

Connections Between Products and Contexts. Key Drivers for the Design of a Product

*Original*

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# ACTA TECHNICA CORVINIENSIS

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## BULLETIN OF ENGINEERING

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## Aims & Scope

### General Aims:

ACTA TECHNICA CORVINIENSIS – BULLETIN OF ENGINEERING is an international and interdisciplinary journal which reports on scientific and technical contributions.

ACTA TECHNICA CORVINIENSIS – BULLETIN OF ENGINEERING publishes invited review papers covering the full spectrum of engineering. The reviews, both experimental and theoretical, provide general background information as well as a critical assessment on topics in a state of flux. We are primarily interested in those contributions which bring new insights, and papers will be selected on the basis of the importance of the new knowledge they provide.

Topical reviews in materials science and engineering, each including:

- surveys of work accomplished to date
- current trends in research and applications
- future prospects.

As an open-access journal ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering will serve the whole engineering research community, offering a stimulating combination of the following:

- Research Papers - concise, high impact original research articles,
- Scientific Papers - concise, high impact original theoretical articles,
- Perspectives - commissioned commentaries highlighting the impact and wider implications of research appearing in the journal.

ACTA TECHNICA CORVINIENSIS – BULLETIN OF ENGINEERING encourages the submission of comments on papers published particularly in our journal. The journal publishes articles focused on topics of current interest within the scope of the journal and coordinated by invited guest editors. Interested authors are invited to contact one of the Editors for further details.

Every year, in three issues, ACTA TECHNICA CORVINIENSIS – BULLETIN OF ENGINEERING publishes a series of reviews covering the most exciting and developing areas of engineering. Each issue contains papers reviewed by international researchers who are experts in their fields. The result is a journal that gives the scientists and engineers the opportunity to keep informed of all the current developments in their own, and related, areas of research, ensuring the new ideas across an increasingly the interdisciplinary field.

ACTA TECHNICA CORVINIENSIS – BULLETIN OF ENGINEERING exchange similar publications with similar institutions of our country and from abroad.

### Audience:

Scientists and engineers with an interest in the respective interfaces of engineering fields, technology and materials, information processes, research in various industrial applications. It publishes articles of interest to researchers and engineers and to other scientists involved with materials phenomena and computational modeling.

### About us:

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering is an international and interdisciplinary journal which reports on scientific and technical contributions and publishes invited review papers covering the full spectrum of engineering.

Every year, in four online issues (fascicules 1 - 4), ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering [e-ISSN: 2067-3809] publishes a series of reviews covering the most exciting and developing areas of engineering. Each issue contains papers reviewed by international researchers who are experts in their fields. The result is a journal that gives the scientists and engineers the opportunity to keep informed of all the current developments in their own, and related, areas of research, ensuring the new ideas across an increasingly the interdisciplinary field.

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering has been published since 2008, as an online supplement of the ANNALS OF FACULTY ENGINEERING HUNEDOARA – INTERNATIONAL JOURNAL OF ENGINEERING.

Now, the ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering is a free-access, online, international and multidisciplinary publication of the Faculty of Engineering Hunedoara.

### Coverage:

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering is a good opportunity for the researchers to exchange information and to present the results of their research activity. Scientists and engineers with an interest in the respective interfaces of engineering fields, technology and materials, information processes, research in various industrial applications are the target and audience of ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering. It publishes articles of interest to researchers and engineers and to other scientists involved with materials phenomena and computational modeling.

The journal's coverage will reflect the increasingly interdisciplinary nature of engineering, recognizing wide-ranging contributions to the development of methods, tools and evaluation strategies relevant to the field. Numerical modeling or simulation, as well as theoretical and experimental approaches to engineering will form the core of ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering's content, however approaches from a range of environmental science and economics are strongly encouraged.

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering appear in four issues per year and is open to the reviews, papers, short communications and breakings news inserted as Scientific Events, in the field of engineering.

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**Invitation:**

We are looking forward to a fruitful collaboration and we welcome you to publish in our ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering. You are invited to contribute review or research papers as well as opinion in the fields of science and technology including engineering. We accept contributions (full papers) in the fields of applied sciences and technology including all branches of engineering and management.

