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Public feed back for better banknote design 2

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Public feed back for better banknote design 2

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Abstract

Developers of new banknotes can optimise banknote designs by making use of 1) public feedback, 2) strategic communication policy, 3) a design philosophy and 4) the stakeholders' approach reflected in a Programme of Requirements. The synthesis of these four elements will lead to new design concepts for banknotes, as illustrated in this article.

This article reports on the result of the 2007 biennial public opinion poll on euro banknotes conducted in the Netherlands. Knowledge of the public security features appears to be declining: the average number of security features recalled by heart is now 1.9, against 2.2 in 2005. On the other hand, confidence in euro banknotes increased from 6.8 in 2005 to 7.1 in 2007.

Appreciation of the euro banknotes rose just a little. However, the 5 euro note again lost some appreciation.

The themes of the notes, Ages and Styles, e.g. *Renaissance* on the 50 euro note, were not recognised.

This paper also reports on the strategic communication advice commissioned by De Nederlandsche Bank (DNB) from a professional agency.

In addition, the principle of preset design layouts for banknotes is explored. Starting from different requirements, different layouts can be made. Special attention is given to preset layouts based on the public security features.

By the end of 2006, the European Central Bank unveiled some documents explaining (partly) the design selection of the first series of euro banknotes in 1996. A recapitulation is given in Appendix 1.

Keywords: currency, payment systems, cash money, banknotes, banknote design, market research, opinion polls, public awareness, communication strategy, perception.

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I Introduction

Being the follow-up to the 2006 paper bearing the same title, this paper is called ‘Public feedback for better banknote design 2’. An earlier version of this paper was presented in June 2007 to the Banknote Materials Committee of the European Banknote Conference [85].

The first paper, ‘*Public feedback for better banknote design*’, was first presented at the SPIE Conference on counterfeit deterrence held in 2006 [36]. Later that year, two updated version were published, one as a DNB Working Paper [39, 44]. Both papers were made available on DNB’s website and were downloaded frequently from www.dnb.nl, Research/Research Publications/DNB Payment Publications. Positive reactions were received from the Central Bank of China on Taiwan and the central banks of Bulgaria and Italy. Also several banknote producers said they appreciated this publication or used parts of it (Arjo Wiggins Security, Papierfabrik Louisenthal, Orell Füssli and De La Rue) as did – again – Mr. Hymans, a criticaster of euro banknotes. DNB published a summary in their monthly bulletin [48], and some newspapers dedicated a short item to it [49]. The paper was also used in an article on new banknote designs, including a plea for a more exciting second series of euro [81] and quoted in the study of the u.s. National Research Council [79].

This 2007 paper not only reports on the latest findings of the traditional Dutch bi-annual public opinion poll, but also on a new research field: strategic communication. In 2006, DNB enlisted the services of the international agency 180 for the development of a communication strategy for the public security features of new banknotes [46]. This communication strategy is based on a short, simple story related by the public security features, to be referred to as the retrieval path. This leads to the assumption that a short story connecting the public security features should be the leading principle for a new banknote design instead of a main image. This story has also consequences for the layout of the design.

A first historical overview of banknote designs based on preset layouts is provided. However, information is not enough to come to new concepts for banknote design. That is why this paper also performs analyses and even delivers several syntheses. Such a layout could be based on mathematical figures like a line, square, circle or ellipse, but also on different concepts. Based on a communication slogan, like for example *All features in a row*, new banknote design concepts were created.

For a proper understanding of this development an introduction to the so-called stakeholders' approach is relevant. Such an approach is the basis for a design philosophy and the user requirements.

While the statements it contains apply for any banknote development process, this paper was written with a Dutch eye for the euro notes.

This Occasional Study should also be seen in the light of 'DNB Knowledge Bank', a motto introduced in 2002. Payment systems is one of the subjects pointed out in together with oversight and monetary policy.

2 Development of a stakeholders' approach

Future banknote concepts can – and should be – based much more on user requirements. It is a central bank's task to collect all these user requirements and, subsequently, to identify, analyse and review them. However, many central banks still rely on their banknote printers' or chief cashiers' advice, and hardly conduct any research in this field. *As long as we get no complaints, we are doing fine*, seems to be the reasoning. This passive approach may lead to claims, as was recently experienced by the Federal Reserve Bank in the USA: a pressure group standing up for the blind and poor-sighted urged the American central bank in court to improve the dollar notes [54], despite their stakeholders study 'Currency features for visually impaired people' in 1993 [13].

Figure 1

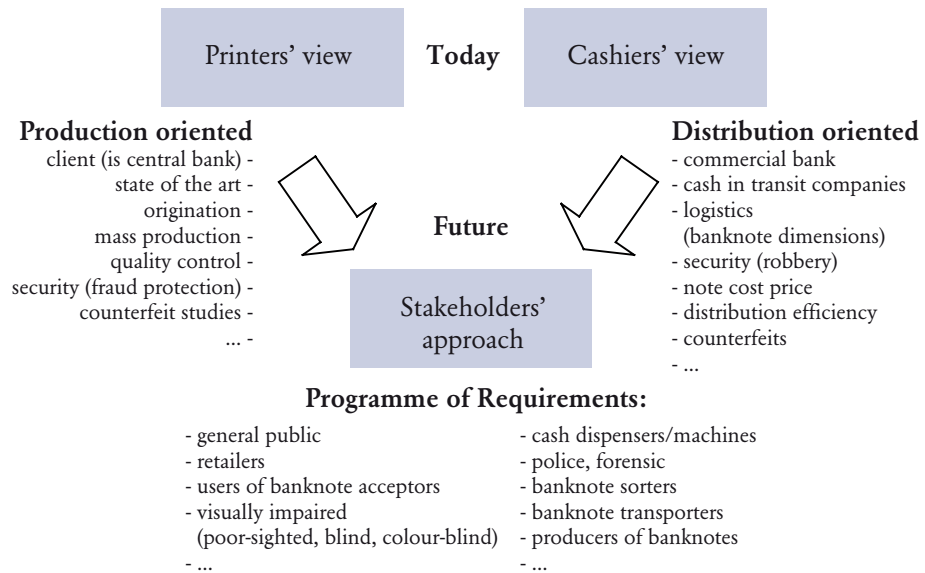


Diagram of the transition of banknotes designed from a *printers'* and/or *cashiers'* point of view to those designed on the basis of a *stakeholders'* approach. Listed are the focal points of each approach.

Market research would show that many customers are not really satisfied, but that they can live with the situation. The vending industry, for example, would like to see banknotes with narrower tolerances. And the cash in transit carriers want more protection, e.g. by way of a method ensuring that, if ATM cassettes are opened by unauthorised persons, the banknotes get stained with a very bright red ink.

For a more precise identification of the user requirements, central banks should conduct additional research. Examples of information to be obtained in this context are not only the need of the visually impaired, but also the retail sector's opinions on authenticity devices like uv-lamps, their opinion on convenience ATMs or third-party sorters' views of non-orienting, authenticity devices. This policy of a central bank is also called the *stakeholders' approach*. Today the view of banknote issuing authorities is characterised by what may be called either a *printers' view* or a *chief cashiers' view* (see Figure 1). A more detailed stakeholders' overview is presented in Appendix II.

Such stakeholders' view will prove to be a powerful catalyst for new design concepts. Central banks will develop more and more insight into the different stakeholders, including banknote printers. As a consequence, banknote designers will proceed to operate more in the interest of the central banks, giving origination orders to the printer. Another positive outcome will be that central banks will be developing activities in the field of consumer research. A case in point is the Bank of Canada. They researched that poor-sighted individuals prefer a dark numeral on a light background and just as many others prefer it the other way around. This finding has resulted in banknotes with numerals printed in positive contrast and those on the reverse in negative contrast (Figure 2). The numeral on the front is made positive (and highly tactile!) by the thick intaglio lines surrounding it. The

Figure 2



The Canadian banknotes incorporate numerals meeting the requirements of visually impaired individuals who find it easier to recognize pale numbers against a dark background and vice versa. Height of the numerals: 22 mm [29].
Designed by Jorge Peral.

