

Energy design between art and artisan work¹

Design e energia entre arte e trabalho artesanal

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Abstract

Design and energy between art and artisan work: thus was born the process that generated a research and innovation pathway, conducted in Campania, between research centres and local know-how, within a tradition of relationships between art and knowledge, between craft and experimentation and more recently, between design and technological innovation. These relationships, which have roots within the local culture and the artisan tradition of the industry in Campania, were the synthesis of the pathway and of the process that led to the creation of the highly innovative outcomes of the Fotofun programme for integrating photovoltaics into buildings. In this sense, creativity and knowledge led to a shared phase of experimentation, and to an example of technological innovation, constituting a clear design process: one that delineated the scenario of reference for developing the Fotofun project which, via collaboration between universities, research institutes, and firms, returns a highly customisable product that is flexible, and can penetrate into new industrial sectors, defining guidelines for identifying future energy landscapes. In terms of tactics, the industrial design assumes the role of actor and director, guiding the processes of technological innovation, working within them, acknowledging their dynamics and the factors that can influence their strategies, making modifications where necessary, and using projects and products to construct the path towards innovation.

Key words: design, energy, artisan work, innovation.

Resumo

Design e energia entre arte e trabalho artesanal: assim nasceu o processo que gerou uma investigação e inovação de percurso, realizado em Campania, entre centros de investigação e know-how local, dentro de uma tradição de relações entre a arte e o saber, entre artesanato e experimentação e mais recentemente, entre o design e a inovação tecnológica. Essas relações, que têm raízes na cultura local e a tradição artesanal da indústria em Campania, foram a síntese do percurso e do processo que levou à criação dos resultados altamente inovadores do programa para integrar células fotovoltaicas Fotofun em edifícios. Neste sentido a criatividade e o conhecimento levaram a uma fase de experimentação compartilhada, e um exemplo de inovação tecnológica, constituindo um processo de concepção clara: aquele que delineou o cenário de referência para o desenvolvimento do projeto Fotofun que, através da colaboração entre universidades, institutos de pesquisa, e as empresas, portanto, retorna um produto altamente personalizável que é flexível e pode penetrar em novos setores industriais, definindo diretrizes para a identificação de paisagens de energia no futuro. Em termos de tática, o design industrial, assim, assume o papel de ator e diretor, orientando os processos de inovação tecnológica, trabalhando dentro delas, reconhecendo sua dinâmica e os fatores que podem influenciar suas estratégias, fazendo modificações quando necessário, e por meio de projetos e produtos buscando construir caminhos para a inovação.

Palavras-chave: design, energia, trabalho artesanal, inovação.

¹ In this essay, the first section, entitled "Art as Knowledge", is written by Mario Buono, the one entitled "Craftsmanship as Experimentation" is written by Sonia Capece, and the one entitled "Design as Technological Innovation" is written by Giuseppe Vaccaro.

Art as knowledge

Design and energy between art and artisan work: thus was born the process that generated a research and innovation pathway, conducted in Campania, between research centres and local know-how, within a tradition of relationships between art and knowledge, between craft and experimentation and more recently, between design and technological innovation. These relationships, which have roots in local culture and the artisan tradition of industry in Campania, were the synthesis of the pathway and of the process that led to the creation of the highly innovative outcomes of the Fotofun programme for integrating photovoltaics into buildings.

The project entitled "FOTOFUN – Multipurpose Photovoltaic Elements with High Architectural Integrability"², using photovoltaic technology, was developed by the Built Environment Control Laboratory_ Ri.A.S., of the Second University of Naples in collaboration with the Elettro Sannio Snc company of Benevento.

Art, said Konrad Fiedler, is "a progression from confusion to clarity": that is, a process of acquiring knowledge and of ordering a chaotic experience of the world, to obtain an image that has absolute value. A process of distinguishing and separating, but at the same time of developing and constructing; and its value is linked to knowledge. It is knowledge that determines its value, regardless of the time in which it is made. There can be no knowledge without experience is where it lies the basis of art and technology: *techné* is what we create in the material sense, through technique and art, the one concatenated with the other, the one a part of the other.

