Products as signs
- An implication of semantic and three-dimensional visual analysis in product development

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Abstract
This article maps the semiotic dimensions of a product, with particular importance to the semantic functions. In addition to the semantic functions, the article defines the value of the product as a sign and presents a method for three-dimensional analysis. The design of a product is a sign which carries a message the market has to interpret. The semantic functions of a product constitutes this message. Knowledge of semantic functions in addition to its three-dimensional visual properties, enables a broader interpretation of its message. If we want to develop a new product with new purposes and range of use, this knowledge helps us to achieve a product with a precise and exhortative message, that reduces the chance of misunderstanding. The theory provided is demonstrated through two cases. The information derived from the cases is relevant in the project that follows this article.

Keywords
Product signs, semantic analysis, three-dimensional visual analysis, cutlery

Introduction
Almost every meal is assisted with cutlery either through preparation or consumption. Few products are in such a frequent and intimate use as cutlery. Through this article, I will try to map what factors contribute to the development of a cutlery. A selection of seafood cutlery has been analysed where the purpose is to unveil the language of cutlery and extent of comprehensibility of each one. The semantic functions of the products are the main theme for the analysis. In addition to the semantic functions, I will map the formelements the product consists of.

Concerning the users, it is a matter of understanding and interpreting the product well enough to use it. This is the greatest task of any designer.

Scope of the review
Through the analysis accomplished by this article, I want to indicate the aspects an semantic analysis should consist. The analysis will be useful in the project which follows this article, where I will develop cutlery for seafood; moreover, for any other project concerning increased aesthetical consciousness during product development. It will give an account for what semantic functions a product development should emphasise, as well as raise our consciousness of the value of the semantic functions. I shall examine the products’ representational qualities on the semantic dimension; try to answer what a thing may represent, and how it expresses something about itself and about something else. Concerning the following project, it is important to be conscious of a the products message and its content.

According to Susann Vihma (1995), a complete semantic analysis of a design product requires knowledge of its other three dimensions (fig.1). An interpretation of the sign should be based on such knowledge in order to be valid. This article treats only the semantic dimension of the product, to describe what is comprised in the message of a product. The semantic dimension of a product does not stress the value of form analysis. According to Vihma (1995), literature on and pictures of the product does not suffice for semantic analysis. The product must be perceived as a three-dimensional artefact. This explains why a basic understanding of what is an integral part of a semantic analysis is complemented with some guidelines for visual three-dimensional aspects of a form. It will map the most central relationships between elements of the form. The goal is to strengthen an understanding of the possible sculptural properties of a products structure.

Topics for semantic and form analysis
The analysis will be realised through two cases, because theory is best understood and perceived through reading examples. The cases will make use of the theory provided through this article. The two products for analysis are a fish tool and an oyster glove.

The fish tool helps relieve one of the main problems with fish, the bones. This is a widespread problem which often prevents children from enjoying a fishmeal. Oyster are a well-known delicacy, especially further south in Europe. The oyster breeding industry in Norway is growing in correlation with the increasing hunger for seafood delicacies both inland and abroad. Although the oyster glove is intended for use with oysters, it is suitable for work requiring hand protection.

These products were chosen because of their versatile
usability with seafood. The fish tool and oyster glove are helpful tools for a variety of meals in Norwegian cuisine and can be used in different ways (www.sealife.no). Through the article I will map some factors that contribute to the message of cutlery, and make use of them during the following product development.

**Product signs**

The designer communicates by means of the product sign (Monö 1997). As an introduction to the analysis of the two products signs, one must describe the definition and content of a sign. A sign is not a physical object, but the essence of it. It may be treated as both a dyadic (fig.2) and a triadic entity (fig.3). In this article, the product signs will be treated with the triadic concept of the sign because this is a more delicate approach to the analysis (Vihma 1995). According to Charles S Peirce (§ 2.228) the signs can be divided into three categories: icons, indexes and symbols. "A sign, or representamen, is something which stands to somebody for something in some respect or capacity." (Peirce 1931-66)

When the product functions as an iconic sign, it refers to another object by virtue of characters of its own. It resembles what it signifies.

The index is a sign that is affected by its object. It draws attention by being "existent" and not "similar" as the iconic sign functions.

The symbol refers through an association of ideas, but it does not, in itself, identify the things. The comprehension of symbolic signs is based on established habits and forms.

Another interpretation of sign is that of the Swiss linguist Ferdinand de Saussure (1857-1915) (Monö 1997). He claims that it is the combination of the signifié (content) and the signifiant (expression) which constitutes the sign (fig.2). The dyadic sign does not take the materiality of the product into consideration.