Figure 3

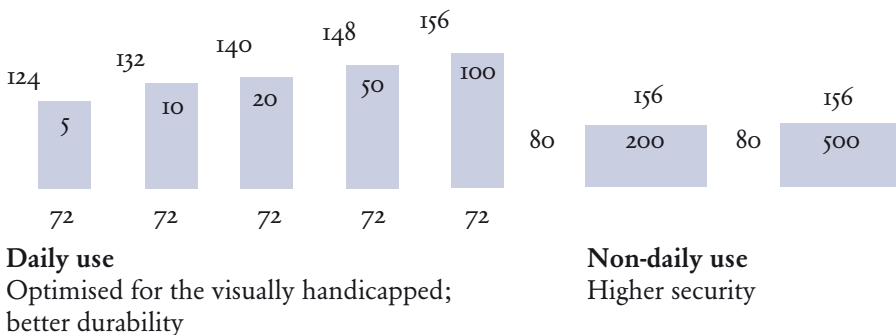


Sticker from the central bank of Spain encouraging the Spanish public to return 5 euro notes in a poor condition to the bank (2006).

contrast is further heightened by the light paper tint. Furthermore, the denomination numerals are large dimensioned with a view to the poor-sighted, older people without reading glasses and semi-dark conditions [29].

In 2004, the ECB expressed the need for more user input in banknote design, a customer based approach [26, 44]. In 2006, the central bank of Spain researched the quality of the 5 euro notes in circulation. When this quality turned out to be rather

Figure 4



Example of a creative concept for a new banknote series based on the analysis of user requirements. The low denominations are vertical or portrait-oriented, while the higher denominations show horizontal or landscape positioning [47].

poor, the bank launched a public awareness campaign (Figure 3). Also in 2006 the central bank of Romania researched the public and retailers' opinion with respect to the introduction of polymer notes [45].

Having set up such campaigns in the early eighties, DNB was among the first central banks active in this field [20]. Recently, DNB published three articles reflecting the stakeholders' approach: '*Banknote dimensions and orientation: user requirements*' see also Figure 4 [47], '*Counterfeit or genuine: can you tell the difference?*' [61] and '*Banknote numbers. What is their use?*' [57, 58].

3 2007 Public Opinion Poll

Since 1983, the public's appreciation and knowledge of its paper currency – first Dutch guilder notes; after 2002, euro banknotes – has been measured by means of biennial polls [44]. Some of the results are presented here, illustrated by relevant press publications or other contextual remarks.

The methodology of the questionnaire makes it possible to add questions on special subjects with every new round. In 2005, the *split* between low and high euro banknotes was such a supplementary subject. The outcome was that all denominations should have the same security features. Additional research was also conducted to determine the need for elements in euro banknotes that evoke emotions.

In 2007, additional questions were asked about the theme of the euro banknotes (e.g. *Renaissance* on the 50 euro note) [77], prompted by indications that this message of the euro notes did not come across [44].

Some of the research results were selected for publication in the Quarterly Bulletin of DNB [87].

3.1 Public knowledge of denominations

Just like in previous years, almost all respondents spontaneously mentioned the 5, 10, 20 and 50 euro notes. The other three denominations are less well-known. However, in 2007, the 200 and 500 euro notes became more familiar than in 2005, as indicated in Table 1. Remarkably, the 5 euro note does not have the highest spontaneous awareness (Perhaps, because appreciation of this note is low? See paragraph 3.4).

The prompted awareness of the euro denominations with values up to 50 euro is nearly 100%. The least known banknote still is the 200 euro note; 71% of the respondents are familiar with this denomination.

High euro denominations in NL

Many retailers like petrol stations do not accept denominations over 100 euro. Dutch people seem to be reluctant to use high denominations. On the other hand, the Eurosystem's demand for euro 200 and, especially, 500 euro notes is increasing

Table 1

Euro	2002	2003	2005	2007
5	94	94	91-	92
10	96	96	97	97
20	94	95	94	95
25	1	0	1	1
50	93	96+	94	95
100	74	82+	86+	89+
200	49	52	53	57+
250	6	11	14	11
500	62	55-	57	61+
1,000	2	3	7	7

Spontaneous awareness ratings for euro banknotes (in %) in the Netherlands. The denominations 25, 250 and 1,000 do not occur in euro [44, 77].

+/- means a positive or negative significant difference compared to the results of the previous survey.

each year. Value wise, the 500 euro note is now used the most, representing around 35% of the total value of the euro circulation (2006). However, number wise, the 500 euro note accounts for just 3,5% of the total volume of euro banknotes. These facts caused law enforcement officials in the Netherlands to question the need for high euro denominations, the 500 euro note in particular, as this one would be used by criminals for money laundering purposes [41].

One million euro in cash takes only 2 bundles of 500 euro notes (200 millimetres) or 5 bundles of 200 euro notes (500 millimetres high) and is convenient for cash transports. In 2006, a cartoon on this subject appeared in a widely read newspaper [50]. Comments like this are not new and seem to recur with every new decade. Already in 1985, DNB researched and published about the use of the NLG 1,000 notes (comparable to the 500 euro note) [e.g. 4, 12]. In 1997, in the Netherlands the use of high denominations also received much attention, but this time the focus was on anonymous Dutch accounts abroad [18]. DNB's position has always been that there is public demand for such high denominations, e.g. for buying second hand cars. For DNB has no mandate to interfere in criminal, black or grey money circuits.

1,000 euro banknote in 2040?

Although 500 euro is a high denomination, the real value of this note has been declining over the years. Since its introduction on 1 January 2002, its purchasing power now (mid-2007) amounts to around 460 euro. High denominations gradually come to be accepted for everyday public use by themselves [15]. However, it will take another 35 years before a 1,000 euro note will be required to replace the 2002

Table 2

	1814	2002	2007	2040
Constant 1814 purchasing power Required banknote	EUR 454 ¹	EUR 5,177 ²	EUR 5,502 ²	-
Present highest banknote	NLG 1,000	EUR 5,000	EUR 5,000	-
Purchasing power of NLG 1,000 (EUR 454) expressed in 1814 value	EUR 454	EUR 40	EUR 37	-
Constant 2002 purchasing power Required banknote	EUR 44	EUR 500	EUR 543	EUR 1,000 ³
	NLG 1,000	EUR 500	EUR 500	EUR 1,000

Overview of high banknote denominations in the Netherlands.

From its very beginning in 1814, DNB issued NLG 1,000 (EUR 454) notes. In 2002, a 500 euro note came in the place of the 1,000 guilder note. The table gives an impression of inflation in the Netherlands and the consequences for the high banknote denominations, as well as translating 1,000 guilder note's value in 1814 in today's value (without inflation) [76].

1 Conversion NLG to EUR: EUR 1 = NLG 2.20371.

2 The price index in 1814 is not exactly known. For 1810 - 1814, it is 255 and for 1815 - 1819, 155. The purchasing power (PP) is calculated as the average of the PPs based on the two price indexes above.

3 At an average inflation of 1.84% in the period 2002-2040.

purchasing power of a the 500 euro note, as is indicated in Table 2. This table also shows that DNB issued a 1,000 guilder note (= EUR 454) ever since its was first founded in 1814.

Today, the comparable value would be EUR 37, just around 7.5% of its original value. Or, based on price index calculations since 1814, the same purchasing power today would be represented by a banknote of EUR 5,000 [76].

To prevent money laundering, travellers in the EU may – since 2006 – carry up to 10,000 euro cash with them. For tracing money smuggling, the Dutch custom authorities have trained special dogs for random checks at Amsterdam Airport. Such dogs, experts in smelling banknotes, are also operating on airports in the US, UK and Germany and are quite successful [63].

Euro 300

Do you know if there is a 300 euro note? This question was put to several German citizens in early 2007. Most of the interviewees were not sure. The judge saw reason in this not to prosecute a German woman who found a 300 euro note on the street and tried to pay with this note (Figure 5). The 50-year old lady was not surprised to find naked women on this fake note, nor by the European heart-shaped 'stars' [68].

Figure 5



Examples of fake notes with non-existing values.