The arts of speech, the visual arts, and the arts of sound or movement, are united by the particular language of art that is expression and communication, is language: perhaps the most direct, profound, universal language that makes it possible to decode the world, attain knowledge, and transmit it.

To know the language of art means to know, in a deeper and more precise way, the epoch that produces it, but for the artist, it also means establishing contact with one's profoundest self, and expressing it.

The work of the craftsman is situated within this dynamic equilibrium, between divergent worlds like art and technology, reality and utopia. Through experience dictated by consolidated wisdom and expertise, the work of the craftsman has the ability to transfer matter, and to create objects whose practical use is to enhance, by a singular artistic context, how to investigate materials, the study of physical forms, and the care it takes over every stage of their development, thus imparting added value to the product.

These inanimate universes, made of matter, are the

fruit of experiences, of areas of expertise, and of areas of knowledge, of techniques, and of arts. It was these that guided the development of the research carried out within the Fotofun project, into multifunctional photovoltaic elements capable of being highly integrated into architecture. A project born out of the collaboration between different actors who were the bearers of their own interests, of their own expertise, of their own differing interpretations and world-views: designers, engineers, architects, firms, economists, and others.

The outcome was the development of a single-component photovoltaic roof tile whose design process resulted from studying diverse areas of specialised knowledge, wealth of experience, the complexity of the context, the ways in which materials are chosen, studies of architectural form, artisan work, experimentation, and material as this is linked to tradition: a product that was developed through the interaction between research, development, and producer firm, following a path of research, of study models, and of processes inextricably linked to the discipline of design, to ideas, and to culture; giving life to 'form through matter', but especially form through art, experimentation, scientific knowledge, and technological innovation.

In this sense, creativity and knowledge led to a shared phase of experimentation, and to an example of technological innovation, constituting a clear design process: one that delineated the scenario of reference for developing the Fotofun project which, via collaboration between universities, research institutes, and firms, thus returns a highly customisable product that is flexible, and can penetrate into new industrial sectors, defining guidelines for identifying future energy landscapes.

Craftsmanship as experimentation

Art is a concrete and real human activity, not only because of the media it requires, but precisely because it offers instruments to embody and lend form to the interior world, vision and the imagination. "Art is a unique language [...] that can and wants to grasp reality in its metaphysical heart. [...] It is the language of the individual and of society" (Grazioli, 2001, p. 243).

But this is not the entire reality of things, which is far vaster, albeit often submerged. And we can say many things, but not that art is dead, because its very language is an essential part of human nature.

We should consider that, in our everyday lives, we are surrounded by artistic objects; the applied arts, design objects, buildings and monuments of our cities are part of our daily experience, particularly because we live in a country full of objects *d'art*, built century by century to become a unique entity.

² The project was developed thanks to funding from the Pacchetto Integrato Agevolazioni (PIA, Integrated Facilitation Package) funding, envisaged as part of the Programma Operativo Nazionale (PON, National Operating Programme) "Sviluppo Imprenditoriale Locale" 2000 – 2006 (2nd call for proposals), of which Mario Buono is the scientific head. It was reviewed in Salvio (2009, p. 15). Diamond – mono tile pv and dual tile pv. Designed by SUN + Elettro Sannio + ENEA Research Centre, project published in Domus (no. 940, October 2010, p. 153). For a detailed examination of the project, see Pelosi (2009, p. 212-215). Furthermore, with the project entitled "Diamond mono tile pv_NewCo" the team directed by Mario Buono participated in the "Start Cup Campania 2010", an award for innovation promoted by the universities of Campania, structured as a competition among groups of people who develop entrepreneurial ideas based on research and innovation. In this competition Buono's team placed second, receiving a cash prize and obtaining various reviews in regional and national periodicals. This award also led to participation in PNI CUBE – Palermo 2010, National Prize for Innovation 2010.

