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An aesthetic for sustainable interactions in Product-Service Systems?

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1.1 The limited diffusion of eco-efficient Product-Service Systems

Eco-efficient Product-Service Systems (PSS, in which the economic interest of the stakeholders involved in the offer continuously foster the optimisation of environmental resource consumption) represent a promising approach to sustainability. However, despite their potential win-win characteristics, the application of this concept is still limited. One key reason is that eco-efficient PSSs are often radical innovations and their adoption usually challenges existing customers' habits (cultural barriers), companies' organisations (corporate barriers), and regulative framework (regulative barriers).

Starting from these considerations this chapter first investigates the barriers that affect the attractiveness and acceptance of eco-efficient PSS alternatives. A debate

is then opened on the aesthetics of eco-efficient PSSs and the way in which aesthetics could enhance specific inner qualities of eco-efficient PSSs, i.e. facilitating and enhancing their wider diffusion. Through the analysis of several case studies, and integrating insights from semiotics, the chapter then outlines several research hypotheses on how the aesthetic elements of an eco-efficient PSS could facilitate user attraction, acceptance and satisfaction.

1.2 Eco-efficient Product-Service System (PSS): user acceptance barriers

Consumption behaviour is a matter of individual choice, influenced by social norms and institutional settings. The diffusion of alternative eco-efficient PSS solutions is hindered by the current and dominant consumption behaviours. Let us summarise the most important factors that determine this opposition (in industrialised contexts); we will follow [Mont's \(2004\)](#) line of thought, dividing them into economic and socio-psychological factors.

From an **economic perspective**, [Röpke \(1999\)](#) states that current consumption behaviours are first determined by the entire history of industrial development. The Industrial Revolution led to increased production volumes and reduced product prices, determining the need to sell more and more new products. This in turn encouraged creation of demand for all the produced artefacts, and therefore strategies were defined to boost consumption. In relation to this, [Kilbourne et al. \(2001\)](#) state that economic and political institutions have persuaded people to believe that higher material prosperity is the expected behaviour.

Another cause that contributes to reinforcing material consumption levels is related to so-called externalities. Since environmental and social costs connected to products are not included in their market prices, it can become difficult for eco-efficient PSS solutions to compete with industrially produced products ([Mont and Lindqvist 2003](#); [Ceschin and Vezzoli 2010](#)). Moreover the prices of labour-intensive solutions (and eco-efficient PSS is often included in this category) are increasing, and therefore it is cheaper for customers to buy product-based offers (e.g. washing machines) instead of PSS-based offers (e.g. clothing care services).

In addition users show a lack of knowledge and understanding about life cycle costs ([Mont 2002](#)). It is therefore sometimes difficult for users to understand the potential economic benefits of PSS-oriented solutions. PSS-based offers are usually (and erroneously) perceived by the end-user as more expensive if compared to the purchase of products (even if sometimes the contrary is true), since the total cost of ownership (including use, maintenance, repairs and disposal costs) is not taken into consideration in the purchase of a product.

Economic studies are traditionally based on the assumption that consumers are rational decision-makers whose choices are driven by utility maximisation, with price and income factors as most important in making choices. However, as

underlined by [Mont and Plepys \(2008\)](#) consumer behaviour has been found to be far more complicated than merely a rational response to prices, being influenced by different internal and external drivers induced by **human psychology, social norms** and **institutional settings**.

Sociological studies underline the role of *habits* in influencing consumption behaviour, arguing that consumption choices are dependent on prior consumption patterns. In relation to eco-efficient PSS, the problem is that solutions based on sharing and access contradict the dominant and well-established norm of ownership ([Behrendt et al. 2003](#)), making consumers hesitant to accept ownerless-based solutions. This is especially true for particular types of satisfaction (e.g. for washing our clothes we are not accustomed to the idea of a washing machine in our home that does not belong to us), while in other cases ownerless-based solutions have entered into our routines (e.g. the use of public transport services).

Another barrier to the diffusion of ownerless-based solutions is the fact that the quantity and quality of accumulated goods is perceived as a measure of success in life because they represent an indicator of a certain position in society ([Mont 2004](#)). Moreover, as underlined by [Halkier \(1998\)](#), the current trend towards individualisation is boosting consumption demand because a person's identity is no longer defined by a community but rather by the goods s/he owns (goods that represent the signals of one's own identity). In addition, hesitation towards offers based on ownerless access and sharing can be linked to the perception of independence, hygiene and intimacy usually connected to one's own products.