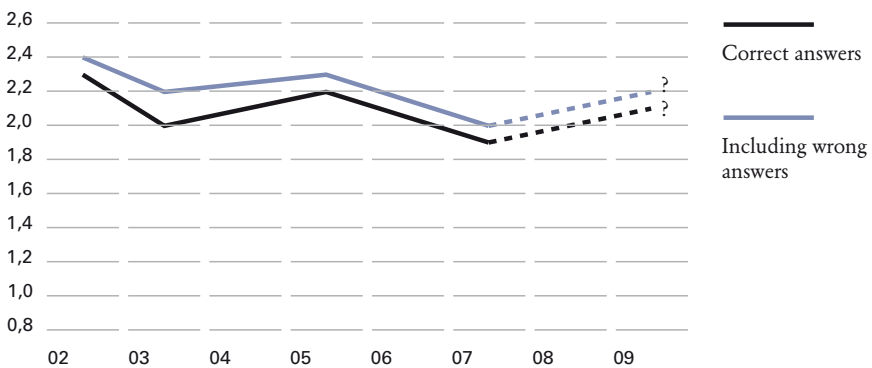
Left: 300 euro, named Eros. Green-coloured. For fake 600 and 1,000 notes, see www.1000euroschein.d (2007).

Right: 4,000,000 euro. Purple-coloured. Used in a leaflet of Dutch Lotto Weekend Millionaires (2004).

3.2 Public knowledge of security features

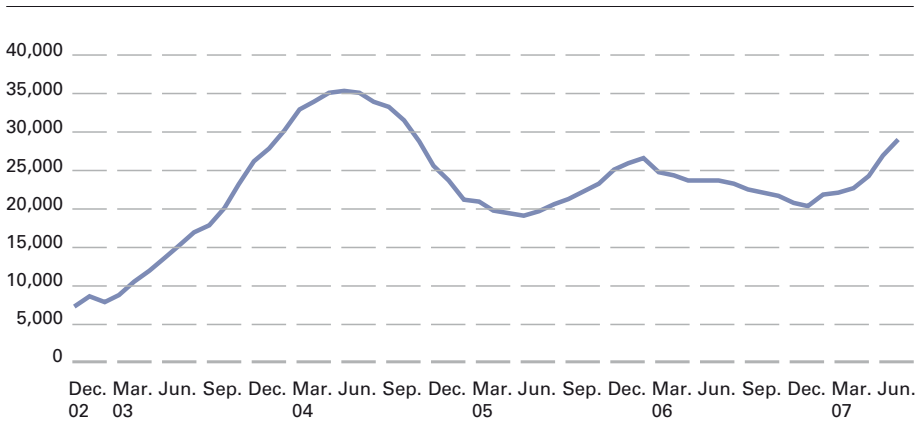
The average number of features mentioned has dropped to 1.9 (Figure 6), significantly lower than in 2005 (2.2). There are two explanations for this trend. The first is that in the years 2004 - 2005, the number of counterfeits dropped (see Figure 7). Secondly, in that period DNB was not active with information to the public. Also, there was not much attention for counterfeits in the media at the time. The answers received are again corrected for wrong or partly wrong answers (Appendix III, Table 3). As said before, people find it difficult to put the security features into words [44]. In line with this finding, people often provide the wrong name when asked about the security features, as is illustrated by the following conversation between the interviewer of TNS/NIPO and a respondent (noted on 13 February 2007):

Figure 6



The average public's knowledge of security features in the euro banknotes in the Netherlands over the years 2002 - 2007 [44, 77].

Figure 7



The number of counterfeit in the Netherlands, 12-month rolling average number of detected counterfeit 2002 - 2007 [82].

Interviewer: ‘To discourage counterfeiting, the banknotes issued by the European Central Bank, the new ones in particular, are provided with a great many features enabling cashiers etc. as well as the general public to check if a note is genuine or false. Could you name some of these security features? What do you do to ascertain if a note is REAL?’

Respondent: ‘Something with magnets.’

Interviewer: ‘What do you mean?’

Respondent: ‘With magnets you can see some stars.’

Interviewer: ‘Some stars?’

Respondent: ‘Yes some stars and little things, under the blue lamp.’

Interviewer: ‘You mean the fibres and print under a uv-lamp?’

Respondent: ‘Yes.’

Table 3 provides an overview of the knowledge of security features by the Dutch since the introduction of the euro in 2002.

Number of security features

The number of security features in the euro notes is subject of speculation, as analysed before [44]. Klaus Bender, a well informed journalist, writes ‘*No fewer than twenty-six security features were packed into the notes*’ [56]. In a way, the speculation is correct, though, since occasionally the ECB unveils new features, like the see-through foil perforation in 2004 and the scratch section on the front of the notes on 1 December 2006, when the ECB renewed their website. The text on the ECB website is: *Feel. To feel the raised print run your finger over it or scratch it with your fingernail.*

Table 3

Euro banknote security features (only NL)	DNB	DNB	DNB	DNB
Type of research	Periodic	Periodic	Periodic	Periodic
Time	Feb 2002	Feb 2003	Feb 2005	Feb 2007
Research done by	TNS NIPO	TNS NIPO	TNS NIPO	TNS NIPO
Number of respondents	2,002	2,015	1,501	1,506
Method	by heart repeated	by heart repeated	by heart repeated	by heart repeated
Watermark	70	65	68	65
Hologram/silver foil	61	52	49	43
Security thread	31	13	12	14
Special ink: glossy stripe (iridescent gold)	5	3	3	4
Special ink: colour changing ink (ovi)	5	3	4	4
See-through register	7	5	5	3
Raised ink, relief	7	5	9	5
Micro text	3	4	4	4
Type of paper	7	8	10	7
Ultra violet (uv) total	11	16	23	18
- <i>dull paper</i>	1	2	5	4
- <i>fluorescent fibres (red, blue, green)</i>	5	9	12	7
- <i>ink brightens up (front, e.g. flag, sign.)</i>	3	3	3	3
- <i>ink brightens up (rev. e.g. bridge, map)</i>	2	2	3	2
- <i>no specification, hold under uv light</i>	-	-	-	2
Infrared (IR)	2	3	5	3
Don't know any security feature	11	18	15	19
Average knowledge of security features	2.3	2.0	2.2	1.9

Acquired knowledge of the security features of euro banknotes in the Netherlands in 2002, 2003, 2005 and 2007 (in %) [44, 77].

Look. Perforations. Hold the note against the light. In the hologram you will see perforations which form the EURO-symbol. You can also see small numbers showing the value.

Neither feature is explicitly mentioned in the 2007 poll, meaning that the Dutch public does not recall them spontaneously [77].

The number of people who can not recall spontaneously one single feature has grown to 19%. Over the years this figure is quite stable [44]. A similar figure was reported in 2006 by the National Bank of Romania: 24% have no idea of any security feature [45].

In line with the limited capacity to memorise security features, it is the security features' quality – rather than quantity – which is essential for facilitating a public check. As stated before, increasing the number of security features does not help authentication by the public, as most people seem to rely on a small number of features. Issuing over-secured banknotes will overshoot the mark, as they will discourage people for being too complex. The adage is *More through less*, as was introduced by designer Buckminster Fuller.

Use of retail devices

The knowledge of UV-features has dropped from 23% in 2005 to 18% in 2007. The knowledge of IR-features dropped from 5% in 2005 to 3% in 2007. These figures from Table 3 are supported by recent research on the use of banknote detectors by retailers in the Netherlands as presented in Table 4 [88]. Auto detection devices, which do not require specific knowledge of security features, may be the future trend. Just a green light or a beep will tell the retailer if a note is genuine or not. And to the customer the retailer may tell: 'I am sorry, but the detector does not accept your note; shall I try another one? For the retailer a much easier message than 'Sorry, but I can not accept this note, I think it is a counterfeit.'

