

Sustainable Production: Design by Components methodology in order to obtain a tailored product

Original

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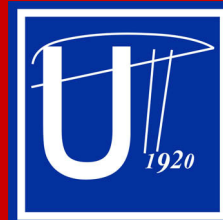
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Aims & Scope

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.

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General Topics:**ENGINEERING**

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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:

- Acceptance without any changes – in that case the authors will be asked to send the paper electronically in the required .doc format according to authors' instructions;
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The manuscript accepted for publication will be published in the next issue of ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering after the acceptance date.

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SCIENTIFIC EVENTS IN 2012

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- **THE 7th INTERNATIONAL SYMPOSIUM – MACHINE AND INDUSTRIAL DESIGN IN MECHANICAL ENGINEERING – KOD 2012**
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14–16 June 2012, Zadar, CROATIA
- **INTERNATIONAL CONFERENCE ON INDUSTRIAL LOGISTICS – ICIL 2012**
14–16 June 2012, Zadar, CROATIA
- **THE 9th INTERNATIONAL CONFERENCE – ELEKTRO 2012**
21–22 May 2012, Rajecké Teplice, SLOVAKIA
- **THE 2nd CONFERENCE – MAINTENANCE 2012**
13–16 June 2012, Zenica, B&H
- **THE 4th INTERNATIONAL CONFERENCE ON SUSTAINABLE AUTOMOTIVE TECHNOLOGIES – ICSAT 2012**
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- **THE 20th ANNUAL INTERNATIONAL CONFERENCE ON COMPOSITES, NANO OR METALS ENGINEERING – ICCE-20**
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- **THE 12th INTERNATIONAL MULTIDISCIPLINARY SCIENTIFIC GEO-CONFERENCE AND EXPO – SGEM 2012 (SURVEYING GEOLOGY & MINING ECOLOGY MANAGEMENT) – MODERN MANAGEMENT OF MINE PRODUCING, GEOLOGY AND ENVIRONMENTAL PROTECTION**
17–23 June 2012, Albena, BULGARIA
- **INTERNATIONAL CONFERENCE IN SURFACE METROLOGY – ICSM 2012**
21–23 March, 2012, Annecy, FRANCE
- **THE 9th INTERNATIONAL CONGRESS “MACHINES, TECHNOLOGIES, MATERIALS - INNOVATIONS FOR THE INDUSTRY” – MTM'12**
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ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering, Fascicule 1 [January-March] is a volume dedicated to THE 3rd INTERNATIONAL SCIENTIFIC CONFERENCE – MANAGEMENT OF TECHNOLOGY – STEP TO SUSTAINABLE PRODUCTION – MOTSP 2011, organized in Bol, Island Brac, CROATIA (8–10 June 2011). In this sense, ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering, Fascicule 1 [January-March] includes nine scientific papers which was presented in the Conference's sections. The new current identification numbers of papers are #11 – 19, in the content list.

Also, ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering, Fascicule 1 [January-March] includes three scientific papers presented in the sections of Conference on INDUSTRIAL SYSTEMS 2011 – IS '11, organized in Novi Sad, SERBIA (14 – 16 September 2011). The current identification numbers of papers are #20 – 22, in the content list.

ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering, Fascicule 1 [January-March] includes, also, original papers submitted to the Editorial Board, directly by authors or by the regional collaborators of the Journal [papers #1-10, and 23-25].





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SUSTAINABLE PRODUCTION: DESIGN BY COMPONENTS METHODOLOGY IN ORDER TO OBTAIN A TAILORED PRODUCT

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ABSTRACT: A sustainable production needs a change in the design methodology. By applying both the approach of Design by Components and Systems Design, the focus of the project becomes the human being and no more the final product. In order to design for a “human being” it is important not to project for a “user” but for a “subject”, which has strong links with its territory and with its typical culture. The result of this methodology is a tailored product: different Countries and Cultures will define different needs and thus different products. The “customised product” will replace the standard one.
KEYWORDS: Sustainable design, components, tailored product, subject

INTRODUCTION

A sustainable production needs a change in the design methodology.

One of the biggest century challenges is the creation of “sustainable communities”: social, cultural and physical environments where we are able to follow our needs, without a restriction on future generations.

A sustainable community is based on cooperation with the Nature and its principles.

The survival of the human being depends on our capacity to understand the rules of the ecology and consequently to live according to the Nature.