Even if there are barriers that hinder the acceptance of ownerless-based offers, there are also windows of opportunity ([Mont 2004](#)) that can be exploited to favour the acceptance of such solutions. First, while traditional economics argues that users demand physical products to satisfy their needs, the works of some sociologists (e.g. [Max-Neef 1991](#)) tell us that needs can be fulfilled by material and non-material 'satisfiers'. Moreover material consumption is not linked to happiness; in fact more materialistic people are not always happier than less materialistic people ([Belk 1985](#); [Max-Neef 1995](#)). In addition, some studies state that an increase in consumption levels represents the need to satisfy psychological and social aspirations rather than material ones ([Jackson and Marks 1999](#)). On the same line of thought, [Hacker \(1967\)](#) argues that the purchase of the same brand represents a substitute for a lost sense of community. Moreover, in relation to goods possession, if it is true that this is perceived as a measure of a certain social status, it can also be proposed that ownerless solutions may represent a certain status; let us consider for example the use of a taxi or access to education or cultural events ([Mont 2004](#)).

We have seen that different barriers on a user level may be obstacles to the acceptance and the satisfaction related to ownerless-based solutions. At this point several key questions arise.

- How is it possible to help the user to accept the (radical) behavioural changes linked with this kind of solution? How is it possible to encourage the embedding process into his/her habits?

- During the purchase choice, how could we help the user to be more attracted by an eco-efficient PSS rather than a traditional product-based offer?
- During use, how could we help the user to perceive an eco-efficient PSS as more satisfying than a traditional 'product-based' offer? In other words, how can an eco-efficient PSS be perceived as a solution that produces more comfort, pleasure in use, etc., than a traditional offer?

1.3 A potential role for aesthetics?

We know that aesthetics has an important role in product design and in user acceptance and satisfaction. Moving on to the system innovation level the question is: in what sense is it possible to consider an aesthetic of an eco-efficient PSS? As we have seen previously, an eco-efficient PSS is quite a complex artefact, made up of different elements: **products, communication, services** (interactions between the user and the producer/provider) and more in general **interactions** (between the different socio-economic stakeholders involved in the PSS value production system). The attraction, acceptance and satisfaction related to a PSS therefore depend on how its system of products, services, communication and interactions are perceived by the user. We therefore argue it is fundamental to focus on the way in which the different elements of an eco-efficient PSS are perceived. We could talk of a **system aesthetic**, i.e. an aesthetic as the integrated perceptions of the *expression forms* of the different elements of the PSS: an aesthetic that therefore integrates in a coordinated way the aesthetics of products, communication, services and interactions. How, then, can the aesthetic elements of an eco-efficient PSS facilitate user attraction, acceptance and satisfaction? In order to try to outline a framework for possible answers, we will analyse several cases of eco-efficient PSS to gain some insights and put forward several working hypotheses.

1.3.1 Insights from case studies

Wash bar

Wash bar (Tamborrini 2009) is a LG Electronics laundry, established in 2005 in Paris. Users have access to washing machines and dryers, but also to a bar and various recreational-cultural services, such as a Wi-Fi internet connection, short film showings, and participation in organised events. The interior spaces appear like a bar or a games room in which washing machines and dryers are integrated.

The environmental benefits connected to this kind of solution are clear. What, then, are the differences between Wash bar and traditional laundries? First of all in Wash bar the intention is to appeal to a wider range of users to adopt this kind of solution. The strategy is simply to make the waiting time during the washing and drying cycle more pleasant. The various elements of the system (the furniture

elements, the communication elements and the service elements) are considered and arranged in order to create a sense of hospitality. Users can feel at home: they can read, listen to music, and surf the internet.

The main aspect of interest in the solution is therefore the social dimension. The tangible elements (sofas, armchairs, tables, etc., and their layout) coupled with the various available services (bar, Wi-Fi connection, etc.) together determine the possibility for users to develop interpersonal relations. This relational aspect represents the key point of the PSS solution. It is the social quality of the innovation that could potentially contribute to make the solution perceived as more satisfying compared to traditional laundries (and perhaps even to domestic laundry).