3.3 Confidence in euro notes

In 2005, DNB began measuring the perceived security (Figure 8). Confidence in the euro banknotes increased from 6.8 in 2005 to 7.1 in 2007. It seems that confidence in euro notes correlates with the number of counterfeits, since the average knowledge of security features dropped by 0.3 and confidence in the euro notes increased by 0.3. This was food for the thought for a relation between these two indicators:

Table 4

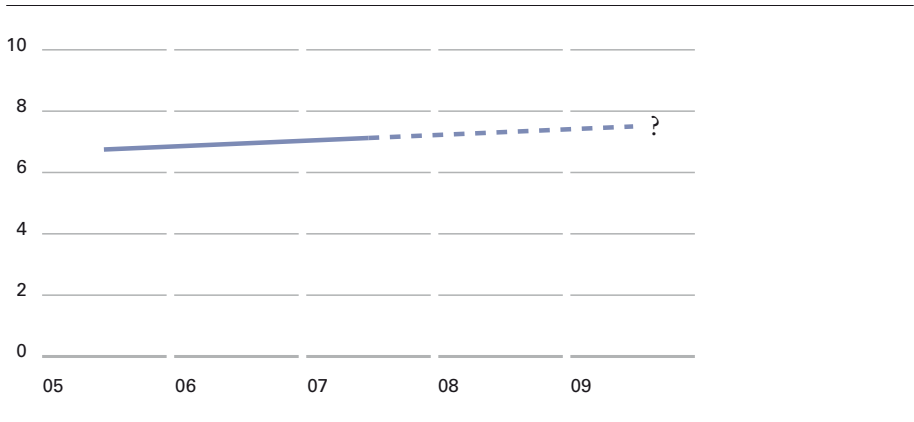
In percentages

Retail device	Used by
1 uv-lamp	35
2 Auto detection	16
3 IR-viewer	4
4 Different	3
5 Magnifier or mirror	0
6 None	45
Total	100



Overview of the use of retail devices in the Netherlands (2007). First time reported; no earlier data available [88]. Left: example of popular auto detection device in the Netherlands: Euro banknote verifier *évision*.

Figure 8



Confidence in euro banknotes in the Netherlands. Confidence went up, while the number of counterfeits declined [77].

$$f(y) = \kappa(y) + c(y) = \text{Constant}$$

y = year, κ = average knowledge of security features, c = confidence in banknotes.

The second *perceived security* question is a report mark for the protection of the euro banknotes against counterfeits. This report mark rose from 6.5 to 6.9 in 2007. The elderly still have less confidence in the protection of euro banknotes against counterfeiting than the younger generations [77].

Confidence in euro banknotes might correlate with confidence in European Monetary Union
Confidence in euro banknotes might be influenced by the attitude towards the single currency, which was introduced in 1999. The eight-year-old European Monetary Union did not foster much confidence in the euro as a currency. In January 2007 over 5,300 adults in 5 large EU-countries were interviewed. Around two-thirds of the French, Spanish and Italians believe that the introduction of the euro has had a *negative impact* on their economies. Over 50% of the Germans hold the same view [69]. Confidence in the euro and European Monetary Union is still low. This could also be heard during the conference organised by DNB in late 2006 to commemorate the 5th anniversary of euro cash money in the Netherlands [59, 60].

Canada: public confidence score

The Bank of Canada reports the ‘public confidence score’ on their website. This score is the aggregated result of the responses to the following four ‘attitudinal’ questions:

- 1 To what extent is counterfeiting a problem?
- 2 How likely are you to receive a counterfeit note within the next six months?

- 3 What is the likelihood that you will experience fraud or loss when using cash?
- 4 How confident are you in the systems currently in place to remove counterfeits?

Each year, around 2,000 people are interviewed by telephone. In 2004, 2005, and 2006, the scores were 55.7, 53.1 and 54.0 respectively, on a 100-point scale. This caused the Bank of Canada to conclude that confidence in Canadian banknotes is *close to neutral, between 'somewhat' and 'not very' confident* [42, 80].

3.4 Appreciation of euro banknotes

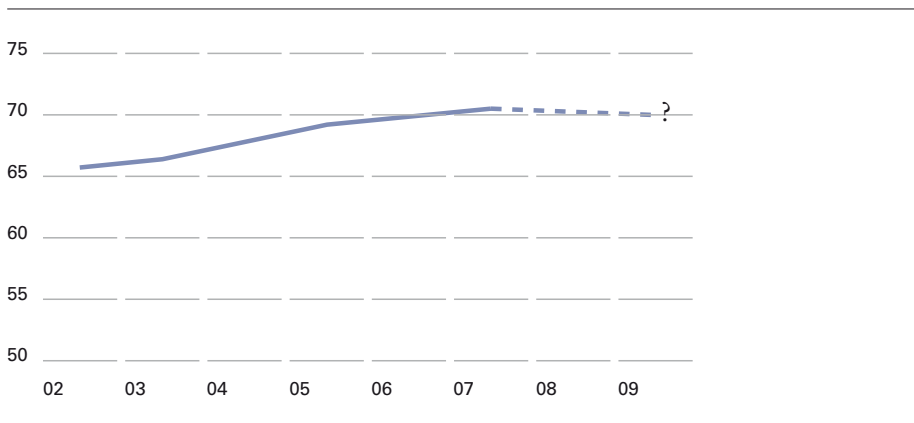
While the Dutch appreciation of euro banknotes has gone up somewhat (see Figure 9), it seems to be stabilising at around '70% beautiful' for the complete series. The 5 euro note performs the worst, with 56% of the Dutch finding it ugly, against 55% in 2005.

When asked specifically for a favourite, the public prefers the 50 euro note the most, just as much as in 2003 (around 35%).

3.5 Theme of the watermarks: not known

As reported before, people are not able to recall the watermarks in the 5 and 50 euro notes [44]. For both banknote models, most people answer 'an old building' or 'a Greek building'. A wide variety of words is used to describe the watermark: porch, window, doors, church, chapel, balcony, niche, alcove, gate, and altar. The watermarks seem incomplete; some elements are felt to be missing. The correct style

Figure 9



Appreciation of the euro banknotes - complete series - in the Netherlands [44, 77]. Dichotomic method.

period is seldom mentioned; people are not familiar with the Ages & Styles periods (see below in paragraph 3.6). Compared to 2005, there are significantly more people who cannot name the theme of the watermark on the 50 euro note (93% and 90%).

To help memorizing the watermark theme, a stepping stone might be provided, e.g. by way of a hierarchy in the subjects. In another survey, one Dutch interviewee suggested that the watermarks should reflect the hierarchy in the animal kingdom, with a lion on the highest, and a little bird on the lowest denomination [73].

3.6 Euro note themes: not known

As people proved unfamiliar with the watermark design, a similar question was asked about the main image, the windows and the doors. DNB proposed such a question to TNS NIPO for the 2007-poll: *'Every euro banknote represents a certain style period, a certain era of architecture. Do you know which of the following style periods are shown on the 5 euro note?'* This question was asked for the first time. Since not everybody understood what is meant with a style period, TNS NIPO advised to change the question from an *open* to an *aided* question. The themes were mentioned in random order to prevent any bias (see Appendix IV for phrasing of the question). The same question was asked for the 50 euro note.

People are not familiar with the themes Ages & Styles

The results found are very poor, as people often are unable to give an answer. *'You can stop with summing up the periods, I really do not know'* was the remark heard several times. Finally 82% of the respondents could not tell any theme for the 50 euro note. The correct answer *Renaissance* was only given by 1%. The 5 euro note scored a little better: 77% could not tell any theme and 2% gave the correct answer: *Classic period*. See also Figure 10 and 11.

Why are people unable to recall the themes on the euro notes? This is not known. Probably, the designs are all the same for the public: an old building. People seem unable to discriminate between the different styles. The link to Europe as a whole does not seem to work. Specific main subjects like e.g. the Eiffel tower, induces associations with a specific culture within Europe (in this case the French), and are therefore often considered unsuitable for European banknotes. *Citizens would rather identify with their country than with Europe*, it is said in a recent article in InfoSecura on the design of the euro banknotes [81]. However, the other side is that their appearance remains meaningless. The public cannot seem to grow an emotional attachment to a (non-existing) old building. Although, in the iconographic history of banknotes, often images of anonymous people were used, especially in the period 1920 - 1950, it seems that today people would experience such images as meaningless. Perhaps this explains why the themes of Ages and Styles are not recalled.

Figure 10



Classic, Mediaeval or Baroque? For the Dutch they all amount to the same: an old building. The image of the watermark is unknown to the Dutch (e.g. same building as printed), nor are they able to tell the specific style period of a denomination (e.g. *Renaissance* for the 50 euro note).

