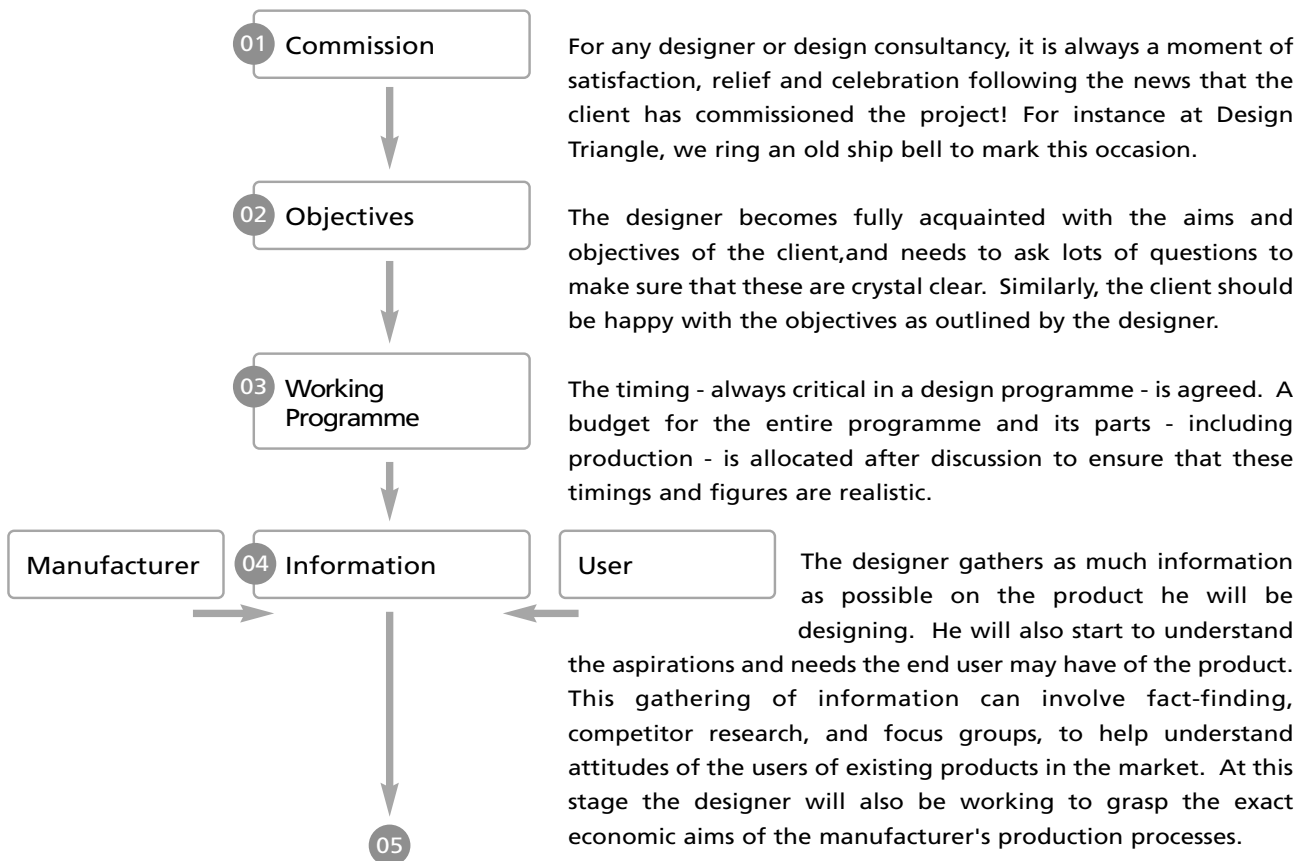


The Design process can be broken into the a sequence of events, no matter who the designer is. Like any other business discipline, successful designs come out of a structured process, with critical milestones that need to be addressed and revisited as the design develops. This flowchart could be called the backbone or the spine of the design process.



Ergonomic research in entry and exit from a facing double seat position. A solution to this problem of passage constraint is to position the gangway seats slightly backwards or reduce their seat cushion length.



05 Analysis

This stage involves further questioning. What are the main problem areas? How will the various parts of the product function? How will all these functions interact together?

06 Specification

The designer refines the objectives (02) and defines the product's requirements (e.g. all materials that will be used). As far as possible, the product's performance will be defined in hard facts and figures.