According to the theory of living systems, each organism – animal, vegetal, microorganism or human being- is seen as an integrated whole, a living system. Throughout the living world, we find systems nesting within other systems. Systems theory entails a new way of seeing the world and a new way of thinking, known as systemic thinking. [1]

Through the Design by Component and Systems Design methodologies, the concept of “system” is also extended to the product and its production process. Therefore a product could be considered as a component of a big system, and each component is itself formed by several other sub-components. [2]

In a system each component is linked with the others through several flows of material, energy and social links. The study of relationships concerns not only the relationships among the system's components, but also those between the system as a whole and the surrounding larger systems. Those relationships between the system and its environment are what we call by “context”, namely the “territory” (Figure 1).

In order to find a solution for human needs of all contexts in the world, designers should project tailored products for people, which live in different territories, located in several Countries.

The aim of this paper is to describe cultures and features' relevance of each different Country, in order to underline the necessity of a design of a customized product, namely “tailored product”, and defined ad hoc for each territory.

In order to define a tailored product, it is necessary that the industrial companies change their production approach, that it means going from a “linear” system, where each actor of the process takes care only to its personal success, to an advanced type of interconnections, defined by cooperation and relationships between parts.

The Systems Design methodology applied to the industrial field moves the production towards the metabolism principles of Nature, where all the waste – namely output - are considered as resources for the same or other systems.

Applying the systemic thinking point of view the designer is able to consider not only the final product, but also the context: the final result is a more responsible product, deeply related with the local territory.

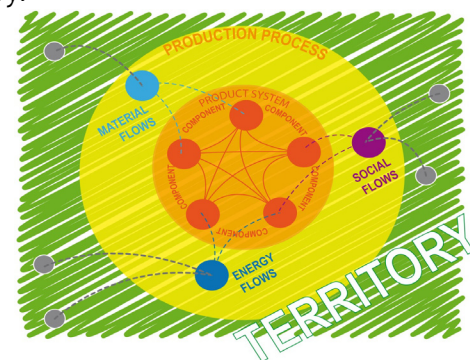


Figure 1 – Energy, material and social flows link together the product system, the production process and the territory

RESEARCH – DIFFERENCES BETWEEN “SUBJECT” AND “USER”

Until today the focus of the project was the “final product”; from now on the focus becomes instead the “human being” and its needs.

In order to design for a “human being” it is important to project not for a “user” but for a “subject”, namely the “man”. On the dictionary we can read:

- User¹: a person or thing that uses something
- Subject²: the person, mind, ego, or agent of whatever sort that sustains or assumes the form of thought or consciousness.

Two different meanings take place.

The “user” is someone who uses something, the one who does something often driven by habits. He conforms his choices to those of the majority of people.

The “subject”, on the contrary, is aware of his decisions. He consciously manifests the will to take action, he has the critical ability to define how and what to do. He is characterized also by a strong sense of belonging to territory.

Frequently advertising and marketing turn their attention to “users”: persons that do actions, following their unconscious behaviours.

As pointed out by Professor Luigi Bistagnino (Design, Politecnico di Torino, Italy), “users” define the “target”, described as a large group of people, characterized by a standardization of taste, needs and requirements.

Projecting for a “target” has simplified the design phase, but has also led increasingly to a product devoid of cultural specificity, identical all over the world. This kind of product is detached from its local context; it is possible to define it as a “standard product”, sold in a global market, part of an international economy.

The “global economy” takes advantage of users’ weakness and leads them to impulse buy of products in order to follow a suggested trend and life style. The vast majority of the people will choose a product not because of its intrinsic features but rather because of its market-based idea and personal belief that it will make them part of a group and elevate their social status.

The designer, basing the project on the mass culture, without links to the local context, cuts the cultural roots of individuals, creating a “globalized product” identical all over the world.

In order to reach a sustainable design, it is important to change the aim of the project: from a general product, to a customised one, founded on real human’s needs and territory’s resources.

The “subject”, through conscious choices, will prefer local products instead of standard ones; so that he will move the market towards a holistic systemic approach, deeply related with the context and its characteristics.

METHODOLOGY

The “old” design process, based on “users” as target and on standard products, might be replaced with a “new” approach, focused on the “subject” and its strong links with the local territory.

According to the Systems Design theory and to the Design by Components methodology, the man and its needs become the centre of the project: this focus point gives a specific identity to the product.