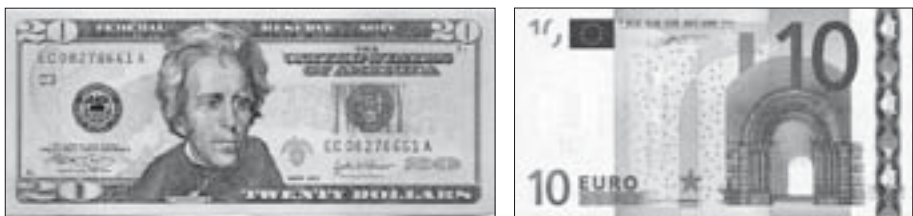
3.7 Themes proposed by the Dutch

In line with the question on the euro note themes, in 2007 DNB asked for suggestions for themes to be used for the new euro note series. *Suppose you were the designer of the next euro banknote series.*

Which of the following themes (with a European character) would have your preference?

The Dutch seem to be ready for the use of European images, like the Eiffel tower or the Acropolis, on the euro notes (Table 5). A famous European person was proposed by 11% [77]. From other research it emerged that this person does not need to be Dutch, but might equally well be Copernicus or Leonardo DaVinci [73].

Figure 11



An old president

An old building

What is on the note?

USD: for many Americans it is an old president. Some will say: an old dead president.

EUR: for the Dutch it is an old building.

Table 5

Preferred themes on a new series of banknotes	Score in %
1 Pictures of well-known European buildings like the Eiffel tower, Acropolis etcetera.	37
2 Pictures of animals	17
3 Pictures of plants and flowers	12
4 Portraits of famous European	11
5 Pictures of bridges, windows and gates	7
6 Something abstract, no representation	7
7 Pictures of a musical instrument	5
8 Don't know, it doesn't matter	3

(Prompted) themes preferred by the Dutch for a new series of euro banknotes [77].

3.8 Old guilder notes are still popular

Although appreciation of the euro banknotes is still growing, it does not compare with the level of appreciation of the former guilder notes. In 2007, DNB added specific questions asking respondents to indicate which series of banknotes they liked best, that of euro banknotes or the last series of Dutch guilder banknotes (see Appendix IV for the phrasing of the question). In line with the appreciation score, the last series of guilders banknotes proved far more popular than the euro banknotes: 61% versus 26%. One out of ten respondents had no preference. The higher the respondents' social status, the more they seem to like the last series of guilder banknotes. This especially held for those between the age of 34 and 54 and citizens of large cities. Also outside the Netherlands, guilder banknotes are recalled: 'She got misty-eyed reminiscing about the note with the sunflower...' (wrote Nick Carter from Central Banking Publications to the author about his Danish girlfriend on 10 April 2007).

DNB received several requests for the use of images of guilder notes

The popularity of the former Dutch notes is also shown by the election of the best Dutch design ever, organised by a major Dutch newspaper in 2006. The design of the NLG 50/Sunflower came second after the airplane Fokker F27 Friendship [43]. Also the Dutch Ministry of Finance still love the guilder notes. In 2006, their new meeting halls were named after 11 typical Dutch banknotes [75]. The Dutch Triodos Bank used the sketch design of the NLG 50 in their advertisements for an *art and culture investment fund* (2006). The NLG 250/Lighthouse was used by the Architecture Museum for a 2006 exhibition on Dutch architecture. Finally, a Dutch chocolate

factory started printing Dutch banknote designs again in 2007 as wrapper for their chocolates (Union Edel Chocolate B.V.).

3.9 Quality of euro notes in circulation

The circulation quality of euro banknotes in the Netherlands has been stable over the years 2003-2007 (Figure 12). According to the dichotomic method, almost 9 out of 10 respondents (86%) regard the banknotes on the whole as clean. The 50 euro note is considered clean by significantly more respondents (93%) than the 5 euro note (61%). In 2007, the opinion of the cleanliness has stabilized compared to 2005 [77].

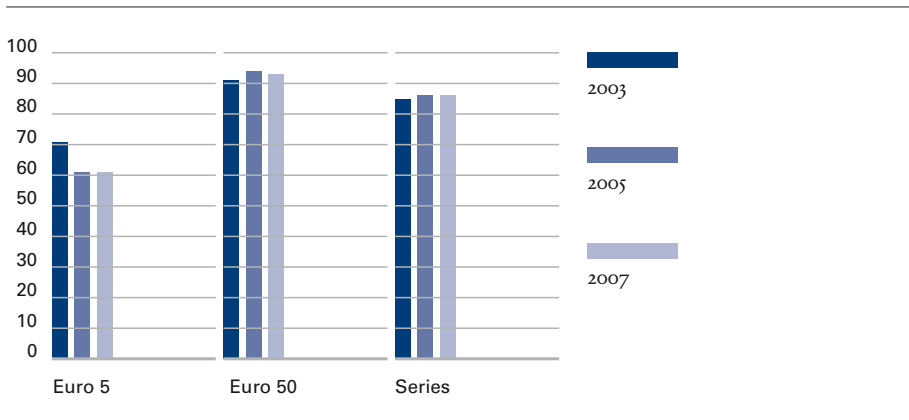
3.10 Research in 2009

The public poll will be repeated on a bi-annual basis, and a new survey will be introduced in 2009. The polls provide essential feedback on the public's perception of the euro banknotes. Some suggestions for the 2009 survey are given below.

Smaller sample size

The sample size in 2005 and 2007 was 1,500 respondents. This number could be further reduced to 1,000 respondents. For an observed percentage of e.g. 50% the accuracy would drop from +/- 2.5% to +/- 3.1%, meaning that if 50% of the polled population of 1,000 persons answered yes, the accuracy for the entire population

Figure 12



Neatness in % of 5 and 50 euro notes and of the full series over the years 2003-2007, as measured by DNB [44, 77] using the dichotomic method.

would lie between 46.9% and 53.1% (with a reliability of 95%). See also Appendix III, Table 1.

In the future, the sample size might be even further reduced to 500 or 300 respondents. Marketing people often use even fewer respondents: *'Ask just 3 persons and you will find 75% of the product defects. Ask 9 persons and it is already close to 100%!*' [51].

Hard to find willing respondents (by telephone)

As reported before, telephone interviews are harder to realise than before. Especially, the young male group is the most difficult to get on the phone. It takes six trials on average before a willing respondent is found. Another reported development is that more and more young people have mobile phones, whose numbers are not in the database of TNS NIPO [44]. As a consequence, the weighting of the young male group was increased in the 2007 survey.

To overcome these trends, it is possible to move to another research method. With *Capi Home*, TNS NIPO has created a large selected group of respondents that is willing to answer questions by phone.

Combination of 'by heart' and 'written' questions

With *Capi Home* it is also possible to move to so-called *switch mode research using NIPO Base*. The basis of the questionnaire is still a spontaneous answer, but some questions had better be posed in writing. With switch mode research both are possible. The same respondent will first answer the spontaneous questions by phone and, subsequently, the other ones in writing. In that case it is also possible to offer images of banknotes to which people are invited to react.

Conjoint analyses

Relatively new quantitative tools in marketing research are the conjoint analyses, first used around 1985. A prototype, e.g. a complete proof print of a new banknote, can be researched, each time with two parameters being changed. For example, one version contains watermark design A, while in the second print watermark design B is used. Respondents will indicate their preferences and will be asked for their reasons.

Respondents cannot effectively process more than about 6 attributes at a time, with nine levels each. The final outcome could be a matrix of 6 x 6, with, e.g. six different public features and the one axis, and, on the other axis, attributes like *clear – unclear, this I can check – this I cannot check, or beautiful – ugly*.

4 Strategic Communication Policy

Banknote designs are often not based on a well-considered communication concept. The banknote designer seems to be in charge, while this is not her or his first domain. This paragraph provides several leads for a better banknote design, based on a preset communication policy. However, a design philosophy predominates over a communication policy.

4.1 Design philosophy

The design philosophy or design policy is the start of any banknote design and is preferably provided by the highest management, the Governor and the Board of the central bank. The necessity of a design philosophy is described in several articles by the author [20, 27]. The design philosophy describes for example that – in case of the euro notes – *‘the notes should be clearly identifiable as European’* [see Appendix 1, A6, A9]. Preparations for a new design should start with a review of the existing design philosophy. Such a review could also be triggered by collected criticism.

Criticism on euro design

‘Public feedback for better banknote design’ already collected criticism on the euro banknote design over the years 1996 - 2005 [44]. In November 2006, members of the European Parliament analysed the euro notes as *‘contributing to creating a cold image of Europe’* and invited the ECB to make the next series of euro notes livelier [53]. If this advice is accepted, the philosophy for euro banknote design should include a suggestion of warmth.