Figure 1.1 **Wash bar: pictures of the interior spaces**

Source: [Tamborrini 2009](#)



Car sharing/pooling system for the Vehicle Design Summit project

The second case we present is an urban mobility system that integrates car sharing and car pooling, developed as a Master's degree thesis by Lorenzo Davoli within the research project Vehicle Design Summit.¹ In synthesis ([Vezzoli and Ceschin 2008](#)) it is a system through which users have access to a fleet of low-environmental-impact cars and in which users are encouraged to share trips with others. The user, once registered, receives a smart card that allows access to the fleet of electric cars as well as to public transport. The reservation of the car (located in dedicated parking lots made available by the municipal administration) is made via the internet or cell phone. During the use of the vehicle a GPS system suggests to the user the shortest and least crowded route. Payment for the service is based on the kilometres covered.

¹ Vehicle Design Summit is an international consortium made up of 27 universities and coordinated by MIT of Boston. The consortium objective is to design and realise a low-environmental-impact and 'open-source' car, as well as to define the conditions for its market introduction through innovative and sustainable mobility offers. The role of the Politecnico di Milano team (Lorenzo Davoli, Francesca Fiocchi and Jun Lin, coordinated by Carlo Vezzoli and Fabrizio Ceschin) was to design an innovative and eco-efficient business model, as well as a transition path to introduce and diffuse this model onto the market (cf. [Davoli, Fiocchi and Lin 2008](#)).

The peculiarity of this system is that through the internet the user can create and manage his/her own network of contacts (friends, colleagues, relatives, neighbours, etc.) and through this network organise his/her own journeys and plan to share them. Moreover, via cell phone it is possible to know in real time the location of friends that are using the car in order to ask them for a lift (sharing the service costs).

Figure 1.2 **Car sharing/pooling system designed for the Vehicle Design Summit project: storyboard of one of the possible user interactions**

Source: [Vezzoli and Ceschin 2008](#). With kind permission from the authors.



The environmental advantages of car sharing/pooling systems compared to the use of a private car are obvious. What, then, are the differences between this system and traditional options? As in the previous case, there is the intention to make the solution more satisfying if compared to traditional car-sharing systems and the use of private cars. Also in this case the fulcrum is linked to the inherent relational qualities. The key point is the possibility to create and manage a network of contacts to share trips. In this way users can build new contacts as well as feel part of a community. And it is this social dimension of the service that could act as a stimulus to modify user habits and behaviours.

Importantly, to support this change, the system is designed to also create awareness about environmental issues. The service on one hand supports the user in choosing the less crowded routes (with consequent resource saving) and on the other explains the environmental benefits connected to the system. This represents

a further element potentially capable to strengthen the satisfaction generated by these kinds of solutions.

1.3.2 A design research working hypothesis

At this point this key question emerges: what effects should the aesthetic of an eco-efficient PSS have on the user?

First it must be remembered that eco-efficient PSSs are satisfaction-based offers, meaning that what is designed is a *satisfaction* rather than the product that aims to fulfil it.² From this perspective:

- The aesthetic dimension, and the delivery of the perceived value, can be designed into the ultimate and profound level of the offer, i.e. the satisfaction, rather than the various means to reach it. In this sense the same aesthetics (as attraction, acceptance, and satisfaction) is more *honest* and *transparent* to the user

Moreover, as we have seen previously, since eco-efficient PSSs are most often based on access (to products or final results) and sharing (of products), it is necessary to focus on the advantages connected to these characteristics if we want such solutions to be perceived as better than the traditional product-based offers. In particular eco-efficient PSSs can potentially favour:

- The interactivity between the various users (of the PSS). The sharing of products between more people can lead to the development of new interpersonal relations (as seen in the cases described above). The direct contact between people that takes place during the use of a PSS can determine a greater participation by the user, who can feel ‘part of a community’: consider, for instance, solidarity purchasing groups (organised groups of people who buy food directly from local farmers) and the relations that take place between the users
- The interactivity between the user and the PSS producer/provider, because the relationship does not end after the purchase (as happens in traditional product-based offers) but extends over the length of the stipulated contract/agreement

These elements—the relational qualities that can be built between the users of a PSS and between the users and the producer/provider—are precisely those elements that cannot usually be found in traditional product-based solutions. Therefore they represent distinctive traits of eco-efficient PSS solutions. Consequently, these relational qualities should be the elements to be valorised if we want to enhance user attraction, acceptance and satisfaction.