Submission of a paper implies that the work described has not been published previously (except in the form of an abstract or as part of a published lecture or academic thesis) that it is not under consideration for publication elsewhere. It is not accepted to submit materials which in any way violate copyrights of third persons or law rights. An author is fully responsible ethically and legally for breaking given conditions or misleading the Editor or the Publisher.

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## Review process & Editorial Policy

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering is dedicated to publishing material of the highest engineering interest, and to this end we have assembled a distinguished Editorial Board and Scientific Committee of academics, professors and researchers.

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering publishes invited review papers covering the full spectrum of engineering. The reviews, both experimental and theoretical, provide general background information as well as a critical assessment on topics in a state of flux. We are primarily interested in those contributions which bring new insights, and papers will be selected on the basis of the importance of the new knowledge they provide.

The editorial policy of ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering is to serve its readership in two ways. Firstly, it provides a critical overview of the current issues in a well-defined area of immediate interest to materials scientists. Secondly, each review contains an extensive list of references thus providing an invaluable pointer to the primary research literature available on the topic. This policy is implemented by the Editorial Board which consists of outstanding scientists in their respective disciplines. The Board identifies the topics of interest and subsequently invites qualified authors. In order to ensure speedy publication, each material will be report to authors, separately, thought Report of the Scientific Committee. For an overview of recent dispatched issues, see the ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering issues.

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering encourages the submission of comments on papers published particularly in our journal. The journal publishes articles focused on topics of current interest within the scope of the journal and coordinated by invited guest editors. Interested authors are invited to contact one of the Editors for further details. The members of the Editorial Board may serve as reviewers. The reports of the referees and the Decision of the Editors regarding the publication will be sent to the corresponding authors.

The evaluated paper may be recommended for:

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ACTA TECHNICA CORVINIENSIS – BULLETIN of ENGINEERING is seeking qualified researchers as members of the editorial team. Like our other journals, ACTA TECHNICA CORVINIENSIS – BULLETIN of ENGINEERING will serve as a great resource for researchers and students across the globe. We ask you to support this initiative by joining our editorial team. If you are interested in serving as a member of the editorial team, kindly send us your resume to [redactie@fih.upt.ro](mailto:redactie@fih.upt.ro).



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Department of Mehatronics, University of KRAGUJEVAC, Technical Faculty – CACAK

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University Politehnica BUCUREȘTI, Faculty of Materials Science and Engineering – BUCUREȘTI

**Aurel CRIȘAN**

University Transilvania of BRAȘOV, Faculty of Material Science and Engineering – BRAȘOV

**Mircea BEJAN**

Technical University of CLUJ-NAPOCA, Faculty of Mechanical Engineering – CLUJ-NAPOCA

**Ioan VIDA-SIMITI**

Technical University of CLUJ-NAPOCA, Faculty of Materials Science & Engineering – CLUJ-NAPOCA

**Nicolae FARBAȘ**

Association for Multidisciplinary Research of the West Zone of Romania (ACM-V) – TIMIȘOARA

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University Politehnica TIMIȘOARA, Faculty of Engineering – HUNEDOARA

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University Politehnica BUCUREȘTI, Faculty of Materials Science and Engineering – BUCUREȘTI

**Cristian PREDESCU**

University Politehnica BUCUREȘTI, Faculty of Materials Science and Engineering – BUCUREȘTI

**Carmen ALIC**

University Politehnica TIMIȘOARA, Faculty of Engineering – HUNEDOARA

**Csaba GYENGE**

Technical University of CLUJ-NAPOCA, Machine Building Faculty – CLUJ-NAPOCA

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University Politehnica TIMIȘOARA, Department of Mathematics – TIMIȘOARA

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University Politehnica TIMIȘOARA, Department of Mathematics – TIMIȘOARA

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University Politehnica TIMIȘOARA, Faculty of Engineering – HUNEDOARA

**Tibor BEDÓ**

University Transilvania of BRAȘOV, Faculty of Material Science and Engineering – BRAȘOV

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Institute of Engineering Materials and Biomaterials, Silesian University of Technology – GLIWICE

**Stanisław LEGUTKO**

Institute of Mechanical Technology, Polytechnic University – POZNAN

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Silesian University of Technology - KATOWICE, Faculty Materials Science & Metallurgy– KATOWICE

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Institute of Metallurgy and Materials Science, Polish Academy of Sciences – KRAKÓW