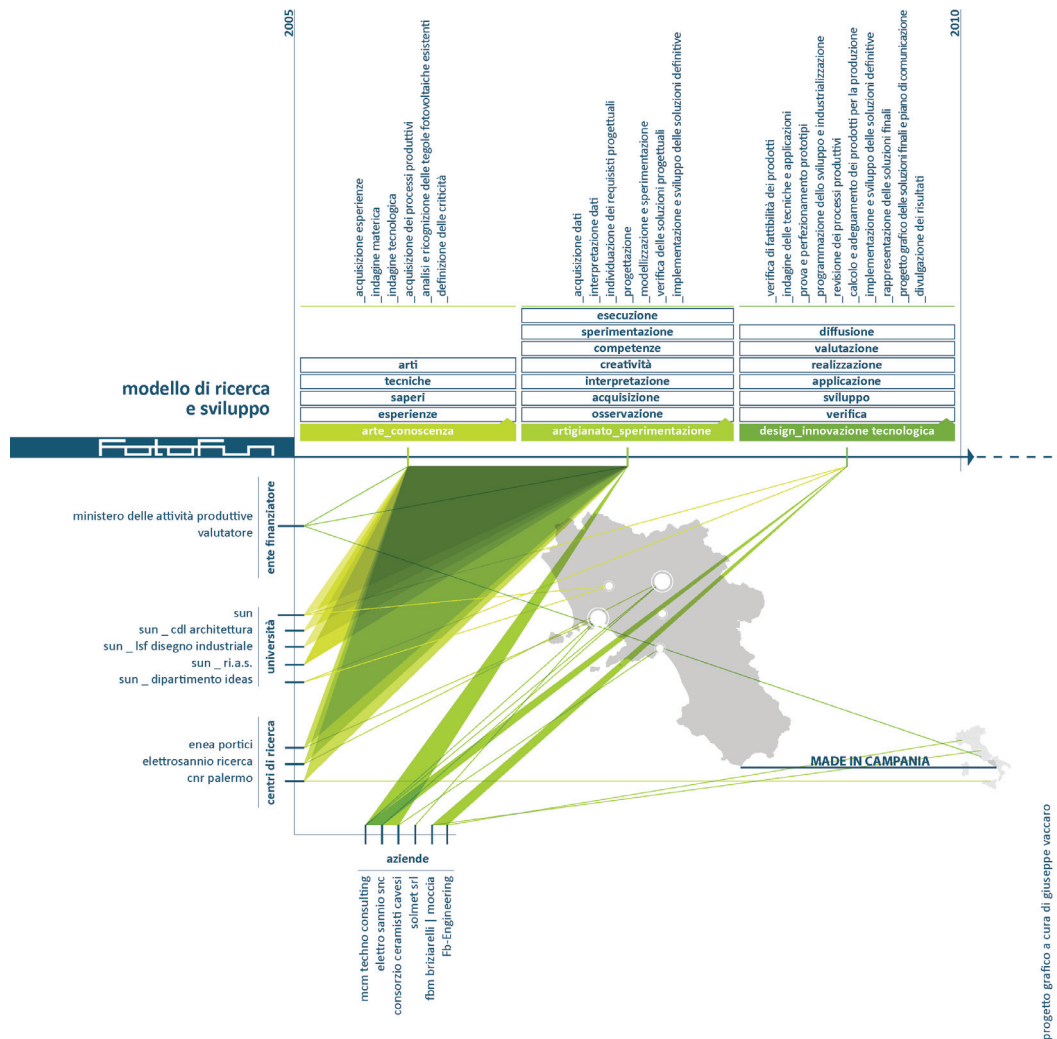


Figure 1. Fotofun model of research and development.

The fact is that since art is a language, its meaning is not immediate but must be grasped and understood. It is a process of individual and introspective knowledge, of self-awareness and knowledge of the setting in which one moves. But the process of individualisation is also a creative one, as it is not passive but active, requiring instruments and categories that, one at a time, are created and adapted to this purpose.