The sign functions at the same time as a transmitter, an indicator and a meaning.

**The cutlery as iconic signs**

With the two wide forks pointing down, the fish tool looks like a pair of tweezers. The third fork, which points in the opposite direction, reminds us of a knife with its flat and wide blade.

The oyster glove looks like an ordinary textile glove, with sufficient space for an adult hand.

**The cutlery as indexes**

The two forks of the fish tool which are connected in one end tell us that this is a tool for precision work, in this case picking smaller elements. The curved knife outline will not satisfy requirements for cutting, yet enables puncturing and smearing.

The oyster glove has a textile-glove shape and fits the hand rather than any other part of the body. The rough surface of the steel mesh creates friction to hold the oyster in place while working.

**The cutlery as symbols**

At first glance, the fish tool looks like a garden tool used to stir the soil with and remove unwanted items. It can also remind us of a fish, with the handle as the body and the blades as its tail fins.

The oyster glove reminds us of a chain mail, which protects your hand from the knife in your other hand. In the same category of protecting outfit we find the fencing glove.

**Current product sign**

The clearness of the current product sign indicates the markets chance of recognising the product with the purpose of it. The goal of the designer is optimisation of this quality. If new products appear frequently, the expectations will have less time to become fixed. Any small deviation is seen as a risk.

The fish tool is a youngster in the same market and may not be known as well known as the oyster glove, although the utilitarian value is comparable.

The design of the oyster glove is based on well-known symbols (the glove). It was released several years ago and is now established as a saleable actor on the market of seafood tools.

"*Signs are the core of our ability to communicate.*"  
Rune Monö

**The dimensions of a product**

A design product as a sign, according to Vihma (1995), may be divided into the following four dimensions: material dimension (hyletics), the dimension of

![Fig.4: The semantic functions of a product (Monö 1997)](image-url)
technique and construction (syntax), the dimension of technical product form (semantics) and the dimension of use (pragmatics). The division into four dimensions is broader than that of Monö, which is triadic (fig.1).

The pragmatic dimension describes the relationship between the user and the signs; the use of the sign. Syntactic dimension is the relationship between the sign and other signs, and the users interpretation of the product sign. Together with the hyletic and the semantic dimension, the dimensions describes the communicative whole.

According to Monö (1997), well-known products may be difficult to analyse semantically because so much appears to be self-evident. The importance of such an analysis is indisputable, nevertheless, both to question and improve the existing products, and to develop new ones.

The products are analysed by means of pictures from the manufacturers. The wholeness is to be analysed which means every detail and element in the context of the whole.

What are the semantic functions?
The goal of considering semantic functions during product development is to obtain knowledge of the users understanding of the product. The semantic functions of a product are its signification. According to Aubry/Vavik (1992), the semantic dimension consists of the level of denotation regarding the meaning and comprehensibility, in addition to the level of connotation which includes status, profile and symbols.

The four most important semantic functions are to describe (purpose), to express (properties), to exhort (reactions) and to identify (the product) (fig.4). The four semantic functions should, according to Monö (1997), be clear, unambiguous and honest. Good semantic design demonstrates a semiotic overview and that the description, expression and exhortation all work together.

The semantic function to describe
The product as a sign, with its totality of form, colour, surface, structure and so on, can describe the product’s purpose. Clarification of the description optimally is one of the semiotic tasks of the designer.

The semantic function to express
The expression of a product is more related to feelings than that of description. A form can be manipulated and made to express a quality the product does not possess or has too little of.

The semantic function to exhort
The semantic function to exhort supposedly triggers an intended behaviour of the user. Signals are variants of this function.

The semantic function to identify
For a products manufacturer it is of outmost importance that his or her products are associated with positive user experiences and are easily recognized. The introduction of a new product in an already existing product family through establishing likeness, is part of the work in creating a clear company profile.

The designer should be able to transfer the system of products into a semiotic system. In addition to this, he or she increases knowledge about the object of development through supporting the act of making by communication theory.

“Product family” is (...) a group of products with one or more common properties, which have the same principal purpose but different functions.”
Rune Monö

How we perceive the semantic functions of a product
The semantic functions of a product are perceived on two different levels. The first level, denotation, is informative and logical. The second level, connotation, is based on the first level and open to interpretation.

Denotation is the understanding of an object in a way that enables characterisation of its function and identity, the first level of information from an object. This level displays the product in a rational and logic way.

In a connotative system, the object is analysed through the meanings and symbols it holds. The products functional elements and formal units are objects of every psychological, social and cultural interpretation.