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**Ognyan ALIPIEV**

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University "St. Cyril and Methodius" SKOPJE, Faculty of Mechanical Engineering – SKOPJE

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University "St. Cyril and Methodius" SKOPJE, Faculty of Technology and Metallurgy – SKOPJE

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University "St. Cyril and Methodius" SKOPJE, Faculty of Mechanical Engineering – SKOPJE

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CEO Himtech Oy Engineering – JOUTSENO

**Pentti KARJALAINEN**

University of OULU, Department of Mechanical Engineering, Centre for Advanced Steels Research – OULU

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5, REVOLUTIEI, 331128, HUNEDOARA, ROMANIA  
<http://acta.fih.upt.ro>

## Content of FASCICULE 4 [OCTOBER–DECEMBER]

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**SOLVING TRAVELLING SALESMAN PROBLEM BY USE OF KOHONEN SELF-ORGANIZING MAPS**

**ABSTRACT:** This paper presents an approach for solving the traveling salesman problem (TSP) by using artificial neural network (ANN). The ANN model adopted in this paper is the Kohonen’s self-organizing map (SOM) which uses competitive, unsupervised learning. The paper briefly describes the competitive learning and Kohonen’s SOM model development. The possibilities of SOM were applied for solving real problem of disposal plastics waste. The Kohonen’s SOM was trained using original geo coordinates for container locations in the city of Niš. The results demonstrate that the proposed approach is comparable in terms of solution quality and computational requirements to classical approaches such as Clarke-Wright saving algorithm.

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**ABSTRACT:** In this paper a simple fuzzy logic control is proposed in order to ensure DC-bus voltage regulation and to keep the capacitor voltages balanced with minimizing the zero-sequence component in the source current in three phase four wires active power filter. A comparison of the proposed method against the conventional proportional integral one is illustrated through simulation results and a clear advantage of the fuzzy logic control can be observed. Moreover, identification of reference currents will be developed by the use of Multi-Variable Filter having the advantage of extracting harmonic voltages directly from the  $\alpha\beta$  axis. Computer simulation results show that the dynamic behavior of the fuzzy controller is better than the conventional proportional-integral (PI) controller.

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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering, Fascicule 4 [October–December] includes original papers submitted to the Editorial Board, directly by authors or by the regional collaborators of the Journal. In this sense, ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering, Fascicule 4 [October–December] includes 25 scientific originals papers.

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## CONNECTIONS BETWEEN PRODUCTS AND CONTEXTS – KEY DRIVERS FOR THE DESIGN OF A PRODUCT

<sup>1,2</sup>- POLYTECHNIC OF TURIN, FACULTY OF ARCHITECTURE, DEPARTMENT OF PRODUCTION SYSTEMS & INDUSTRIAL DESIGN, TURIN, ITALY

**ABSTRACT:** According to the recent economic situation, the actual business model will not be sustainable for a long time. In this paper we want propose a design methodology, which leads the possibility to influence people behaviours through the products. The aim of this paper is to underline the role of the designer, as director of the process, in order to coordinate involved actors and actions. This approach suggests a result, namely a product, which uses the local resources preserving material and cultural tradition and furthermore understanding the relationships between the customer and his territory. The link between the product and its context defines a “surplus value” which characterizes the design process as “sustainable”. According to that, the final aim should be a “customised product” defined through a multidisciplinary approach, where the role of the designer is creating a dialogue among all the different actors involved in the definition of the product.

**KEYWORDS:** sustainability, territory, relationships, multidisciplinary, industrial product

### BACKGROUND

Since the second half of the last century the scientific community was able to document, with an increasing deepening, the dramatic effects which human beings' activities wield on natural systems to solve their needs [1].

According to that, the Living Planet Report 2010 [2] pointed out that the ecological footprints of countries are causing an increasingly impressive environmental deficit.

Every day the International scientific community describes the effects of the human impact on the earth's natural system that still remains the only source we have and that is the base of the entire world economy and our wellness [3].

The actual economic and financial crisis is a huge and serious problem, but our ecological deficit is much more worrying than any other crisis we went through, also because environmental problems are probably one of the biggest reasons of the increasing of the economic crisis.

The world economy has grown with a massive rate in the last sixty years. The gross world product (GWP), has reached 69,000 billion of dollars in 2008, and already in that year there was a soft deflection in the annual growing percentage, due to the current economic crisis [4].