In order to reach this “design-changing”, it becomes necessary to design according to people knowledge, respecting their culture, the characteristics of the territory and its resources.

The result of this approach is a new idea of product, which becomes a customised product, and a different concept of the consumer.

The expectation is that “users” will be inspired by this different design-way, becoming “active subjects” and creating positive relationships within their social context and their territory.

According to the systemic thinking, it is possible to say that the essential properties of a living system arise from the interactions and relationships among the parts. Systemic thinking is thinking in terms of relationships. The shift from the parts to the whole requires another shift of focus, from objects to relationships.

Designing for the “subject”, with the Systems Design approach, brings to a new scenario, in which the person is autonomous but related with other individuals and with the environment. Systemic thinking is always contextual thinking. [1]

Relationships between elements are fundamental for the balance and the survival of the system: from these links take place reciprocal influences, which change the whole.

Therefore system components are strictly related to each other with bonds based on responsibility and awareness of each element and not on the exceeding of a subject to another. [3]

As pointed out by Fritjof Capra (Ph.D., physicist and systems theorist, <http://www.fritjofcapra.net/>): “life in the social realm can also be understood in terms of networks. Living networks in human society are networks of communications. Each communication creates thoughts and meaning, which give rise to further communications, and thus the entire network generates itself. As communications continue in a social network, they eventually produce a shared system of beliefs, explanations, and values – a common context of meaning, known as culture, which is continually sustained by further communications. Through this culture individuals acquire identities as members of the social network, and in this way the network generates its own boundaries.

¹ <http://www.oxfordadvancedlearnersdictionary.com/dictionary/user>

² <http://www.merriam-webster.com/dictionary/>

The social network also produces a shared body of knowledge – including information, ideas, and skills – that shapes the culture's distinctive way of life in addition to its values and beliefs.” [1]

Capra’s theory is useful to understand the reason because of different territories and Countries – developed or not – are characterized by several different cultures, each defined by its values and meanings: the “man” creates networks of communication, which define specific cultures, depending on the context.

Each territory is also defined by its material resources: gradually the human being defines the ability - namely “know how” - to use this resources in order to solve its needs. Thanks to his “know how”, the “man” develops a “material culture”, formed by elements of the material realm, closely related to the territory.

These several cultural frameworks define the necessity of a new designing process, based on the project of customised products, which comes from different areas and cultures. This sort of product should be referred to specific resources of the territory, in order to enhance cultural and material peculiarities of any different geographical zone.

Following a customised project approach, designers should restrict their range of project action, in order to provide different solutions to several different subjects (Figure 2).



Figure 2 – Countries are characterized by several different cultures, each defined by its own resources, know-how, material and social culture

According to Design by Component approach, a product is like the union of several interrelated components that perform an action and that is connected with other elements to form a “macro-component”. Each macro-component can be part of a more complex system. [2]

Applying this concept to product customization it is possible to imagine an object as the sum of several parts: the main part - the “heart” of the product - and the ancillary changeable ones - as cultural, social and environmental issues.

The “heart” of the product is responsible of the object’s functioning; the ancillary components define the context characterization of the product (Figure 3).

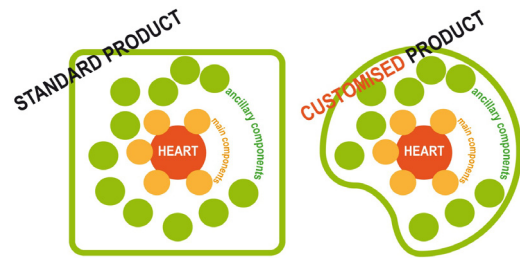


Figure 3 – Differences between standard and customized product. In a product, according to the Design by Components methodology, the shape follows the function. The application of the Design by Components methodology to the product design generates a new holistic manufacturing model:

- the main company will control the whole production systems thanks to its know how;
- the same company will produce the “heart” of the product;
- the “foreign” supplier will be turned in local producer, that means that they will produce the ancillary components, the accessories, or the out shell of the product, according the cultural background and technologies.

This transformation should underline a flexible and adaptable object, obtained by a production structure model strictly linked to local features and resources. [4]

The Ikea Company applies a similar approach: this Swedish industry of furniture has 1220 suppliers located in 55 different Countries, but gives to its customers a “customized product” specific for each territory.