07 First Concepts

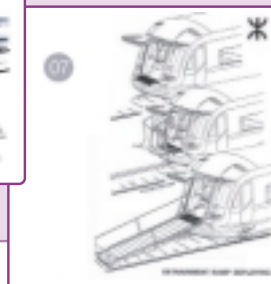
The creative process moves into motion. It is impossible to fully define how this! Suffice it to say that it is a cocktail of theoretical analysis combined with creative intuition. Design studios are chosen according to their design intellect and each one is different and cannot be imitated by another. In any event, it is the end result that is important. Picasso was asked by a lady at an exhibition what he meant by a painting, and he answered "Do not speak with the driver".

The designers and design engineers work together using their creative imagination to produce solutions for the technical functions and overall appearance of the product.

First sketches for the MTRC Airport Express trains. MTRC trains had an emergency detrainment (for allowing passenger to leave the train in an emergency) ramp behind a blind door in the middle of the front and rear of the train. This resulted in very small cab windows on either sides of the cab. One of the MTRC's objectives was to improve the vision and daylight in the cab by also having a windscreen in the middle door.

Through brainstorming sessions, Design Triangle developed a Kevlar folding system for the ramp. This principle was accepted by MTRC and a front end design with full windscreen glass was agreed.

The ramp was tested in a user trial on a full size mock-up to ensure the detrainment safety and performance. When these tests proved the design met the specification, the engineering development was undertaken by Design Triangle and a prototype built. This was again tested and developed for production.

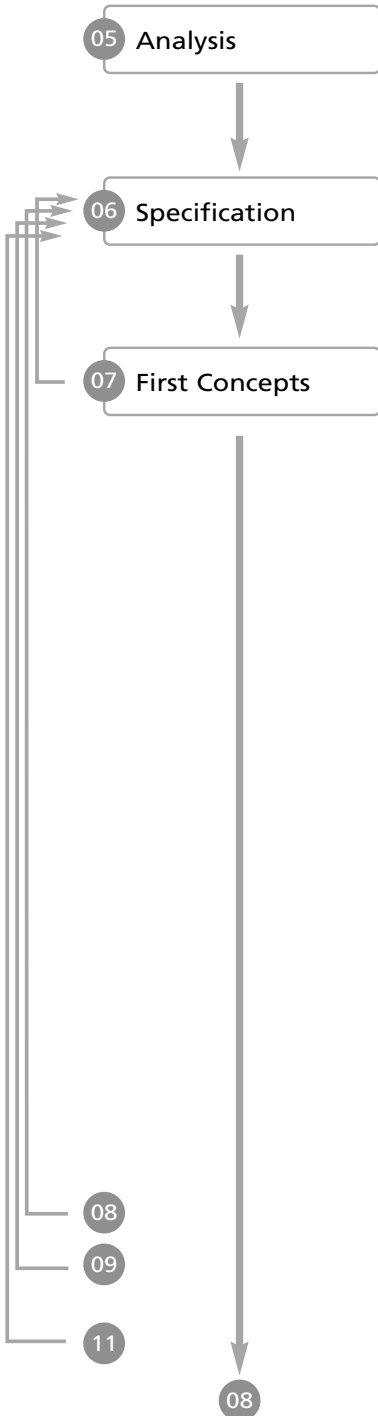


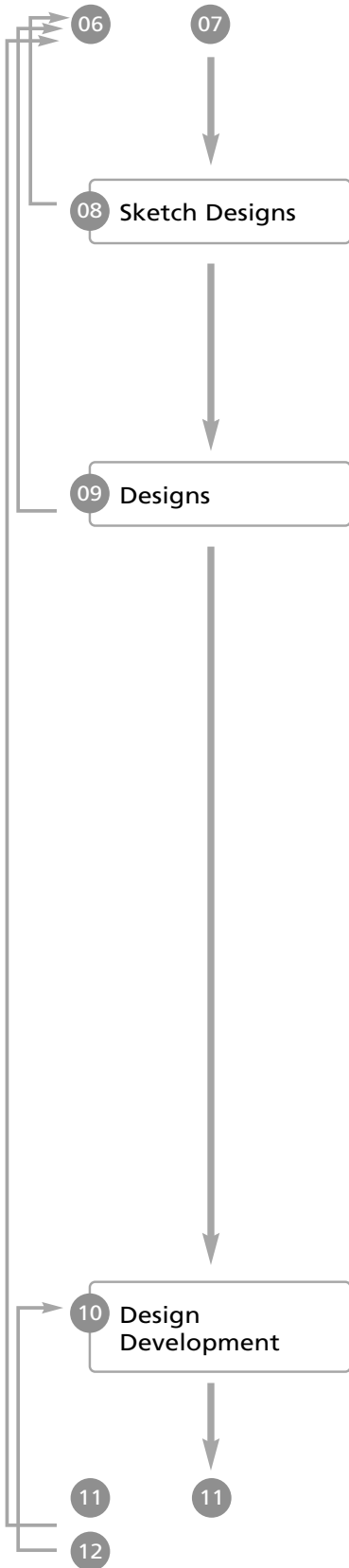
08

09

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08





Hundreds of sketches are often generated to help visualise the creative process. The creative toolkit can include brainstorming techniques and lateral thinking.

