*Born with a congenitally missing lower left arm, researcher Bertolt Meyer was fitted with his first prosthetic device when he was only three months old. Inspired by the possibilities of Touch Bionics he presented the Channel 4 documentary 'How to Build a Bionic Man'. At the Science Museum in London he is portrayed next to his bionic self.*

# FUNCTION ANALYSIS

***Function Analysis is a method for analysing and developing the function structure of an existing product or new product concept. It helps you to describe the intended functions of the product and relate them to its parts and 'organs'. A good analysis can help you find and explore new possibilities to embody certain functions in a product or product concept.***

**When can the method be used?**
A Function Analysis is typically carried out at the beginning of idea generation. Functions are abstractions of what a product should do. During this analysis you describe the product or product concept in terms of functions and sub-functions, without material features such as shape, dimensions and materials. The underlying idea is that the function structure may be built up from a limited number of elementary functions on a high level of abstraction. Being forced to think about the product in an abstract way stimulates creativity, and prevents you from 'jumping to solutions', that is to say immediately elaborating on the first idea that comes to mind, which might not be the best. Function Analysis forces designers to distance themselves from known products and components in considering the question: what is the new product intended to do and how could it do that? With this method, you can accomplish a creative breakthrough and come up with unconventional solutions.

**How to use the method?**
In Function Analysis, a product is considered as a technical-physical system comprising an overall function and its sub-functions, because products usually consist of a number of parts and components that fulfil sub-functions through functional 'organs'. By choosing the appropriate form, materials and composition of parts, a designer can influence how the sub-functions and the overall function are fulfilled. The principle of Function Analysis entails first specifying what the product should do, and then inferring what the parts – which are yet to be developed – should do. The development of a function structure is an iterative process. Of course, you can start by analysing an existing design or with a first outline of an idea for a new solution – but in the course of the analysis you should abstract from it.

**Possible procedure**
STEP 1
Describe the main function of the product in the form of a black box. If you cannot define one main function, go to the next step.
STEP 2
Make a list of sub-functions. The use stage of a Process Tree is a good starting point.
STEP 3
For a complex product, you may want to develop a function structure. There are three principles of structuring: putting functions in a chronological order, connecting inputs and outputs of flows between functions (matter, energy and information flows) and hierarchy (main functions, sub-functions, sub-sub-functions, et cetera).
STEP 4
Elaborate the function structure:
- Fit in a number of `auxiliary' functions that were left out and find variations of the function structure so as to determine the best function structure.
- Variation possibilities include moving the system boundary, changing the sequence of sub-functions and splitting or combining functions.

**Tips & Concerns**
- A (sub-)function is always described by a verb and an object (noun):
  - main function of a mirror: reflect light
  - transformer: change voltage
  - blender: cut and mix ingredients
- 'Drive fast' is not a function of a car but something the driver can do with it. 'Fast' is an adjective. 'Enable the driver to drive fast' is a better description of the car's function.
- If you have a function structure, it is recommended you develop variants of it.
- Certain sub-functions appear in almost all design problems. Knowledge of the elementary or general functions helps in seeking product-specific functions.
- Block diagrams of functions should remain conveniently arranged; use simple and informative symbols.
  Be aware of the different types of functions, such as regular, supporting, unwanted, preventive and technical functions.
- Use drawings.

**REFERENCES & FURTHER READING:** Roozenburg, N.F.M. and Eekels, J.*, 1995. ***Product Design: Fundamentals and Methods.*** Utrecht: Lemma.