This is coherent with what we have seen previously. In fact, if goods purchase can be linked to the need to satisfy social aspirations (Jackson and Marks 1999), and

² For example, having access to mobility instead of cars; thermal comfort instead of boilers and methane; clean clothes instead of washing machines and detergent.

sometimes represent a substitution for a lost sense of community (Hacker 1967), it is especially on these social processes that a PSS should focus, in order to be perceived as better than a product-based offer.

In addition to these elements, an eco-efficient PSS is characterised by its intrinsic environmental and economic benefits. However the problem is that, as underlined in the first section, most often the user is not aware of these qualities. As a consequence it is necessary to also focus on these aspects if we want to enhance the attraction and acceptance of these kinds of solutions. In particular:

- It is necessary to facilitate users' understanding of the environmental and economic benefits connected to the use of eco-efficient PSS solutions
- As a consequence, users will become aware of having adopted a more responsible and sustainable behaviour, and this could represent a leverage point for wider diffusion of the solution because users could inform others and stimulate them into doing the same

Furthermore eco-efficient PSSs, compared to traditional ownership-based solutions, usually bring further benefits to users, such as:

- Release from the problems and costs connected to the product's maintenance, repair and disposal

This aspect should therefore also be emphasised and made more visible to the users.

Finally eco-efficient PSSs must not only create satisfaction during the use phase, but they have also to be more attractive (compared to ownership-based offers) during the purchase choice. In other words an eco-efficient PSS should be able to 'invite' and 'intrigue' users (and attract their interest) more than the product-based solutions.

In synthesis, how can the aesthetic elements of an eco-efficient PSS strengthen user attraction, acceptance and satisfaction? Some working hypotheses (to be verified) are listed below:

- During the purchase choice, the aesthetic elements of an eco-efficient PSS should stimulate users, attracting them and inviting their interest and highlighting the physical product non-ownership qualities
- During the use phase, the aesthetic elements of an eco-efficient PSS should valorise its relational qualities (stimulating interactivity between users, and between the users and the PSS producer/provider)
- During the use phase, the aesthetic elements of an eco-efficient PSS should facilitate users in understanding the advantages of freedom from the problems and costs connected to the product's maintenance and disposal
- During the use phase, the aesthetic elements of an eco-efficient PSS should also facilitate users in understanding and enjoying its various economic and environmental benefits

1.4 Semiotics, aesthetics and eco-efficient PSS

1.4.1 A sense of relations

The case studies presented here clearly show that benefits for the environment and for the users result from the ability to design *relationships*, together with artefacts: relationships of use and social relations. They can be considered in terms of semiotic relationships, because the meaning of things arises from the way the different elements of human experience meet and associate. Both in text analysis and in product and service design, a particularly important type of relationship is that between the *expression plane* and the *content plane* (cf. Hjeltmslev 1943). The expression concerns the way in which things occur: the form they take, the syntactic arrangement of their components, and the materials of which they are composed. Expression is both the logical organisation of the products and their perceptible appearance. The plane of content, on the other hand, covers the entire semantic background of the artefacts: the range of their possible meanings and the meaning of their existence.

But when we talk about products and services, the semantic dimension must also be considered according to the *pragmatic dimension*: the user's response, the ability of artefacts to influence behaviours, the level of satisfaction that they are able to generate, and the user's own purpose of purchase and use of a particular product or service. The artefacts do not only *say*, but also *do* or *make one do*.

1.4.2 From the 'product of sense' to the 'effect of sense'

The satisfaction obtained by using a product, whatever it is, is of paramount importance to the user. It is not difficult to see how the satisfaction degree of a product is largely determined: 1) by the relationship between the sensory nature of expression and the cognitive nature of content; 2) by the dialogical relationship between different semantic worlds and between different communicative intentions; and in design, 3) by the relationships between the *aim of sense* (what the designer intends to propose), the nature of the *product of sense* (as a product is) and the *effects of sense* (the consequences of the use on the user) (Zingale 2009).