To give an example the Ikea’s products follow Company’s design rules, but they are produced in different part of the world (worldwide), in order to use local materials and human’s characteristic. Thanks to this production approach, each product is made with local materials, which define a short logistic chain, according to the territory’s resources. [5]

CASE STUDY: THE COOKING POINT

Applying the Design by Components methodology to a project of a cooking point, it will be necessary not to design a standard product, but to enhance the subject and its culture.

In order to obtain the necessary knowledge for a successful design, the first step is to know and analyze main dishes of the specific territory.

The analysis of the traditional dishes will bring out further information about local foods and their storage, and also about cooking steps and the necessary tools.

Thanks to these project details, designers understand which are the domestic zones involved during the food preparation, and what kind of relationships are established between different home areas and the subject movements.

Used tools, involved domestic environments and cooking methods of different dishes, will define the project of the cooking point.

The final product will be created according to the subject's needs and the available domestic spaces.

The observation of the local traditions and folklore – especially of the countryside – allows the designer to contextualize his product to the local culture. Traditions will suggest best materials, colours and patterns.

Through Design by Components and Systems Design methodologies, the designer is conscious and expert in a particular culture: the final product will answer to the needs of the subject and will respect the resources of the territory.

In order to better understand the concept of the tailored product, it is useful to analyze the differences between a cooking product developed for two different territories – for example the Arctic Zone and the Eastern Africa Area - defined by different cultures, traditions, climate and so on.

The first one, for the Arctic Zone - should be easy to move, resistant to the freezing temperatures, designed for small domestic spaces and useful for the ground cooking.

The second one – for the Eastern Africa Area – could be defined by bright colours, benches which allows the traditional “sitting cooking”, a circular shape of the cooking furniture, in order to favour the sharing cooking moment through components of the family (Figure 4).

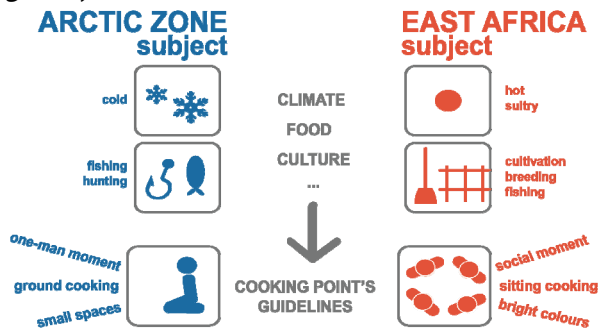


Figure 4 – Cooking point's guidelines for the Arctic Zone and the Eastern Africa Area

CONCLUSIONS

In conclusion, the methodology of Design by Components with a Systems Design approach, applied to a product, outlines:

- the definition of a “customized product” for each different territory, instead of a “standard product”;
- the creation of a “subject” - aware of its choices - opposed to a “user” - guided by unconscious behaviour;
- the maintenance of a local culture, which is not replaced by the global one;

- the origin of a “systemic production model”, defined by a strong relationship between product and local resources (Figure 5).

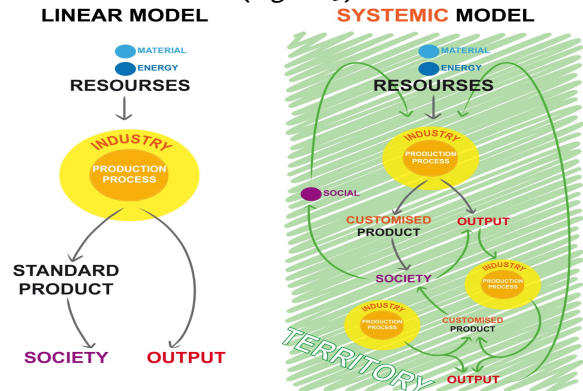


Figure 5 – Linear and systemic production models

This designing approach, based on the surrounding environment, leads to re-evaluate the near and local territory instead of the far and global one.

From this perspective, also the products flows undergo a radical change: the global logistic will be replaced with a limited range logistic. Products will be found locally at lower cost and superior quality.

This scenario reverses the economical globalization, in favour of a local development, which allows the preservation of local, social and material culture.

Strengthening of social bounds should lead to a shift into the industrial approach: from competition between parts – linear model – to cooperation between different stakeholders – systemic model.

It would be desirable a change on the production rules, in favour of systemic strategies deeply integrated with their own territorial, social and economical contexts.

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