Knowledge can thus be defined as “a dynamic framework or structure from which information can be stored, processed and understood”. It is “therefore associated with a process that involves cognitive structures which can assimilate information and put it into a wider context, allowing actions to be undertaken from it” (Howells, 2007 [2002], p. 4).

It “greatly facilitates creative production because it places before the person conducting research an exhaustive picture of the situation he is facing and in which he plans to operate. Knowing what one can expect from a prefigured operation means anticipating the consequences; it means grasping the implications and exerting a creative spirit that is also critical and, in any case, innovative on the level of experience” (Rosati, 2004, p. 182).

The relationship between art and technology has been examined a number of times in the history of design. Art initially opposed technology to preserve the beauty of everyday objects, threatened by industrial mechanical production. Later, however, technology – the expression of progress – had to find its complete manifestation in art. It is about distinguishing and separating, but at the same time it is also elaboration and construction: the one concatenated with the other, the one the expression of the other. Oswald Spengler sustained that technology “does not lie in the completed object but in its planning [...] and he thus define it as the ‘tactic of the whole of life’, which should not be understood starting with the instrument, as it does not refer to the fabrication of things but to the way of working with them, and it therefore originates from the concept of this process” (Vitta, 2001, p. 23).

A product is defined by the meanings it is destined to acquire, meanings composed of material, i.e. the result of experiences, knowledge, know-how, techniques and arts that, in this case, have led to the development of two photovoltaic tiles, the diamond mono tile pv and the diamond dual tile pv.

These solutions arise from the study of different fields of knowledge, the wealth of experience, the complexity of

the context and, above all, the craftsmanship and experimentation of materials tied to tradition.

It is a craftsmanship that is able to give, express and hand down its cultural identity and the ethical, social, aesthetic, economic and religious values of a society. In an era in which we can only imagine a planetary society in terms of a standardizing technological progress that affects the arts themselves and modifies tastes and handicrafts, craftsmanship represents one of the very few stable factors of an evolving society, the connective tissue of a cultural and social experience that ties man to nature and thus the land, a complete knowledge where theory and practice converge and reciprocally perfect each other.

It is a craftsmanship composed of memory, customs, transmission and values that are at once practical and spiritual, in which myth and history, time and eternity, are entwined in ways that increasingly escape the muted attention and sensitivity of post-modern man.

The activity of research and experimentation of the photovoltaic tiles, the diamond mono tile pv and the diamond dual tile pv, were pursued and developed through knowledge, experience and experimentation with artisanal techniques and the materials that were used, such as clay, which encloses and recounts an atavistic history of bonds with the earth.

"Craftsmanship provides yet another opportunity to re-establish the value of art, to exorcise new forms of the division of labour that can question the very autonomy of intellectual work" (Wingler, 1962, p. 8).

The structure that guided the projects for the photovoltaic tiles embraces history, direct experience in the field and design as technological innovation.

Specifically, experience illustrated as experimentation has acquired a significant and priority function in the projects, enabling to get to know the product, study it and evaluate it through the manual and gestural character of the material. The experimentation defined by study models and prototypes on a real scale have made it possible to manage the physicality of the materials and understand their sturdiness, endurance and shrinkage. This involved intense experimentation with materials and with construction and production techniques that can express the essence of the product through the formal rhythm of lines, the opposition or harmony of materials, the manual character and the analysis of the geometric forms that constituted a direct comparison of materials, geometries and colours.

The design path was developed by condensing and blending experiences, know-how, creativity, emotions and knowledge, seeking to interpret and grasp potentially innovative aspects, creating a synthesis of art and technology, and encouraging the relationship between creativity and craftsmanship.

Indeed, creativity, knowledge and craftsmanship led to a shared experimentation phase and an example of

technological innovation, constituting a clear design process that sketched out the reference scenario for the development of the Fotofun project.

Design as technological innovation

Knowledge, culture, skills and creativity represent the main engines of design, factors that can generate innovation and identify the driving force in the local system.