In the case of the Wash bar from LG Electronics, the designer/provider's aim of sense is to make sure that the washing machine reduces energy consumption; the effect of sense is to generate from this experience a pleasant moment for the users, turning, in this case, work time into free time. Finding a 'sense of hospitality' in washing laundry means the feeling of being in a good relationship with the environment, with the space and the furniture and, as a consequence, with other users.

In this case, the artefacts and the environment's way of expression has a material nature, even if the service's organisation is largely immaterial, and yet *mediated* by communication tools, organised environments, forms of social transactions, etc. Here, the semiotic mediation is aimed at influencing decisions on lifestyles and behavioural practices to adopt. The elements are no longer merely products to be

owned, but also actions to be implemented together. Indeed, in PSS the form of the items, the shape of communication and the form of service are a single set of factors that interfere with each other.

This interference set involves an update of the aesthetic-semiotic approach to design. The problem arises when it is necessary to study the sense of a product, taking into account not only its structure, like the text, but particularly the open set of its possible effects. In other words, we must consider not only its shape but the consequences that can arise from it (cf. Peirce 1878, CP 5.402).

1.4.3 Observation of experience

If, in this way, a product can be thought of as a 'text' defined by boundaries, with its own semantic consistency and syntactic cohesion (cf. Marrone 2009), then, on the other hand, a product-service is indeed a 'semiotic text' but with its borders variable and its outcome undefined. It is a text open to occasional events of experience, in which the interaction between service suppliers and users appears as the decisive value.

The semiotic study, in this case, approaches ethnographic observation methods where the user experience is being investigated. This observational character may be applied in three phases:

1. **Before the project**, in the observation, ethnographic or ethno-semiotic (cf. Marsciani 2007), of existing social practices
2. **During the project**, in the verification and testing phases of the PSS
3. **After the project**, in the analysis of already tested PSS case studies, with more or less positive results

In particular, observation of the user experience should include:

- **Levels of understanding.** How the service offered is understood by the user
- **Expectations about the expected benefit.** What the user shows he/she is able to do or wants to get
- **Attitudes.** How the user approaches it and what types of conduct he/she puts in place
- **Choices of action.** What the user chooses to do and why
- **Programmed responses.** Whether and how the user respects the order of actions in the design programme
- **Interpretative cooperation.** What the user can add to the modality use of the service
- **Interpretative responses.** The reactions and judgements made about the service received

1.4.4 From experience to design

Such a procedure can be well illustrated in the car sharing Vehicle Design Summit case study. Here the action of design can be seen as key to giving an ecologically oriented sense to our ordinary habits, which are so entrenched and often heedless of critics. Nonetheless, we must *learn to observe*: the things we do, the way we do them and through which tools.

Here, the semiotic way of looking at things helps to *translate* the observed data into social practices, into design choices that can outline innovative, efficient and satisfactory solutions. The difficulty of this translation is mainly in the degree of novelty of the PSS, or in the implicit request to break behavioural patterns and models. As regards the use of products, individual and social habits are quite entrenched, as mentioned above, and generally implemented on the basis of automatic or traditional adjustments.

Therefore, a PSS innovation requires:

1. **Cognitive shift** towards unknown habits and programmes of use
2. A **semantic reformulation** and subsequently a reconfiguration of the values traditionally associated with artefacts
3. A **didactic clearness** of the PSS's forms of communication

Therefore, a semiotic contribution to the elaboration of plausible solutions will mainly concern the way in which the PSS is able to design the new use of artefacts, marking a difference with tradition. In particular:

- **New habits** that the subject-users must make their own
- **Access roads** to the PSS, which deviate from traditional ways of acquiring a product
- **Sharing rules** of the PSS, or the idea of shared and inter-subjective ownership
- **Learning forms** of new use modalities
- **Elements of satisfaction** derived from the PSS, and which only this one can provide

1.4.5 Sense and satisfaction

This last aspect leads us to the heart of one of the most critical points in the PSS proposal. Indeed, if the PSS marks a discontinuity with traditional forms of use and consumption of products, and if this discontinuity is aimed at transition to more sustainable forms, in which aspects of PSS will a user identify the source of the actual benefit? We therefore return to what was said on semiotic relations at the beginning. The plane of expression plays a strategic role in all forms of communication. It is both what *represents* the content and what *introduces* the content.