In the 1950 the gross world product was approximately of 6,600 billion of dollars and, since then, in sixty years we have almost tenfold.

By comparing these figures, it seems not plausible believe in a continuous and endless growth of the GWP.

As pointed out by the economist Jean Paul Fitoussi in his speech at the East-Forum 2010 in Rome, the sustainability is a complex concept formed by economical, social and environmental dimensions.

These three aspects have to be considered in a complementary manner, they cannot be in

competition, and so it is not possible take into account only the economical part [5].

According to that, the economical and environmental crisis can be seen as two aspects of the same phenomenon.

Thinking about the nature, it's interesting underline as, contrary to our economic model, all the earth's natural systems can renew themselves, generating life.

According to that, the ecologist Eugene Odum called the natural systems: life-support systems. He also described the whole earth as an ecological unit, formed by living and non-living parts, which together interact to form a stable entity [6, 7].

Our dominant culture leads us to neglect, and often to ignore, processes and functions performed by the nature. Each time we use it for our welfare, we probably weak or damage its resistance and resilience, and we difficulty understand that, in this way, we are reducing our chances of development for the future.

As ecologists have affirmed, humanity is closely dependent to processes, features and services provided by natural systems.

The humanity-health is therefore linked to the health of ecosystems and biodiversity, which are the basic constituents of natural systems.

As human beings, we are also a component of natural systems: without them we would not be able to evolve, and survive.

Despite this, people are heavily altering functioning and diversity of ecosystems: this is reflected in significant impacts on wellbeing, economy, wealth, and happiness of society. Because of that, urgent and concrete actions to reverse the negative trend are required.

The challenge we face today has very significant proportions and the only hope we have to win is to involve everybody.

It is humanity's duty figure out how the current 7 billion of population (the number is increasing and will

be approximately close to 10.6 billion in 2050) can live in this planet with an appropriate lifestyle, without causing the devastation of natural systems [8] (United Nations, 2010).

The aim of this paper is showing a possible way for facing the crisis by starting from a co-operative approach in the product's design process.

**METHODOLOGY**

This paper is based on the application of the Systemic Design methodology, namely with the acronym SD further in this paper. This approach underlines the importance of making better use of material and energy flows, in order to model our production and energy systems looking at the nature's rules [9].

This concept is also asserted in principles of Industrial Ecology theory: effluents of one process serve as the raw material for another process; the industrial ecosystem would function as an analogue of biological ecosystems [10].

Furthermore, according to the SD methodology, material and energy flows should be opened, in order to decrease environmental impact and resources depletion.

In particular, according to its principles (Figure 1), the SD:

- considers the waste of a system, namely output, as resources, namely input, for another system
- argues that each system starts from relationships among its constituent parts
- underlines that each system should be self-sufficient as much as possible, in order to naturally led to balance, and furthermore to preserve, itself alone
- assumes the relevance of the local context as resource base
- takes into account, during the design process, the environmental, social, cultural and ethic context as well as the subject of the project.

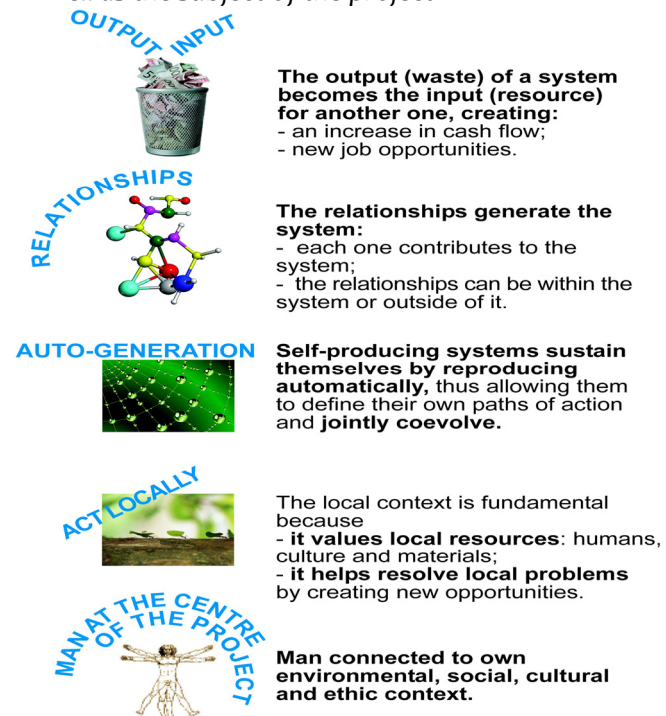


Figure 1: Systemic Design principles

In this paper the applied methodology stresses the relevance of connections and relationships among the elements of a system, which consequently underline the importance of a multidisciplinary approach in the design process.