As Aldo Bonomi (2006) stated, knowledge and creativity became part of a "web of value" that crosses the increasingly porous boundary of industry to spread across the territory, triggering innovative processes that introduce new products, use existing technological solutions and open new markets, modifying the organisational models of production.

In this context, the values of identity and belonging of the production ecosystems of a specific area fit in well with the experimentation and innovation of products and processes, investing in the quality of products and workmanship as a *sine qua non* in order to allow a territory to qualify itself: for example, an area such as Campania, characterised by a prosperous past with a wealth of traditions, but with a difficult present, affected by a profound economic and structural crisis yet able to spread tradition, culture and continuous technological innovation.

Indeed, in the context of the objects that are part of the "Fotofun" research project, the development and manufacture of the first "designed" photovoltaic tiles occurred after acquiring knowledge of Campania's historical and cultural heritage and its local know-how, through interactive and repetitive pathways guided by curiosity, observation, knowledge, intuition and sensitivity, technological and methodological experimentation conducted over the years, and through teaching, interaction and the university's collaboration with Elettro Sannio Snc, a manufacturer of photovoltaic modules, and with companies in Campania that make ceramics.

This action led to a consolidation of the subjects tied to "energy design" and the development of scenarios regarding environmental sustainability that satisfy the needs of a company such as Elettro Sannio Snc, which plans to diversify its commercial offer by marketing a product that is innovative on both technological and formal levels. At the same time, this promotes the "culture of photovoltaic technology" in areas which such installations are jeopardised³, creating a connective tissue defined by a multiplicity of skills and professional abilities so as to generate continuous innovation and come up with design solutions that increasingly cater to the requests of a demanding and constantly growing market.

Through experimentation that involved selecting and verifying the optimum configuration of the photovoltaic module in terms of both form and performance, and through the meticulous study of industrial processes, i.e. the moulding, drying and shrinkage techniques of the brick material, the two solutions that were configured – diamond mono

³ Approximately 48% of the Italian territory is subject to landscape restrictions due to noteworthy historical and artistic value. Consequently, the incorporation of elements for the supply of energy from renewable sources is often ill suited from both formal and aesthetic-environmental standpoint. Unfortunately, from a legislative viewpoint there are various restrictions that make it difficult to pinpoint solutions suitable for the installation of elements to harness solar energy.