Two cases to demonstrate the theory provided
What does the fish tool describe?
The fish tool enables picking of small fish bones and opening of shells. Through experience we know that the
two bendable forks help us locate and loosen bones. The third fork has the form of a knife which is useful for operations like shucking and lubrication.

The three forks and the handle indicate the use of the fish tool. Two of the forks point down and are placed close enough to assume that they fulfill their purpose as a pair and not separately. The third fork points in the opposite direction. This complicates a cooperation with the two other forks and signifies that it works independently. The symmetric handle is perpendicular to the forks and useful for both possible operations.

The thickness of the material 18/10 stainless steel allows a high grade of flexibility, considering bending and elasticity. The soft rubber handle allows a stronger grip while preventing hand fatigue and cramping. You hold the fish tool by its handle while you clench the pair of forks to pick the small bones. Another option is to hold the handle with all five fingers while you use the "knife-like" third fork. The directed forks decrease the angle of the hand during work.

The photograph (fig.3) shows an quite unfamiliar tool despite of the well-known problems you are able to solve with it. Due to this visible anonymity, the form may be receptive to many different and uncertain interpretations. The form is dependent on the meaning "fish tool" because several great variations of it can easily lead to misunderstandings.

What does the fish tool express?
The gestalt principles may help us analyse the expression of the fish tool. First, we clearly see that the handle has the shape and the face of a fish with its eyes and mouth. This tells us that the tool is intended for seafood of some kind. The decoration on the handle gives the tool a naive look.

The two forks pointing downwards are shaped slightly curved against each other, as if they make room for something between them.

The optic centre of the tool lies in the handle because of its stable expression compared with the thin blade. The three forks have an offensive expression which points their tips directly towards their goals. The distance between the pair and the third fork is wide enough to read them as two separate tools within the same overall form. The thin blade gives the tool a fragile and inexpensive look.

The simple form of the tool makes it easy to wipe clean with a soft damp cloth.

What does the fish tool exhort?
According to Monö (1997), the semantic function to exhort may be hard to identify though its intention is always the same, namely to trigger a reaction in the person to whom it is directed.

The soft, curved handle is comfortable to hold and indicates the link between the tool and the human hand. The blade, in thin stainless steel, is less tempting to touch and hold in spite of its curved form. As a result of this contrast between the materials used, the user will intuitively know that he will have to hold it by the handle and not by the blade.

None of the directed forks are strong enough to indicate a superior direction of the tool. The two opposite directions of the blade equalize each other.

What does the fish tool identify?
The fish tool is certainly a member of the product family American Norpro. Their products are easily identified by the use of the soft, non-slip and easy-grip rubber handle, stainless steel and heavy-duty nylon. This combination, according to Norpro, makes each tool a long lasting and dependable part of any kitchen (www.norpro.com).

The blade looks like it may have been made with forging and setting; therefore, giving it the requisite hardness and pungency. The handle is moulded. This production method enables a reasonable tool. The use of less noble materials and production techniques indicates that this tool is affordable for most people and may be bought in surplus.

Quality is always an object of discussion. Norpro describes themselves as manufacturers of high-quality goods; however, at first glance the fish tool may look low-quality. The stainless steel is harder and longer lasting than it appears.

The name of the product, “fish tool”, indicates the object to which the tool is intended, but does not tell us anything about which operations you can use it for.

What does the oyster glove describe?
The oyster glove will protect your hand from the knife.
during work with oysters.
The oyster glove consists of a knitted metal surface in the shape of the outer hand. It has the similar shape as a textile glove which obviously fits the hand and no other part of the body. The glove can be used by both left- and right-handed people.

The mesh is so tight that it prevents a knife or another cutting edge to injure your hand. This protection may be useful in relation to other foods that requires work with cutting edges and involve danger for the hand.

Around the wrist is an adjustable belt to prevent the glove from moving or loosening from the hand during work.

What does the oyster glove express?
Because of its material, this glove acts as the extra layer of skin that protects you from being hurt from hard objects. It reminds us of the age of chivalry when the knights wore chain mails to protect themselves during mortal duels. Nowadays, most accidents take place at home and we are challenged by modern threats.

The adjustable belt is made in textile, not in steel, because it is supposed to be tightened around the wrist. The steel mesh can cause slits if it scratches the skin. In spite of the human shape of the glove, the material in which it is made looks inorganic and cold. The glove looks stiff and difficult to put on.

The flexible mesh of the glove fits all adult hands no matter size. One flexible size is important; otherwise, the glove will feel uncomfortable without this stretchable mesh. The length of the glove indicates that this is not a glove for children. The sharp metal threads and hard surface can be dangerous toys.