Some more critical remarks were – invited by DNB – made by Bureau 180. While the bridges may link people, we do not see any people, only bridges. Deeper analyses tell that these bridges are not linking anything. The bridges start from nowhere and are going nowhere. Furthermore the bridges are floating rather than serving as solid anchors between two banks. The bridge’s function as a crossing facility is not suggested, for we only see the bridge, instead of being on it. More comments from this agency are listed in Appendix v.

Apart from the comments aiming straight at the note design, there are several that refer to the construction of Europe. Some come from the inside, as the comment

made by Klaus Bender: *'It is apparent that a common culture still has to take root in the management of the single European currency.'* [56].

'Diversity characterises Europe and to specify a European identity seems impossible' was one of the statements made at a symposium organised by DNB on the occasion of 5 year euro cash money [60]. Early in 2007, the first Dutch comment expressing this feeling is heard: *Having nothing else in common but the euro.* (In Dutch: *'Niets meer gemeen hebben dan de euro.'*) [67]. A similar conclusion was drawn recently by InfoSecura: *'The euro design is the lowest common denominator of what member states find acceptable* [81]. It is here that an opportunity presents itself: the euro notes are means, important and powerful means, to create and strengthen the identity of Europe. The euro notes themselves are European; the notes are icons of Europe!

Reset design philosophy

Based on these comments, the renewed design philosophy for the new euro notes might be: Develop notes that:

- are *warmer* (e.g. introduce life in the note, select warm paper tints),
- contribute to a European identity (express this in the note design),
- contribute first to the European unity and secondly to the (cultural) diversity in Europe (express this in the note design),
- exude a sense of happiness and/or joy,
- are intuitively useable, self-explanatory. The communication is built into the banknote design concept, i.e. the public will find the public security features without requiring an information leaflet.
- are future-oriented and one step ahead, thus reflecting the ambition that *Europe will be the leading technological continent in 2010* (Lisbon Treaty),
- ...

Symbol of peaceful European unity

'Today our 317 million fellow citizens of the euro area walk around with a little piece of Europe in their pockets'. This statement comes from Mr. Jean-Claude Trichet, President of the European Central Bank. *For Trichet there is no better symbol of peaceful European unity than the single currency, the euro* [78]. Their existence is the first statement, but the design of the euro coins and banknotes – what are their communication messages? – is a second.

Ambition

A clear design philosophy will help to get the desired design objectives clear, and focus and direct design discussions. Ambition of the issuing authority is one of the drivers of a design philosophy. Should the new banknotes receive attention, should they set new standards in banknote design? Or should they preclude criticism and be middle of the road?

Prioritisation

The design is of ultimate importance for the public to understand a public feature. It is helpful if priority is given to the design features (see Figure 13).

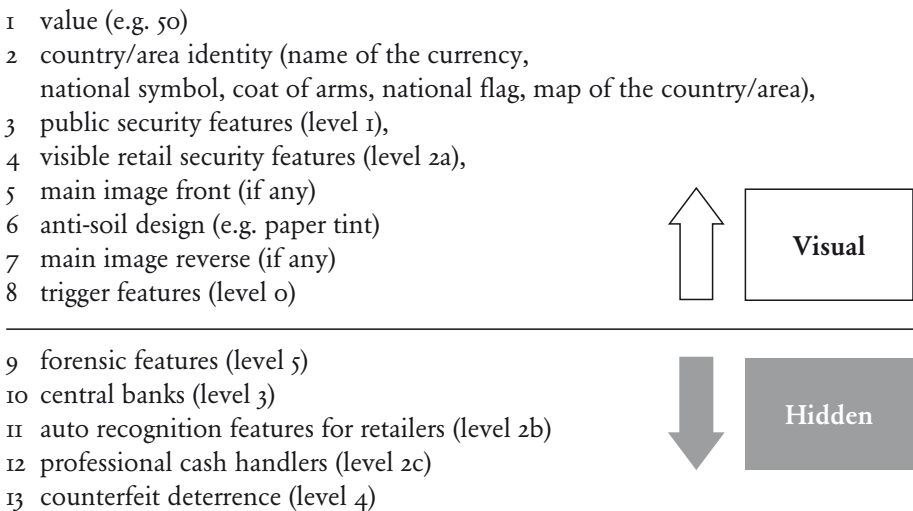
4.2 General strategic communication advice

A very successful communication strategy was adopted by the Austrian National Bank (OENB) in 1996. The slogans *openness to others and bridges linking people* were developed by Robert Kalina and an external communication advisor. Before proceeding to work on the designs, they first thought about the slogan [52]. The messages chosen will be used again for the Euro Series 2! [27].

An important success factor next to an adequate design philosophy is the preparation of a communication strategy (Figure 14). Design philosophy and communication strategy are part of the Programme of Requirements, i.e. the instructions for the graphic designer [20, 27].

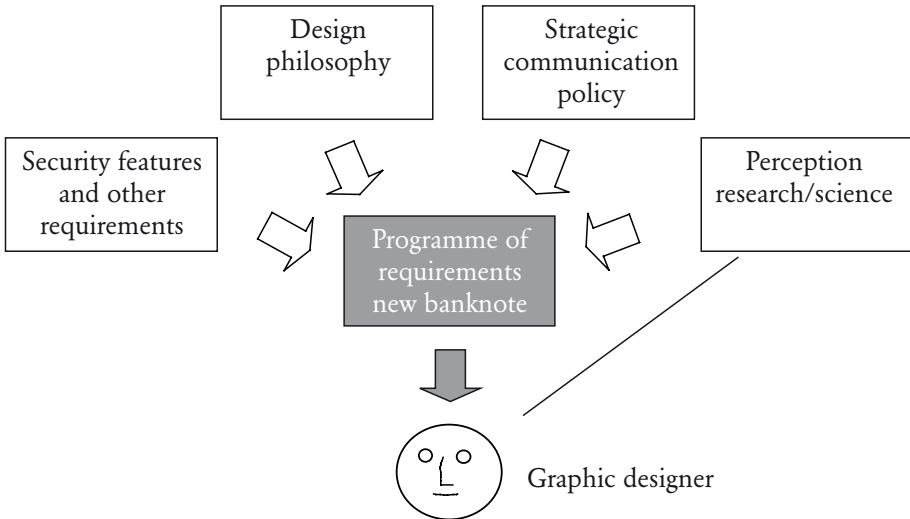
In addition to a proper design philosophy, a communication message may need to be developed before the designer starts sketching. Bearing this information from the Austrian National Bank in mind, in May 2006 DNB called in the independent and well-respected international agency 180 in Amsterdam for assistance with the development of such a communication strategy for the design of public security

Figure 13



Example of priority listing of design features in a banknote. The user levels refer to both the publication 'Public feedback for better banknote design' [44] and the classification of the security features by the ECB (level 1 - level 4).

Figure 14



The Programme of Requirements contains the central bank's instructions to the graphic designer. Such a methodology is a key to any successful product development, so also for a new banknote design.

features. In 2007 the agency i80 was selected as the 'best agency 2006'. DNB asked i80 the following questions:

'What kind of design themes would be suitable for public features to be used by the European public? Should we come up with Europe, with music or birds, as none of these themes require language or present a barrier? Should we use colour as the main communication theme for the public features? Or something else...?'

How to come to 'advanced public-friendly' notes, so that people will find the public security features without the help of an information leaflet?'

Retrieval path

First policy advice is to create a retrieval path. People will remember e.g. a walking route by 'turn left at the red mail box'. This principle should be used as the basis of the communication policy to increase the memory of the public security features. The tool to introduce this strategic pillar would be a little story.

Little story

So, if the public features tell a little story, people will remember more. The story itself should focus on the heart, should be emotional rather than rational. A good example is *Little Red Riding Hood*.