The problem exists in the relationship between the plane of expression and the plane of content. How can the sensible and material aspect of a product persuade a user into a particular content? In PSS the contents that are relevant can be basically collected from two *semantic lines*: the *area of interest* (services and benefits offered, demand of actions of use, etc.); and the *area of utopia* (lifestyle change, sharing of goods, control of consumption, etc.) But these contents carry the risk of remaining inefficient if the PSS does not activate or request also a *pragmatic line*, the one that concerns the action of the product on the user, activating the effects of sense (what I understand, what I should do, what I should choose, etc.) and thus the degree of acceptance/rejection of a product.

1.4.6 Aesthetic mediation

Some may say that the existence of this third line of sense is what has always characterised design, which has entrusted to the aesthetic sphere the task of giving an exclusive and differential value to industrial products. What changes here is, however, the role of the *aesthetic function* and the way we understand it. Perhaps the role that is typically assigned to the aesthetic sphere of products is still influenced by the artistic model. But design is not art. There are many characteristics that unite these two fields, but there are many that also set them apart. Overlapping the two models is a very serious error of 'design'.

If we then assume that the aesthetic function has the task of stimulating the user's cognitive and sensory attention to a product, it must be said that in design in general and in a PSS in particular it should be conceived and developed:

- As an **access road** that helps the user-receiver to understand the overall sense of the PSS
- As a form of **introduction to the instructions** and to the way the user enters into a new and innovative idea of consuming
- As a strategy for **maintaining contact** between user and product

Therefore, we must start from the premise that understanding the deep values of the eco-efficient project resides largely in the role assigned to the *aesthetic function* of the products. According to Jakobson (1963), in an act of communication the aesthetic function is the one related to the message form. However, it is only one of six functions implemented in any communicative process, and it cannot be considered as a single one. The other five are related, in fact, to irremovable factors of the process: to the identity of the sender (*expressive function*), to the type of action applied to the receiver (*conative function*), to the nature of the conventional code (*metalinguistic function*), to the semantic context (*referential function*), and to the communication channel (*phatic* or *contact function*).

By careful examination, in the scheme proposed by Jakobson, the term *function* is presented mainly in the mathematical sense: when one of the variables changes (x), the others also change (y, z, \dots). The same linguist points out that in

any speech event the six functions tend to be distributed in a hierarchical way and all the functions are always present, even if with different weight and importance each time. We can add that often the existence of one function is, in a manner of speaking, a function of another function. For example, consider when letters and words are scanned properly (aesthetic function) to facilitate the understanding of what is said (conative function as a function of the referential function).

In design, the aesthetic function is primarily concerned with:

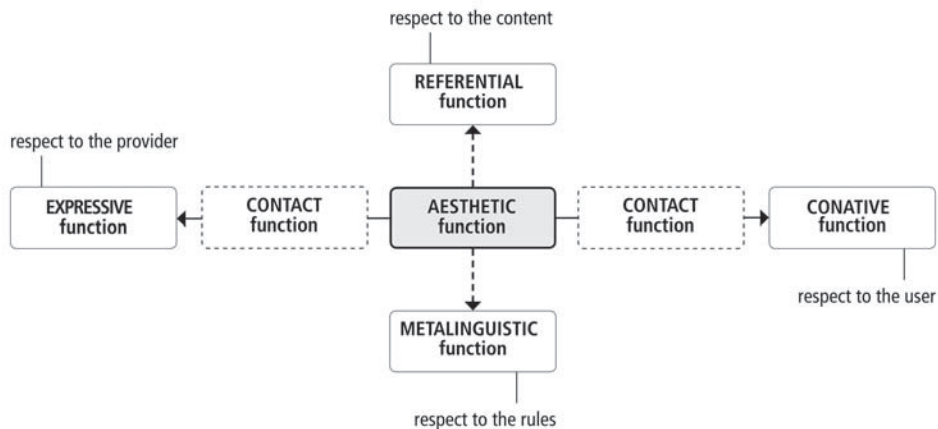
- The type of sensory response (of liking or repulsion) that a product produces, beyond taste or trends
- If this response is able to shift the user's attention to other aspects of the product (recognition of the producer's identity, the legibility of the product, etc.)
- If those aspects that the aesthetic function emphasises are actually needed in the design phase and under the expected measures and manners

1.4.7 The function game

To better frame the role of the aesthetic function in PSS, we present here Jakobson's model of language functions with some graphic variation, hoping to make clear what we call the *functions game*:

Figure 1.3 Jakobson's functions of communication

Source: adapted by the authors



In this reworking, the model makes a clearer difference between the two axes through which the communicative process passes. We call the horizontal one the *dialogic axis*: due to the product-service, it makes the company assets, the service's suppliers and the users communicate. We call the vertical one the *cognitive axis*,

because it refers both to the comprehension of the product-service as well to the competences necessary for the product-service's use.

