DESIGN METHODOLOGY FOR BANKNOTES; SOME REMARKS

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1 INTRODUCTION

Last year in Maastricht, on 9 and 10 December 1991, the EC decided to introduce one common European Currency Unit. It is the intention to fix the exchange rates in 1997, but not later than 1999. ECU coins and ECU banknotes may circulate before the end of this century!

It is clear that this development will entail major changes for the world of central banks, banknote designers and manufacturers. Paper manufacturer Portals was one of the first to anticipate this new development. In the autumn of 1991 they presented the leaflet 'Portals Europa' [1], which contained a proposal, a solution, for the paper to be used for the ECU notes.

Portals specifies the ECU paper as follows:

1 It should be made of the highest agreed specification for banknote paper and incorporate powerful anti-counterfeit features. (...)

2 The paper can provide standard elements which will assist the public both in authenticating the notes and in identifying their denominational sequence.

2 OPERATIONAL REQUIREMENTS

At first sight I think we can all agree with this first 'requirement' of Portals for European banknote paper. But from a design methodologic point of view this type of specification is not very useful.
It is like asking a car manufacturer to build 'safe' cars. But what is a safe car and how can we verify if a new car is safely built? The requirement 'the new car has to be safe' is too general for the designers of a new car. Safe has to be operationally specified in terms of measurable qualities, like:

'When the car has a speed of 50 km/hour and hits a concrete 0.5 m thick wall, the front of the car is dented not more than 50 mm.'

Of course, this formulation is still very short and can be extended. Cases in point are the well-defined paper specification tests in the ISO or DIN series. In practice specifications get much attention, they are usually very detailed, in contrast with requirements, which are for a banknote often written down in one or two pages. In a way, a specification is more easy to formulate because a specification is a quality of a product that already exists, that has already been manufactured, while a requirement is a quality of the desired new product, that has to be designed and constructed afterwards. Images of a new product only exists in the mind of designers and engineers.

3 PROGRAMME OF REQUIREMENTS (POR)

The design process of new Dutch banknotes always starts with the 'Programme of Requirements' (POR). This is still paperwork; describe as completely as possibly by means of text and drawings the qualities a new banknote must have. This is the starting point for the design of the new product.

From a methodologic point of view, a POR is made for two reasons:
1 information exchange between those who are involved in designing, manufacturing and selling (or issuing) the new product
2 discrimination between fit and unfit designs.
It is important that the POR is an exhausted recital of all the requirements and wishes related to a new note. Definitions of demand and wish are:

A requirement is a desired quality that has to be implemented in the new product, before one is satisfied. A requirement is therefore an absolute criterion, but can be formulated in terms of tolerances; if the requirement is not fulfilled, that solution cannot be approved of and is therefore no solution.

A wish is a conscious longing for a certain quality that improves the new product. A wish, in contrast to a requirement, is not an absolute criterion; a wish is a preference. One could say: 'A wish is a non-obliging requirement.' Design A can be better than design B if more wishes are fulfilled. Weighting these wishes is only meaningful if the requirements are implemented in all designs.

One should not hesitate to formulate all requirements and wishes that are brought up. Requirements and wishes that are not yet completely clear also have to be mentioned in the POR. Making a POR is a process of growth. Usually several versions are made before a POR is complete. Consistency may ask that some of the original requirements and wishes are deleted in the final version.

Another thing is that the formulation should be 'problem-oriented' and not (too much) solution-oriented. Sketches for the ECU note are already made by many designers. Others present concepts like an uniform front and a national backside. Portals writes in her proposal that the best subject for a watermark is a human portrait. It is not clear why this should be the case.
In Vienna, in 1988, I reported on our design philosophy on watermarks [2]. We think that the subject of a watermark should in the first place be part of the theme of the note. In this philosophy, portraits are possible, but also other (realistic) subjects, like animals. In our vision, the public should not only know that there is a watermark in a banknote, they should also know the subject of the watermark. This prevents for example that counterfeit banknotes with genuine watermarks of another banknote are accepted, or for instance letter paper watermarks. The public checks for a watermark, and it is there! But it's not the right one, it has an other subject! Or the watermark has only light tints and no dark ones! With an attractive, simple theme the public will recall the subject of the watermark better.