According to that, the inter-connections among system's components are important as well as the dialogue among the participants in the process.

Therefore, a model based on systemic principles takes into account exchanges of material and energy among the involved elements; this is why it is possible to say that it is strictly influenced by the rules of the natural system.

It is a matter of fact that every natural system can be described with flows. In Nature nothing evolves in a static way: everything is linked and interacts with its own surrounding. Indeed, the design challenge for our century is finding the way to link as much as possible the elements of a system, trying to find a solution according to them [1].

**RESEARCH AIM**

The aim of the research is think about the consequences of the human's daily activities on the territory.

By starting from that concept and focusing the study on the design process, it is really important take into account strong relationships among human beings and their surroundings.

During a historical evolution, a territory is defined in time and space by behaviour of its inhabitants and its local peculiarities.

Hence, each specific geographical area is defined by different resources, which during centuries have been used from human beings in order to reach their needs. So that, the inhabitants of different contexts have developed a specific "know-how", strictly connected with defined territories.

Besides, during years the human abilities in doing things have lead a "material culture" characterized by social and cultural aspects dependent on territorial qualities.

Summarizing, a design process based on the local characterizations, has to take into account different aspects of a territory, which can be summarized in: available resources, "know-how" and "material culture" [9](Figure 2).

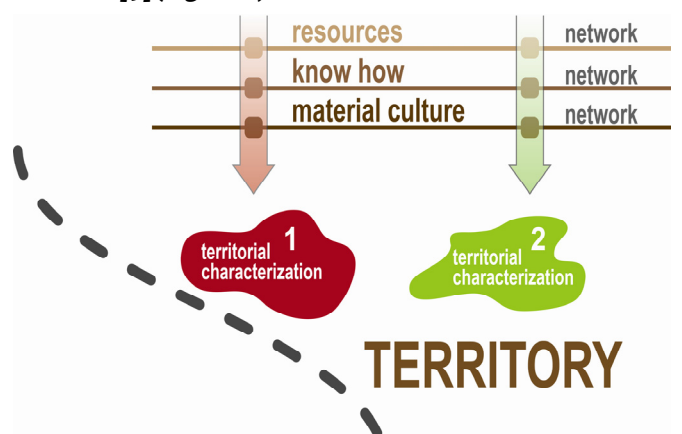


Figure 2: Local resources, know-how and material culture define the characterization of a territory

Because of the suggested approach promotes the interdependency between the product and its context, it is possible to forecast some relevant effects which influence the territory in different fields (Figure 3).

- Economy: the use of territory's resources leads the growth of the local economy.
- Culture: thanks to this approach, each territory will be defined by different expertise, strictly related to the "material culture" of its inhabitants.
- Market: the preference for of a small-scale economy will avoid problems caused by a large-sale logistic.
- Environment: a production method based on the local available resources will produce fewer products with high quality, without affect the environmental balance.
- Quality: the quality-level of a product will be guaranteed by its local-identity.

Moreover the application of this method will consequently enhance the wellbeing level of a place and its inhabitants.

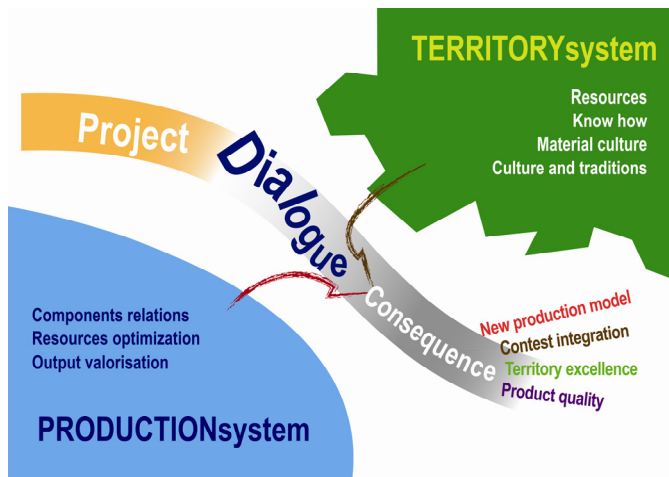


Figure 3: Several consequences are defined by relationships between the product and its territory

**CONCLUSIONS**

In this paper the authors have described a design process based on the strictly relationships between the product and its surroundings, and furthermore the possibility of guiding customers toward a sustainable approach, in term of economical, social and environmental values.