At the centre of the two axes, and at their intersection, the aesthetic function is placed. This means that *everything passes through the aesthetic function*. Each function, and thus every practical or mental action performed by the user, is 'switched on' by this function. Between the aesthetic function and all the others it is therefore possible to presuppose a sort of game of reciprocal influence and determination.

Let us examine how the graph can be described and the game that comes from it.

The *expressive function* (so called because it exhibits a way of thinking or feeling) has the aim to present the origin and identity of who offers the PSS product. This is what makes explicit what we call in semiotics the *subject of enunciation*, in our case the customer and/or designer. Nevertheless this function also identifies the cultural context of a product, so it defines, additionally, the research fields from which the product comes. In the PSS this function plays a strategic and, in a manner of speaking, 'contractual' role. Leading the subject-user to know from which research field the offered product-service comes means: 1) inviting him/her to adopt innovative forms of consumption and relations with the products; and thus 2) involving him/her in a sort of co-design, i.e. participating in the project of transition to sustainability.

If the expressive function is weak, or badly mediated by the aesthetic function, it is reasonable to think that the subject-user may tend to see a low value in the PSS. This happens because he/she does not feel part of a strong bargaining and planning.

This has to do with what we find on the opposite side of the dialogue axis: the *conative function* (from the Latin *conari*, 'to strain'). This function concerns all those actions that, explicitly or implicitly, the product or product-service does to the user so that he/she can also implement other functions and other actions: become aware of the nature of the proposal, recognise the type of product, identify its advantages, understand how it should be used, etc. Also in this case, there is a clear dependence of this function on the aesthetic nature of the product: the more this last one is 'well formed' and 'well designed', the more it should increase its capacity to involve the subject-user in the eco-sustainable project.

Despite this, such an involvement requires decision-making and a consequent action. The subject-user cannot be simply seduced and captured, but he/she should be also guided. It is for this reason that on the horizontal axis there is also the *phatic* or *contact function*. This is the function that allows and supports not only the cognitive and physical relation between product and user, but also the product's ability to guide the user through the various stages of use.

Again, the relations of contact and guidance can be fostered or inhibited by the aesthetic dimension of the product. As an example, this may mean the product's material, colour or size. An object that is too small or too big will be poorly handled. A sign that is too close or too far, as well as too dark or too light, cannot be seen. In these and similar cases it is not only important how a product is formally designed, but the way in which its form was designed considering the relation with

the user. If this does not happen, the functions that we have discussed so far are active, but inhibited, out of the game.

To the game between the functions on the horizontal axis of the graph must be added the game developed on the vertical axis: the one between the *aesthetic function*, the *referential function* and the *metalinguistic function*. Through the *referential function* (which has a semantic value: it makes us understand what kind of a product it is) the user should be able to distinguish a product within a vast offer, to recognise it, to give it meaning and value. The *metalinguistic function* (which has a normative valence: it instructs how to use a product) concerns all the types of knowledge, instructions, procedures that the user must possess when he/she intends to use a certain product.

Also on the vertical axis *everything passes through the aesthetic function*. Distinguishing the semantic nature of a product and its social value, or determining the knowledge needed to use it, requires a semiotic act of passage or access: from the level of expression to the level of content, from what it *seems* to what it really *is* (or what it would like to be).

1.4.8 Pragmatics of the aesthetic function

To conclude, this is also an opportunity to overturn the common sense of seeing the aesthetic sphere as only consigned to the quality of materials and the forms of objects. This is an old problem, already discussed, among other things, in the famous Plato dialogue, the *Hippias Major*. It deals with the commonplace view that sees beauty as a property of things but spaced away from the body and the actions of the user: it is not by chance that beauty is mainly related to visual pleasures. Beauty in this sense means do not touch, do not change.