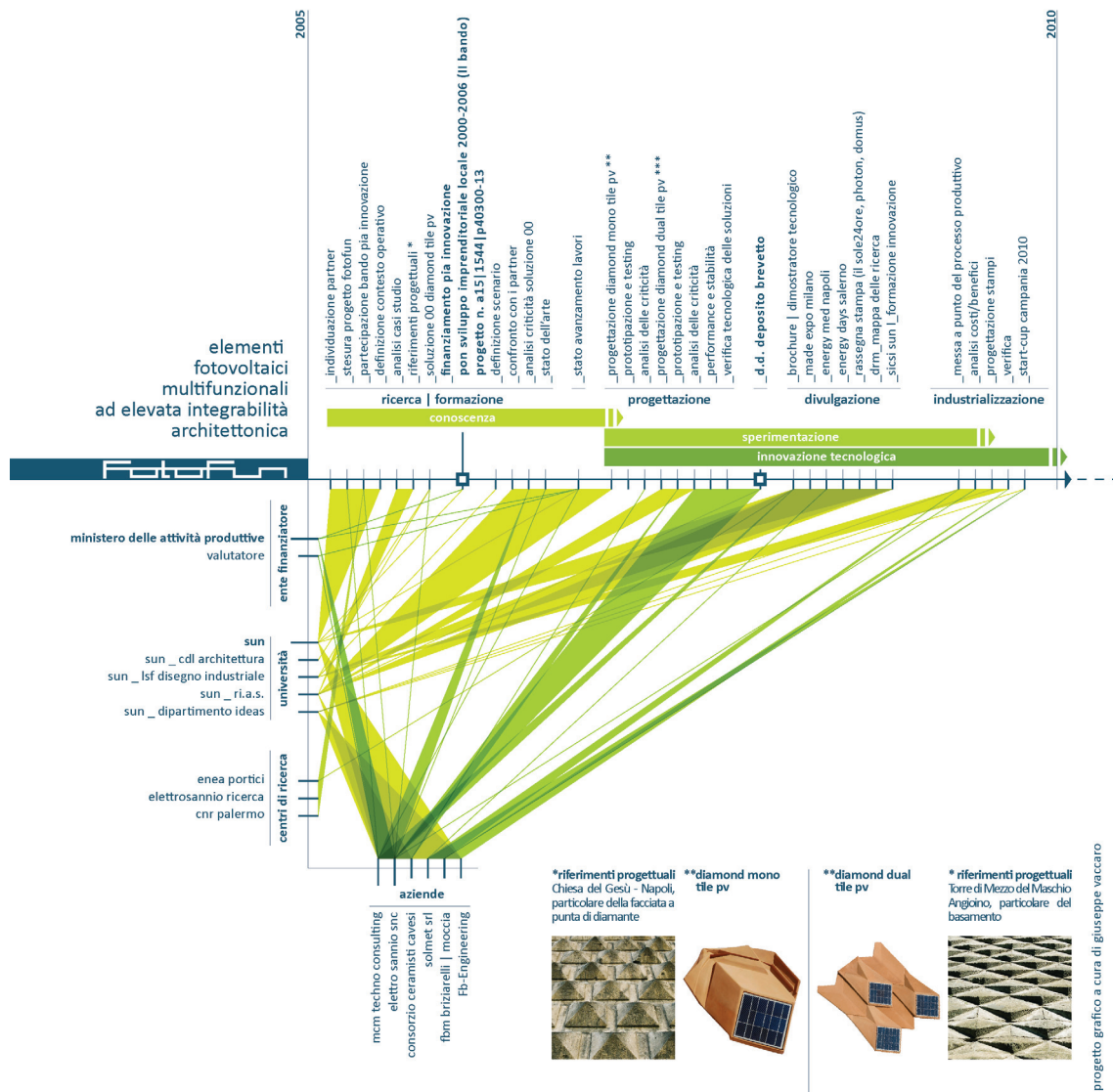


Figure 2. Fotofun: general structure.

tile pv and the dual tile pv – introduce important product innovations as an alternative to the solutions currently on the market, which are often the result of adapting traditional tile forms to new power-supply requirements. The characteristics, combined with additional functions with respect to the simple generation of energy – such as the absence of obstructions and shading between the parts, maximum ventilation of the individual photovoltaic modules and the system for assembling the various components, increasing efficiency thanks to the greater slope of the photovoltaic module with respect to the pitch of the roof – meet the needs for architectural integration in historic buildings, sustainability and the recyclability of the materials.

In particular, based on a single technological model represented by the photovoltaic component and reinterpreting Italy's oldest traditions, the single-component diamond mono tile pv marks the evolution of single-component tiles in which every element envisages a channeling and run-off system for rainwater to ensure that there is no pooling on the surface or water infiltration beneath the roof. Instead, the redevelopment of the function of traditional curved pantiles, the simple overlay of two seem-

ingly separate elements such as the pantile and undertile, generates the two-component tile.

In both cases, the conformation of the surfaces is such that it overexposes the photovoltaic module to ventilation, avoiding obstructions between the parts through the proper balance between form and function, as a compromise between the need to guarantee the maximum energy efficiency of the photovoltaic component and the minimum slope of the remaining faces of the tile in order to ensure water run-off and natural ventilation.

Following the initial phase of analysis, design, prototyping and verification, and the filing of two patent applications for the two types of tiles, the second phase involved a sequence of important encounters at the plants of Industrie Pica SpA and then FBM_Fornaci Briziarelli of Marsciano (Perugia). These encounters made it possible to understand the dynamics and difficulties of the industrial process of two important companies, establish the timing with which choices had to be made regarding the industrialisation phase, and confirm the formal and design choices that were implemented.

