Designing products

Architects, landscape designers, interior designers and product designers are typical designer jobs. They often develop visual themes, to position themselves and their designs in the market. Many clients purchase products of or engage these designers because their products match with the sense of their identity. For example urban planners expect the landscape designers to develop landmarks, to improve the attractiveness of the city, neighbourhood or region. In addition to the visual requirements the design should improve the liveability of the community, preserve the environment and protect sensitive areas. Requirements usually not met by the visual themes of the designer. Most design teams are not composed of visual designers only but also include marketing people, design engineers, manufacturing- and O&M specialists. The design engineers, manufacturing- and O&M specialists ensure that the product meet the criteria of professional correctness, which may be specified in professional codes and standards.

However the customers, users (operators), regulators (government), retailers and pressure groups will judge the products on other criteria, like usefulness, appreciation for the environment and efficiency. Professional codes and standards have no or little value to them. The customer will only engage the designer (and its team) again when the design meets his/her expectations. Marketing people should collect the information about the customer expectations. The expectations are usually related to

- Needs of the customer and their clients
- Efficiency
- Acceptance among pressure groups and government
- Suitability for the recipient operators.

Unfortunately it is seldom easy to formulate a complete schedule of requirements that present the customer attributes. Many stakeholders provide incomplete or ambiguous information about their problems, needs and demands. Customers in addition may provide equivocal information about their clients, financial capacity or the operators of the product. In particular in the early stages of the project, designers, customers and other stakeholders may have different frames of reference. Often the designer and the customer need frequent interaction to clarify ambiguous issues and to change understanding in a timely manner. The designer has to assist the customer in formulating the customer attributes. For example, the designer can show other (similar) products and note down what the customer, including end-users, operators, and maintenance staff is saying about these products and their specific parts. Most designs are compositions of parts! In addition the designer will have to use more traditional marketing research techniques to determine the relative importance of the customer attributes. Interviews are usually more appropriate when the customer orders the product for his/her personal use. When the designer develops a mass-product, observation techniques may be added to validate the results of the interviews. The relative importance of customer attributes is important to the designer because it is close to impossible to accommodate all. Often designers have to trade off one customer attribute against another. Private enterprises (like real estate agents) often want to be able to position the product strategically in the market. This means that the marketing people in the design team will have to study the products of competitors and their markets. The management of the design team may have similar

requirements. After all the design teams compete for work, thus the designs are used as a trademark.
The design should always meet the requirements of the regulators. This is in particular important in countries where the designer will be held liable for the design failures. Designers often have to educate the customers about legislative norms, including the professional codes and standards.

When a first draft of the schedule of requirements is formulated, the designer has to analyse it on basis of conflicting interest. For example, the designer of rural development planning tools foresees that it is impossible to meet the demand of the customer, the Ministry of Local Development, with the current human resource allocation in the districts. If the designer ignores the human resource capacity, the product will not be suitable to the recipient operators. If the planning tool is designed on basis of the available human resource capacity, the product may not be acceptable to the customer. The designer needs to seek guidance from the customer. It is not self-evident that the customer is willing to alter his/her demands on basis of the concerns from the designer. Designers have to keep in mind that customers often learn more about their demands and capacities during the project. Tests, small studies and development of prototypes may improve the communication process.

The customer attributes should be translated into Engineering Characteristics. The Engineering Characteristics still relate directly to customer perceptions and preferably express them in measurable terms. For example the customers will feel the weight of the glass door, but it is unlikely that they will perceive its thickness. The thickness is a so-called Part Characteristic. A measurable term can be a simple yes or no criterion. For example steal beam should not collect water and dust to avoid corrosion.
Usually each customer attribute results in several engineering characteristics, for each of them a desired target value has to be established. The professional codes and standards and other legislative documents give directions about the desired target values of the Engineering Characteristics resulting of regulators' customer attributes. Manuals and competing products may provide guidelines for the others. Eventually the Engineering Characteristics should be translated into Part Characteristics, including their desired target values.

Very often the different design features influence each other. Increasing the isolation value of the walls often results in an increase of the bearing load of the foundation. Thus a change of the desired value of one characteristic affects others. It is important to list down which features affect each other to avoid incomplete design changes.

Many designers are tempted to design the product on basis of the part characteristics. However the production process limits the freedom of the designers. The production process contains controllable and uncontrollable factors affecting the values of the characteristics. As uncontrollable factors are impossible, difficult or expensive to control, the designers have to set the desired target values of the controllable factors to remove or reduce the impact of the changes in the uncontrollable factors. This requires insight in the

interactions between the controllable and uncontrollable factors. Only now the design team can complete the design.