The use of PSS requires getting to the heart of the product-service system instead. It requires not only touching, but also the possibility to adapt, to remodel, to rearticulate to one's own liking the forms of the system. Hence the proposal of a pragmatic vision—and not merely formal and syntactic—of the aesthetic function: this proposal we summarise in two points.

1. In design, what we usually call beauty is intended as a *pleasantness* of the product, as its acceptance, and thus as a search for the *satisfaction* one feels when using the product. In either case, sensorial primacy is given to the sense of touch (and by this it passes to the sense of smell, sometimes to the sense of taste), as an immediate and absorbed perception. The sense of touch may become a phatic guide, a sort of help or service; otherwise it can be offered as a seduction (with regards to the shape and position of affordance and to the material that piques the desire of perception). Cognitive primacy is given here to the sense of desire fulfilment and surprise about the solution of a problem: what happens is pleasant and satisfying, for the way it happens and for what makes it happen. This is, among other things, because we no longer speak about the product, but the product-service. And therefore the

project focuses not only on the form of the product but also on the form of the interaction

2. In PSS, the aesthetic function extends from the objectivity of things to types of relationships between social subjects (between service providers and users, between users of the same service)

But what does ‘taking care of the aesthetic function in human relations’ mean?

It means, first of all, emphasising the dialogical nature of these relationships and, therefore, drawing attention to the forms in which dialogicity is expressed. As an example, this is done through the different perspectives that subjects-users have to develop while using products: a perspective not only inter-subjective, but a collective and shared subjectivity. Any use, as a matter of fact, leaves a trace of the user on the objects. In shared artefacts these traces do not disappear; they are, on the contrary, foreseen by the structure of the product: it belongs *to everyone* and it is *for everyone*. The PSS should be thought of as the semiotic place where the user interacts, directly or by implication, with other users; it is the place where he/she can feel part of a community. The user does not have a benefit; he/she participates in one.

Aesthetical attention requires the product-service to be designed as part of a common language, a language that everyone can speak and, above all, through which each subject has the opportunity to communicate with other subjects. The product is no longer exclusive, nor purely inclusive; it is shared and dialogic. It is designed to pass from one hand to the other, to make experiences to converge, to last and to be subjected to a collective subjectivity.

This effect of sense (community feeling) is the major content of design. It must be communicated through the form of expression of a product-service, a sensible form that represents and introduces such content.

1.5 Conclusions and future research directions

Eco-efficient Product-Service Systems (PSS) represent a valuable offer model for decoupling economic value from material and energy consumption and more generally negative environmental impacts. However, these innovations are in most cases radical and their introduction and diffusion usually encounter various cultural, corporate and regulative barriers. This chapter focused on the barriers that affect the attractiveness and acceptance of eco-efficient PSS alternatives and opened the debate on the role that aesthetics can play in stimulating users to perceive PSS alternatives as more satisfying than traditional ‘product-based’ offers—both during the purchase choice and during use. In particular the key research question that this chapter put forward is: how can aesthetics facilitate user attraction to, acceptance of and satisfaction with an eco-efficient PSS?

This key question, in fact, entails other two main questions.

The first is a more general question concerning design research in general. Since PSS innovations are at their base innovations of stakeholder interactions, the need emerges for a more defined knowledge base geared to a service-oriented society: definitions for the *aesthetics of stakeholder interactions* and, when the interaction is with the customer, for the *aesthetics of services*.

The second question is related to the specific characteristics of eco-efficient PSS innovations, such as the non-ownership of physical products. As highlighted in Section 1.3.2, we hypothesise that the aesthetic elements should serve various purposes during both the purchase decision (such as attracting a user's interest) and the use phase (such as valorising and highlighting the offer's relational qualities, the advantages of freedom from ownership, and the environmental and economic benefits).

In this chapter we have outlined a possible new frontier for the research bridging the design and semiotic domains. The working hypotheses we defined must of course be consolidated. However the opinion of the authors is that this is an important and fertile research ground.

This stance is especially justified because of the role that aesthetics can and must play in the transition towards sustainability. It is not enough to merely develop sustainable innovations; it is necessary that these innovations are perceived as better than the existing and unsustainable panorama of artefacts. Moreover this new frontier is important because it opens a debate that involves not only sustainability, but is related to the foundation of the role of design itself.

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