What does the oyster glove exhort?
The act of working with a cutting edge close to your artery and the thin skin of your hand feel unsafe and foolhardy. Most people will be cautious during this kind of work regardless that they are wearing the oyster glove. In spite of the tight knitting, the holes will feel too large to prevent all kinds of sharp objects.

Due to the fact that the glove is made of steel, it looks uncomfortable and cold. The look of metal intensifies the impression of a tool which is necessary for the interpretation of this as a protective product and not a drag.

The hard surface of the glove may work as a percussive weapon. This gives the glove a frightening look. While wearing the glove, you must be careful of what you touch and stroke.

What does the oyster glove identify?
The oyster glove is made in one of the world’s most enthusiastic nations when it comes to consuming oysters, France. The metal knitting is a complicated and exclusive piece of handcraft which gives the impression of expensiveness.

The name of the product describes both intended use and the object to use with; however, does not describe the protection the glove offers.

"I conceive the form of a product as taking part in the perception process, in which both the physical object and perceiving subject are regarded.”

Susann Vihma

Three-dimensional visual analysis

By accomplishing a three-dimensional analysis, you indicate the ideas and principles containing the pure visual compositional structure for 3-D asymmetry. There is a direct correlation between the visual integrity of the individual elements and the overall organisation.

This analysis is useful in the work of including a new product in an already existing product family. The plan is combined of theory from basic compendiums concerning shaping and analysis of three-dimensional form (Yrkeslitteratur 1993, Akner-Koler 1994)

A basic three-dimensional analysis step by step

Form is the generic term of the total comprehension of the aesthetic value of a product. The basic elements of form are the form itself, colour, material and surface. By adding these elements, we create a composition with a visible content. A new combination of the same elements alters the signification. The relationship between forms consists of the interaction between the different elements (Yrkeslitteratur 1993).

A composition is arranged through the order and complexity concerning arrangement of the different elements. The order and complexity are in inverse ratio when it comes to the comprehension of a form. During the development of a form, it is important to obtain an optical equilibrium both in symmetric and asymmetric compositions.

Steps to analyse a three-dimensional composition:

1. Account for the basic elements of forms (form, colour, material, surface), which constitutes the composition. Any three-dimensional visual situation can be broken down into its different elements to gain an understanding of what the whole is made up of. Deconstructing the volume stresses the importance of focus on three-dimensional origin of visual elements.

2. Perceive the inner- and spacial activity of the elements, movements and forces. This includes the combined effect of the movements and forces. Inner axial movement is the motion expressed within the form. Continual axial movement is the continuation of the inner axial movement. Directional movement is the general form in which the whole form moves.

A force can leave its pattern through a structural asymmetry which is expressed in bending or curving the inner axis of a form and some of its elemental parts. Forces themselves cannot be seen, but may be perceived by how they affect positive forms. There are three different axes (straight, bent and curved) expressing three different general conditions.
3 Decide the relations between the form elements arranged together in a composition. The interaction between the elements is expressed through the centre of gravity, both optical and geometrical, proportions, symmetry, contrasts, orientation, balance, rhythm and dynamics. These relations create a network of visual connections that makes the visual statement. Perceive the organisation of the elements with the contribution of each element to the total expression of the work. Each relationship constitutes an important link in the overall composition.

According to Akner-Koler (1994) the most basic relationships are the axial and the comparative. The axial relationship is created within and between the visual structures of each element, and can be oppositional, parallel or continual. The visual information concerning elements and their movements and forces is examined through comparative relationships, to note the similarities or differences, and measuring contrasts among the form elements.

The scope of isolating the form from the content is to focus on the concrete descriptive visual information that can be observed independent of the work. This ability to abstract the three-dimensional visual structure that is inherent in all products, adds objective viewpoints to the creative process of shaping a form.

A case to demonstrate the theory provided

Step 1
The three primary proportions a form can assume involves the features expressing length, superficial is flatness, and massive which expresses volume.

From the drawing above we see that the tool consists of four main elements with spacial enclosure in-between. The four elements are the two blades pointing down (b and c), the third blade pointing in the opposite direction of the two others (a) and the handle (d). The spacial enclosure is enclosed of a and b in length, and of the blade in height. The blades a, b and c express the proportions superficial and extensional, while the handle expresses massive and extensional.

The blades are made of stainless steel which is characteristic for its “dim brightness” with its dark shade. The surface of the material is smooth and hard. The colour of the material is grey with a touch of blue. The blades are all flat with round contours. The tip of c is an elliptical segment. The two blades b and c have edged tips in comparison with a.

The handle is made in black rubber engraved with a simple pattern. It is bulky compared with the blades, but fits the inside of the hand and enables a steady grip.