Sketches and ideas are compiled in a way that is easy to present to the client. A sketchbook, a video, a presentation on a laptop will help to convey the designer's thought processes and initial ideas to the client.

Design management is critical, at this stage. The designer's ideas and proposals are checked against the specifications (06) to ensure that the proposals are valid. Some ideas might need to be revised, others may be rejected.

Final presentation drawings are prepared for the client.

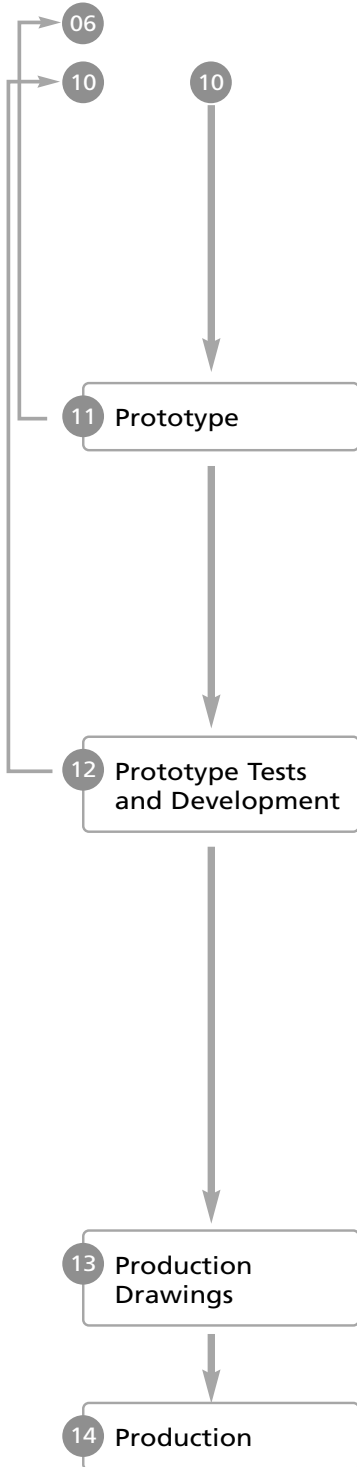
The validity of alternative design proposals are set out against the client's specifications (06) in a report,. Exploded views can assist in estimating the production costs of the various proposals.

The advantages and disadvantages of the proposals are listed. Decision matrix can help the client with the choice of one of the proposals, because the client will have to choose one of these designs for development into the next stage.

The final design for the STIB Tramway 2000. Often scale models or a full size mock-up are produced to demonstrate the design in 3D (scale model and mock-up of MTRC - TCL line trains).



The selected design is developed further and details such as appearance, construction, production and cost price all have to be optimised in a coherent attractive and faultlessly functioning total design. Models, mock-ups, technical rigs and exploded views, as well as, the usual 3D CAD engineering and 3D CAD design models can be used by the designer to reach his goal, and develop a product which is perfect in shape, colour and texture and still responds to the client's specification in every detail.




- a 3D CAD model of a locomotive cab for Spoornet in South Africa
- a full size mock-up for the Velocity GRP sandwich low cost weight tram
- an exploded view of a bus door to identify all the parts and estimate the production costs




A prototype is built and rigorously tested against the specification.

Prototypes for the Happich Modular Bus Roof Hatch.



Every prototype will always have elements which fail or which could be improved. These elements are analysed and the designer will often 'go back to the drawing board' (10) for further design development. The prototype will then be modified and tested again.

Prototype test on this roof hatch to test the emergency break through and safe escape.



13 Production Drawings

All snags or defects must be completely ironed out and the design must completely meet the original specification in performance, production speed, reliability and costs. Production drawings will then be prepared.

14 Production

During production, the designer should assist the manufacturer to overcome any further unforeseen manufacturing problems and make sure that agreed design is faithfully interpreted in an efficient way.