The story should have a clear starting point, a beginning, followed by the middle part: the drama. The story should finish with a clear ending, the solution. Furthermore, the story should be linear, going from A to B to C. The story could be on the level of children. But take care: the note should not be childish; the note should be dignified and serious. The story should be different per denomination, but should have the same structure. For example: Look what happens near the bridge! In one case a fisherman catching a fish. In another case, there is a frog on a water lily. And take care: a story yes, but a puzzle no. Also from perception studies there is evidence to support this approach. Before a visual image reaches the short memory, the image is stored for a maximum of 500 ms in the iconic memory, as reported for the first time by Neisser in 1967. In the short memory these perceptions are combined to form one piece. The long memory (over 15 s) stores this information in a semantic way. According to this theory, the information does not contain any design shapes, but only meanings. This theory would plea for public security features based on a short story around a theme. For Bureau 180 the NLG 50/Sunflower is a good example (Figure 15), just as probably the FFR 50/Le Petit Prince (Figure 20).

In 1982 research of Stilitz for the Bank of England also stated that ‘related elements are better remembered than unrelated’. Design content ‘should be strongly linked through a common story or theme [2].

Add emotional content

Add emotional content to the themes of gates and windows. E.g. add people on the bridge (see Figure 16). Or add a bird flying by. Design the bridge in such a way that people are invited on the bridge instead of looking at it from a distance (Figure 17). See also Appendix v.

Figure 15



The NLG 50/Sunflower, issued by De Nederlandsche Bank in 1982. The watermark is not a mirror image of the flower, but a bee. A bee is also found on the sunflower. The sound of a humming bee when scratching the banknote surface is a further anecdotal element in a row that will enhance both learning and memory. Designers: Robert Oxenaar and Hans Kruit.

Figure 16



When people are crossing a bridge, the bridge is set in an emotional context. Even a small silhouette creates life in the image, just as the bee in the sunflower.

Left: Vincent Van Gogh, Langlois Bridge at Arles, May 1888.

Right: a typical 17th century canal bridge in Amsterdam.

Element of surprise

There should be a little assignment, an invitation or a surprise in checking a public security feature. The surprise element will evoke an emotional reaction, increase attention and stimulate the memory.

Give people a task

Tell people what to do and perception will turn into behaviour. Examples: Look

Figure 17



Left: the observer is now on the bridge, which provides a higher emotional context than looking at the bridge from aside. Bridge at Haarlem.

Right: inviting bridge. Vondelpark, Amsterdam.

below the bridge! Look through the window! But also: Scratch your nail over the strings of the musical instrument.

After completion of their tasks people should be awarded. If the hologram is the last security feature to be checked, it might show a man taking off his hat: Chapeau! You found all features!

Premium

Another advice of 180 was to stimulate emotive learning by using a premium or a bonus. If, for example, two notes are put alongside each other, the bridges are connected (see Figure 18).

Relation euro coins - banknotes

If, for example, a coin fitted exactly inside the circle of the watermark or the arch of the bridge, or covered the globe precisely, people would try this out (See Figure 19).

Also the map of Europe and the writing of the word EURO is different on the coins and the notes and could be more similar (see Appendix v).

Suggested themes for security features

Themes for public security features, suggested by 180:

- sports, flowers, music, birds. Nature does not offend people.
- the theme should be singular, individual. Just one theme, avoid complexity.

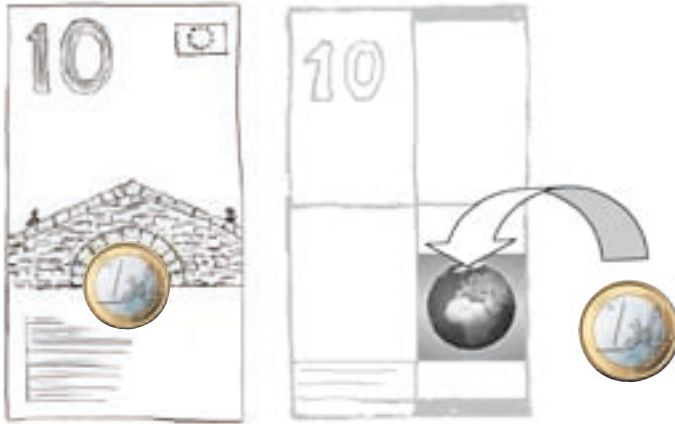
Figure 18



Left: an example of a premium: individual banknotes can be linked to bring people into contact with each other. Design by author.

Right: example of connecting bridges in an advertisement of t-systems in 'Geldinstitut', March 2006.

Figure 19



Left: A 1 euro coin fits exactly in the bridge's arch. Message: The euro supports European unity.
Right: A 1 euro coin precisely covers the globe. Message: The euro is a global currency.

- watermark: a river full of fish (below the bridge).
- a rainbow in the foil, crossing the bridge. Happiness. Amazement.
- ...

It was already concluded that the bridges on the euro are a more powerful message than the window/doors theme [44]. The fact that bridges are often one of the first objects to be destroyed in a war might serve as an explanation. More proof for this are the new Danish banknote designs that have a bridge on the front (see also Appendix v, Figure 3).

Do not stress security features too much

Too much emphasis on security features may provoke negative feelings about the chance of receiving counterfeits.

Numbering of public security features

According to 180, numbering of features will only work for people eager to learn. For those that are not, it is better to use an emotive approach.

Long-term planning

All good branding: evolution rather than revolution. No radical design changes. Make a communication plan for the coming 10 to 20 years. Plan in advance when features will be left out of the note (e.g. UV) and ensure that innovations are implemented gradually. Trust in banknotes can be seen as trust in long-standing brands

like for whisky or perfume. People want gradual, instead of radical, changes in trust products.

The suggestions of 180 are complemented with the following statements made earlier by DNB:

Figurative images in the public security features

The images used should be figurative instead of abstract so that people will recognise the subject. The subjects should preferably represent life (people, animals, plants), or objects made by people like buildings and musical instruments. People like a 'music' theme. Music is emotion and speaks all languages! Music crosses borders, just like birds or butterflies [28].

Notes should be beautiful

The banknotes making up the series should be beautiful to look at: the more people like the note, the more they will know about it. Colour is one of the most dominant parameters in this process. The notes should not be pale. Here, what counts is emotion in the strict sense (poignancy), the feeling we get when we see real beauty and, equally important, realise that Europe really means something and is something to be proud of! (After all, we are all Europeans).

Give the notes a name

The Dutch used nicknames to refer to their old guilder coins and banknotes (e.g. *piek* for guilder and *snip* for 100 guilder). New names for the euro coins and banknotes have not been heard yet. Giving the notes a name would give them the identity required for the public to develop an attachment to the new currency (see also [20]).

The concept of self-communication by banknotes

Banknotes themselves do not explain WHO should check WHICH security features and HOW [21]. Usually the problem already starts with WHERE the features on the note are to be found.

The public features should be:

- easy to find (*coming towards you*),
- large and contrasting in colour,
- represent life,
- inviting to check at least once.

4.4 Create a smile

The public features should provide fun in checking them, appealing to the *homo ludens* or playing man in us. A little humour in the feature will create a smile. But take care, there is a delicate balance.

One of the first banknotes to contain an element of humour was the British 50 Pound note issued on 20 March 1981. Among the crowded details of the view of London from the Thames, is a dog taking a boat ride, a designer's private joke! [9]. Other notes creating a smile are the SEK 20 with Nils Holgerson on a goose and the FFR 50 with Le Petit Prince (Figure 20).

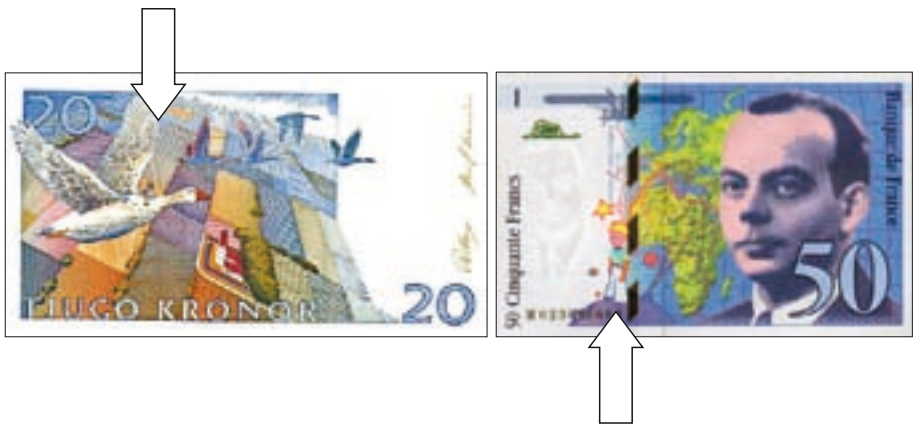
In the Netherlands all banknotes issued since 1968 express some measure of joy. Designer Oxenaar worked several private jokes into the Dutch banknotes (text on Vondel 1 and 2, fingerprint in Spinoza's hair, the names of three women in Lighthouse). In line with this, the very last guilder coin before the introduction of the euro was a very happy coin (Figure 21).