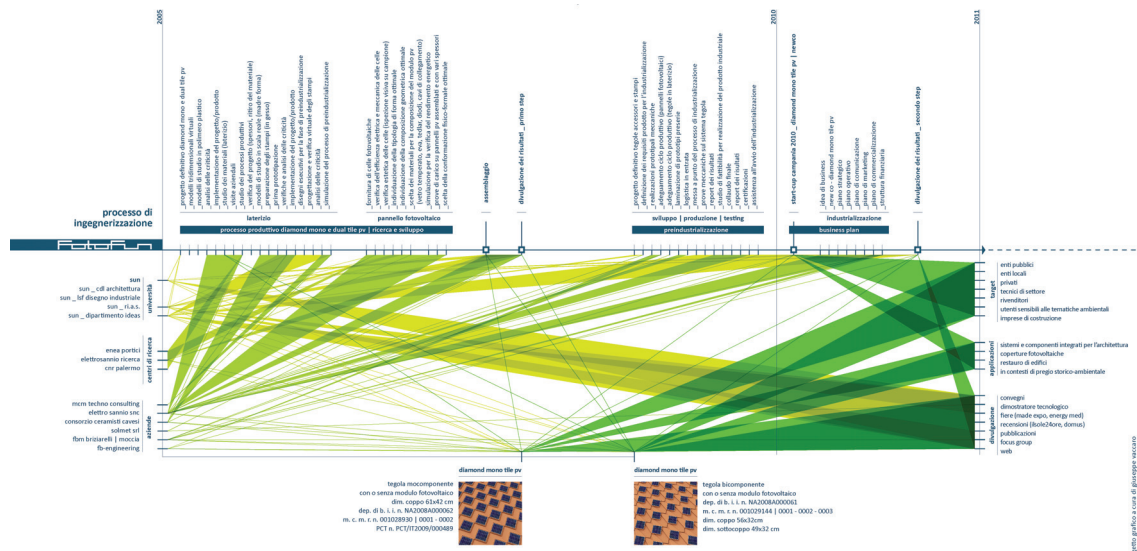


Figure 3. Fotofun: research products.

In this sense, the experience that was gained – dictated by the dialogue between the different areas of expertise and knowledge that made it possible to study, construct and define an innovative formal solution capable of responding not only to production techniques but also to the performance features of the materials and the functions to which the “diamond mono tile and dual tile pv” products had to respond – also came about thanks to the multidisciplinary contribution of design, which is able to observe, learn and decipher reality in order to process, develop and transfer it to the construction of new products with a high social, ethical and cultural value.

This represents a system of cross-cutting relations that, through effective processes for transferring the results of the research, encourage connections with specific groupings of companies, through direct integration with the world of research aimed at developing the competitiveness of the industrial system, a relationship that, thanks to a continuous and reciprocal process of building loyalty, is evolving with several companies in Campania. Therefore, design can be credited with the dual role of director and actor in innovation processes, thus making it capable not only of guiding them but also of working within them, understanding the dynamics and factors that affect change, and altering strategy if the situation so requires, in order to build – rather than merely indicate – the path towards innovation (Pelosi, 2009).

A new development trajectory has thus been delineated based on the ability to generate, accumulate, disseminate and use localised systems of knowledge, within which design is configured as the actor/director of a collaborative activity that can devise organisational and crosscutting networks for the development of creative and innovative scenarios that are the outcome of the cooperation not merely of technical-formal know-how, a function of unique personal and cultural aspects, but also of internal investment in research and development.

The topicality of this subject has consolidated the construction of a network of know-how and skills linking the university, research centres and companies. Consequently, this has allowed the members of the research unit to listen to and interpret the needs of SMEs that, in

a condition of widespread crisis, have wanted to change course and focus their attention on research and innovation, viewing them as the basic principles for economic, cultural and social growth, and entrusting the field of design with the opportunity to participate – on a national and/or worldwide scale – in the introduction of highly innovative components that can promptly respond to a constantly evolving market, anticipating future topics of discussion, and introducing new forms of collaboration and new paths of experience.

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