If we try to break the tool into its elements, we see that the blade c is an elliptic plane with a rectangular end close to the handle. Along one end the material is planed thinner than the rest of the blade. A line that continues down the two other blades indicates this. The two other blades are triangular planes curved towards each other. Both outer tips are right-angled with antiskid rims on the insides.

Concerning the handle, we see that it is composed of two primary geometric volumes. A cone close to the handle merges with an ellipsoid.

Step 2

The inner axial movement in a, b and c is the motion from the handle and outward to the length of each blade. The line along the edge of the blades indicates a continual axial movement from a to c and b to c.

We see that the handle is perpendicular directed to the joint between the blades. The inner axial movement of the handle is so powerful that the whole form moves in its direction, although the other three elements (a, b and c) point in different directions.

All elements have a straight inner axis. In addition to this, the merged volume of the handle curves in two dimensions.

Step 3
The dominant form of the fish tool is the handle, which is the most visible from all views and the largest. The blades are grouped together through size and colour. Together they form a group which has a subdominant roll in the composition.

The oppositional axial movements of the elements pull the forms away from each other, moving the elements out in different dimensions and turning them into independent visual components.

We find the geometric centre of gravity on the inner end of the handle while the optical centre is located further out from the middle of the tool. The handle with its dark and dim surface appears heavier giving the impression
of a heavy element in comparison to the light and thin-bladed metal area. The blade is the active element of the form which retains its entire volume, while the handle is a passive form that is cut to make the complete joint between the elements.

What other factors have influenced the development of the cutlery?
People do not buy complete series of cutlery today. They pick out what they need instead of collecting unnecessary domestic utensils. Cutlery must communicate on different levels, and coax the consumer to use it. Another factor that affects the development of new cutlery is the shape of the food. Potatoes and carrots have determined and constant shapes, while water and milk are amorphous liquids. These phenomena are invariable limitations when trying to develop utensils for everyday eating. The leading factors for a piece of cutlery have been that it should be for everyday use; it should be a reasonable piece and made of stainless steel (DESIGN WEEK Oct '98).

The introduction of foreign cuisine in Norway affects the assortment of cutlery people chooses to keep in the kitchen drawers. Today Norwegians have joined together the chopsticks and garlic squeezer with the wooden ladle and the rolling pin in the drawer.

As Darren Bowden puts it (Design Week 1998), "Food was certainly the main impetus to designing. I wanted to make cutlery that really enhanced what was on the plate and promoted the enjoyment of the food. But it extended further. I wanted to make the table look more exciting." The goal of a cutlery designer is to make a cutlery that was comfortable, practical and good-looking. In other words, the designer wishes to make the link between food and people easy and comfortable, in every perceptible way.

Discussion
The theory concerning the semantic analysis is mainly collected from Susann Vihma (1995) and Rune Monö (1997), except from some aspects collected from different articles in some periodicals. Concerning form analysis, the theory from Vihma was complemented by among others Cheryl Akner-Koler.

Vihma (1995) describes the semiotic values of a product thoroughly, and her outcome is supported by numberless relevant references. Pierce’s sign theory is central and represents the heart of sign theory for many product developers. Vihma presents the importance of form theory in the shaping process of the product development.

Vihma’s semanthic approach to the design process is accomplished considerably more thoroughly than that of Monö (1997). Monö introduces the readers to the semiotics and indicates the most central aspects of the theories. Monös triadic division of products dimensions is surpassed by Vihmas additional fourth dimension.

The three-dimensional form consciousness is provided mostly from Akner-Koler and her basic approach to form theory. This theory is in addition to Vihma and Monö whom deal with this aspect of the product message in very little regard.

Conclusion
According to Vihma (1995), many definitions of design avoid the word “form”, so that the outer form, appearance or surface of the product will not be given too much attention in people’s conceptions of design. Design can be considered a kind of cosmetic finish given to technical construction. She conceives the form of a product as taking part in the perception process, in which both the physical object and perceiving subject are regarded.

Knowledge is requisite to obtain the wanted message of a product (fig.12). The message of the product ought to match the company’s business concept, aims and reputation. This article illustrates the value of increased awareness of semantic functions, products as signs and the form analysis. Adding examples to the theory emphasises the theory provided.

A good semantic design allows for the other dimensions of the product. This article treats the semantic dimension independently; moreover, to enlighten the comprehensibility of a products message. The product visual form supports this message. The importance of this aspect is often underrated.

Concerning the development of cutlery, the theory provided through this article will hopefully optimise the usability of the new product and increase its comprehensibility. By using authentic examples of seafood cutlery, the necessary foundation is provided to fulfil the semantic functions of the new product.

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