My thesis is that all recently presented solutions for an ECU banknote are the result of an implicit problem. This problem should first be analyzed. Not only in terms of technical counterfeiting, but also in terms of perception. The best way to do this is by means of a Programme of Requirements.

Demanding and wishing are relatively easy. Asking too much is quickly done. And there is also the phenomenon of conflicting requirements, like the limited size of a note and all the qualities it has to have.

A POR is not a book of law, but a tool to design better products. It is a practical document, that can be changed during the design process. That is why, at the end of the FOR-phase, a lot of the 'requirements and wishes' are finally left out. A big advantage of working this way is that one is conscious of what is changed, what was given preference over other requirements and wishes.
4 FOR FOR BANKNOTES

With respect to banknotes, a POR has to include the following subjects:
- design philosophy
- dimensions (size, thickness, weight)
- security (geometry, material, mass, colour, density, depth of field)
- life
- texts
- price
- environment
- toxicity
- ...

I already mentioned the design philosophy. Last year in Copenhagen, I told you about a strategy for optimizing the life and security level of a note. At that time I also reported on our strategy to develop the security features by means of the POR [3].

In daily practice there are three POR's as is given in Figure 1.

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FIGURE 1

Classification of Programme of Requirements for banknotes in three parts.
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These three POR's match the three common design phases of a new banknote: sketch-design, first printing proof and mass production. This is a logical classification and has two advantages:
- a design phase ends with the systematic control of all requirements and wishes; the control of the sketch design is done with the naked eye and a ruler, the control of the printing proof is performed with instruments like a densito- and spectrophotometer
- each design phase has its own special products, like for instance examples of colour copies of the printing proof.

The last 10 years we have worked conscientiously on our three POR's. We have now formulated more than 150 different requirements and 19 wishes, drawn up and laid written down on a total of more than 250 pages. Only the essential conclusions for designing a new banknote are laid down!

The source of the requirements, reports with background information, are listed in a reference paragraph with almost 200 different company, national and international titles! This way we created a 'company memory' for banknote design!

5 QUALITY ASSURANCE

The FOR is part of a Quality Assurance Plan. Quality Assurance has two essential parts:
1 Quality Control
2 Quality Audit.

The requirements and wishes in the FOR are part of Quality Control, the quality setting. Verification of the requirements and wishes in the FOR falls under Quality Audit.

Figure 2 is a scheme of the Quality Assurance of our banknotes.
The development of a European banknote should, in my opinion, not start with solutions, but with assessing the problem. The best way to do this is by means of Programme of Requirements.

For some qualities of the ECU note, the mean of the present EC banknotes may be used. Portals calculated for example for the height of their Europa-design a mean of 74 mm. However, a mean is a compromise and does not necessarily imply an optimal solution, for example from the view of handling, logistics and costs.

For most qualities of an ECU note I think we first have to develop a vision, a policy in respect of the users of banknotes: the European public.

This means first of all (in short):

1. the value of the note must be easily recognized
2. the public must be able to check the security features for the general public.

Perception and good design are therefore essential. Technical solutions to counterfeiting must be implemented in the note design according to the philosophy. This is the task of a good graphic designer, assisted by engineers.
Overview of the Quality Assurance of banknotes of the Nederlandsche Bank, related to the product development cycle.
7 CONCLUSION

The best banknote is a note that is properly used and accepted by the public, is well-protected against counterfeiting, has a long life, is a work of art, has cheap production costs but is also user- and environment-friendly, free of toxic materials etcetera.

As you all know now, this is not the way to define the design problem of a banknote. The first thing we have to do is to dispose off these 'open door' requirements and replace them by a well-worked out Programme of Requirements. The requirements must be formulated in a problem set, based on facts from research and an explicit design philosophy.

8 REFERENCES

1 'Europa'; leaflet by Portals, autumn 1991
2 De Heij, H.A.M.; 'Choice of the image for a shaded watermark'
   De Nederlandsche Bank, BPC Paper Committee Vienna 26-27 January 1988
3 De Heij, H.A.M.; 'Market based strategy for the development of new security features for banknote paper'
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