipped with an advanced technological set-up that is capable of controlling vital parameters of public or private green spaces - temperature, humidity, irrigation, activity of pathogen agents and harmful animals, pollution, or environmental benefits - using the Internet of Things. In particular, thanks to the development of a multi-sensor system and a cloud platform for the management of the detected data, it is possible to intervene on factors such as: health of the garden and of the people who frequent it, irrigation, lighting, video control, anti-intrusion, anti-diffusion, loads and alarms, atmospheric and sound pollution and more generally on the overall sustainability of the system. By means of particular sensors positioned on plants or in their vicinity it is possible to concretely monitor different aspects of the life of a garden, such as: external environmental conditions (temperature, humidity, pressure, C02, particles); soil conditions (humidity, density, PH, organoleptic composition); conditions of the plants (state of growth, presence of problematic elements such as insects, poor structure of the plant); remotely accessible information, images and noises; implementation of actions through electronic drives (irrigation, soil and plant nourishment).

These particular sensors have been inserted into intelligent products such as furniture systems and outdoor accessories in stone material made by two Tuscan companies: Travertino Sant'Andrea and UpGroup. The sensors and drives send data to a specific platform through a control unit, using different access technologies, wireless and wired. The management platform collects the data coming from the control unit, records them and analyzes them through advanced algorithms that enhance the performance of the green spaces monitored, allowing the problems of the maintenance processes of these spaces, whether public or private, to be managed in a predictive and systematic way. Through this control app that connects with the control unit, the various products become effectively intelligent, able to relate to the various actors who interact with the system: on the one hand with the maintenance technician regarding aspects concerning health and maintenance of greenery; on the other hand with people, from an emotional / experiential point of view - by sensitizing them to the green space they are living in and to how much that particular place contributes to the improvement of our ecosystem (Marseglia, 2020, pp. 216-229).

Fig. 7. SMAG interconnections (Alessio Tanzini, Marika Costa, University of Florence, Department of Architecture, Laboratory of Design for Sustainability, 2020)

The SMAG project brings out the enabling role of technologies, and platforms in particular, in accompanying and supporting innovative processes not only through a technological push but also the social and economic one. With a view to the general sustainability of the ecosystem, the SMAG project falls within what is called the Platform Economy, which stimulates the formation and continuous growth of a number of nodes - or subjects - suppliers of relevant information populating the overall system, giving life to a "fragmented society" or a fragmented ecosystem, in which fragmentation is understood positively as polarization and unequal distribution of social and economic conditions and opportunities (Guarascio, 2018).

4 Conclusions

Given the discoveries and the practical examples reported in support of the thesis, it is possible to define today's reality in an almost "biological" nature that developed a neuronal system of connections between things and people that has never existed before (Zannoni, 2018). A hybrid ecosystem that, despite the fact that its evolution and transformation is still ongoing, manages to expand the concept of the network to define it as a system of synapses in which everything is potentially connected and interactive.

However, the environment must not succumb here, but rather it must become the pin that makes this progression work, because as we can see from the examples provided: without land there is no identity and without identity there is no context; therefore there are also no stakeholders to analyze, let alone connect. The land functions as an anchor that allows all innovations to be brought to reality and made applicable, avoiding parts of the negative effects inherent in new technologies.

Any innovation, even technological and digital, without a land for application and an ultimate goal aimed at sustainability, today has no point, if not in a dimension of mutual co-existence. In the future, therefore, to develop a society and a territorial system aimed at sustainability without neglecting the component of innovation, including the technological and digital ones - especially in relation to production processes - it will be important to try to work to create concrete bridges between these two spheres. Technology should not be demonized but used as a strategic driver aimed precisely at improving our ecosystem with a view to sustainability, both environmental, and social and economic. Technological tools as concrete mediums, yet to be tested in their infinite potential, can bridge the gap, make processes more sustainable and users more aware - as well as active - even in complicated and technologically complex systems such as the Smart System that is currently being formed and that will lead us, through a global redesign, towards the future Society 5.0 (Ruffinoni, 2020), also termed the Super Smart Society (Takahashi, 2018).

This consideration together with the examples provided, underline how the physical and the digital world are interacting in an ever-closer way and the boundaries between the two are becoming more porous. In this view, the role of the project is even more important since it allows us to manage and direct the processes of innovation and change in sustainable directions, in which the digital can become the ally and engine of a "digicircular" transformation (Epifani, 2020). Thus the two fundamental pivots of contemporary innovation and scientific debate are to be united: digital transformation and circular economy, in a single word that aims to make one become the conceptual as well as design support of the other, in a new, desirable, and certainly more sustainable harmonic whole.

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