By starting from the natural systems' concept of the interaction among the elements of a system, it becomes clear that a product has to be related to its territory, in order to use the available resources and to preserve its "know-how" and culture.

The customer, who hopefully will understand the relevance of connections between the product and its territory, will be also able to appreciate these characteristics as a "surplus value" of the product itself.

The inter-dependency between the product and its surroundings, defined by multiple social, cultural, economical and environmental factors, point out that every earth's zone define as many products.

Consequently, by applying a systemic approach that considers the product as a "system" connected with several other related elements, a "customized product" would be preferable instead of a "standard one".

A systemic and holistic approach like the SD methodology, is based on the co-operation among the actors of the process. Because of that, the designer should take the role of expertise's coordinator, in order to show common points among the elements of the system; to point out possible hidden connections among the product and the other related systems and furthermore to explain interconnections among the participants' expertise.

Thanks to a systemic approach, the designer is able to show interactions among components and also wide the boundaries of a product that will be influenced by several factors, from social to environmental areas (Figure 3).

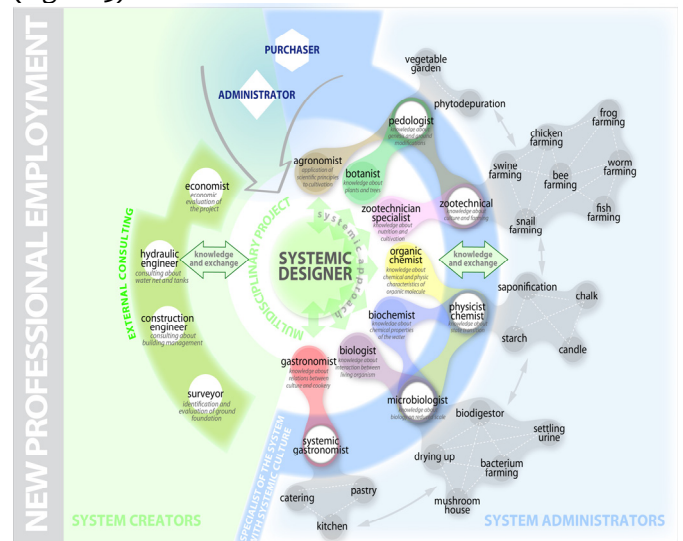


Figure 3: The role of the systemic designer, case study of a jail in Turin, Italy. Project of some students of the Master course "Systemic Design", Politecnico di Torino, 2011-2012

The straightness of the social, cultural and environmental factors shift the industrial approach from a "linear model", characterized by the competition among parts, to a "systemic model", defined by the co-operation among stakeholders. In this process multiple disciplines and seemingly unrelated aspects of design are integrated in a manner that permits synergistic benefits to be realized [11].

**FUTURE RESEARCH**

We introduced a method for the development of products that are highly connected with the local characteristics.

However the practical-aspects have not been analyzed in this paper. Because of this reason, possible future developments can be:

- The analysis of the role of the consumer, which should be educated in order to appreciate the "surplus value" of a product connected to the territory.
- The development of a "consumption model", based on the valorization of local values and territorial aspects.

- The application of this methodology in a case study, in order to study the real consequences that this approach causes to the products' design process.

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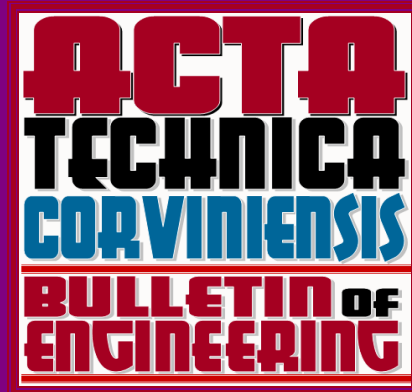
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