But be careful with humour

A little girl in a promotion campaign for an insurance company was rejected by the public. Insurance products are based on trust, which obviously should be sold by adults. Trust is one of the primary emotions of the old brain. This probably also explains why banknotes should not be made to contain much humour. Being a serious medium, they should show neither smiling people nor children (Figure 22).

People think that humour is an aspect that does not belong to money or bank-

Figure 20



Left: Nils Holgerson on the reverse of the SEK 20, issued in 1991.

Right: 'Le petit prince' on the front of the FFR 50, issued in 1992. Design by Roger Pfund.

Figure 21



Happy last guilder coin from the Netherlands (2001), designed by Tim van Melis. He won a contest in which 3,000 primary schools participated (groups 7 and 8; 11 – 12 year-old pupils). The coins were issued in June 2001.

notes. Most respondents prefer banknotes to be neutral and serious. Humour by way of a magician is considered unacceptable by almost everyone in each EMU country (except for the very young) [28].

While it is all right for banknotes to express certain joyfulness – a modest smile is ok –, laughing people or cartoon figures should not be used. Some more freedom to use humour is given to communication tools on banknotes, as is illustrated in Figure 23. Since trust is involved, communication on banknotes should not be based on fear. Appendix vi shows two concepts for cartoons on public security features using a little humour.

A gradual *smile scale* for banknotes – from sad, grumpy to cheerful – is offered in Figure 24.

4.5 Development of a slogan

Too often, the communication around a new banknote is developed after the note design is finished. However, such communication by way of a slogan for the pro-

Figure 22



Examples of children on banknotes. Left: A child's portrait on a test note of De La Rue (1999). Right: Children and the globe on the 1,000 Yuan note (Taiwan; 2004).

Figure 23



Examples of humour in communication on banknotes. Left: information leaflet of Austrian National Bank (1999). Middle: information leaflet of Bundesbank (1996). Right: News paper illustration on counterfeited notes, Handelsblatt, Germany (17 June 1993).

motion of the notes had better be developed during the design phase (and not afterwards), by principle together with the note designer.

What do we tell the public, is there a message, or slogan? Should we use the same slogan as used for the previous series (e.g. *Feel, Look, Tilt*) or create a new one, based on the design concept of the public features? In Chapter 6, some of these concepts are shown, e.g. using the main colour of the note or positioning *All features in a row*.

Table 6 is an overview of communication slogans or slogans that could be used as a starting point for new banknote designs.

In 2006, Korea issued a new banknote of 5,000 won. The slogan accompanying this issue was *'More secure, more elegant, more convenient'*, because: *'The new banknotes are more convenient to handle. They are shorter and slimmer, as the earlier series were out of tune with modern Korean life styles.'* [70]. *'Take Note'* is used for the new GBP 20 issued in 2007 and is a variant of the Bank of England's slogan *'Take a closer look'* (2005). *The value buys the same* is a slogan developed by the Central Bank of Ghana for the coming currency reform (2007). And *'The Euro. Our Money'* was the slogan used for the introduction of the euro cash money in 2002.

Figure 24



A gradual *smile scale* for banknotes: from sad, grumpy to cheerful.

From top to bottom: Lithuania 1 litas note (1991), 10 dinar with Alija Sirutanovic, labourer of the year in Yugoslavia (1968) [3], 20 Swedish kronor with Selma Leyendorf (1991), NLG 1,000/Spinoza (1973) with the fingerprint of designer Oxenaar in Spinoza's hair and a Disney dollar (2001).

Table 6

Theme/slogan	Idea/concept
1 Look for the orange	Best known element of banknotes: the colour. Generic slogan: <i>Look for the colour</i> . Feel areas in orange intaglio, watermark in orange paper with supporting orange print, security thread in orange etceteras.
2 Look for the value	Use the denomination numerals, e.g. 20 and 50, as is (partly) done in the euro series.
3 All features in a row	Positioning the features in a mathematical figure, a line, circle, oval etceteras. Read the features from left to right.
4 Discover...the Renaissance	Invite the public to discover more about the Renaissance: 1 Typical clothing style + small portrait (e.g. watermark). 2 Typical musical instrument (e.g. violin or mandolin) (e.g. foil). 3 Typical flower (e.g. lily) (e.g. Computer to Intaglio Plate).
5 Feel, look, tilt	Focus on <i>feeling, looking and tilting</i> . Use communication symbols denoting these actions and additional design elements like colour, circles and other figures to draw the eye to the public security features.
6 Check all three	Focus on three public features, 'one-two-three'. Exploit the 'one-two-three' in design elements.
7 Check all six	Focus on six public features, 'one-two-three-four-five-six'. Use e.g. dominoes as symbol.
8 Amazing Features	Use the letters A - F (six letters).
9 ...	

An overview of possible themes/slogans to help *memorizing* the public security features.

5 Perception

Perception is often used as a magic spell in a banknote design process. However, not much is really known, since central banks, if active in this field at all, are reluctant to publish the research results. Often, central banks rely on the perception knowledge of the graphic designer (see Figure 14).

Basically, the following fields of research seem possible:

- 1 Dedicated studies, e.g. recall ability of figurative and abstract images done by DNB in 1986 [7].
- 2 Studies measuring the human response to banknote stimuli, e.g. by way of eye movement research (eye ball tracking) or brain activity testing – by measuring the blood flow – with Magnetic Resolution Imaging techniques (MRI).
- 3 Testing complete banknotes for the behaviour they induce, by observing test persons and recording their behaviour (e.g. conjoint research, see paragraph 3.10).
- 4 Dedicated advice by perception specialist.

Literature research on perception

Despite the many experiments and abundance of literature on the subject, their relevance is often not directly clear. Coins seem to be more popular for perception research than banknotes. Several researchers report on studies of the natural memory of details in coins. Interesting is the outcome that people cannot recall the head direction correctly. For right-facing heads the accuracy was below 50%. This poor knowledge might be attributable to coins having a modest functional value in everyday exchanges. Right-handed people would draw profiles facing to the left. But what is a designer to do with all this information?

To find relevant information on public perception of banknotes is not easy. However, there are several compendium books that give some clues, like ‘Vormleer’ (Theory of forms) by Gerda Smets (1986) [8], ‘Mapping the mind’ by Rita Carter (1998) [19] and ‘Body of Truth’ (2003) by Dan Hill [24]. Some examples to give a flavour:

- More than 90% of the people in the world are right-handed. The implication for banknote design would be that people accept a banknote with their right hand. As a consequence, tactility elements should be on the right side of the note. Tactility is a very important alerting feature.

- Pictures are earlier and much more intensely looked at than text. Pictures in a security feature will draw more attention than e.g. numerals or currency symbols.
- People will detect an image more quickly and accurately if there are fewer distracters. Banknotes should not contain too many elements.
- Conscious thought is the tip of an enormous iceberg. It is the rule of thumb among cognitive scientists that unconscious thought makes up 95% of all thought. And that may be a serious underestimate.
- Language is seated in the left part of the brain. According to 'linguistic determinism' it is even so that people can only put things in order as far as language allows them to do so. This may explain why it is so difficult for people to describe the security features.
- Movement is a strong stimulus for the eye. Therefore, security features with some movement in them will receive more attention (e.g. hologram, floating images and colour-shifting).
- The perception of any form starts with the outline followed by the details (Navon, 1977).
- It will not be noticed when 10 prunes are taken away from a tree full of prunes. If 100 prunes have been taken away, the observer might be able to tell the difference. So if two objects are compared, e.g. a real note and a counterfeit, a person will only be able to tell the difference if there is a fixed percentage of difference between the objects.
- People need more time (1/1000 s) for judging the properties of a small feature next to a large object than they would the other way around. This finding by Kosslyn (1975) would plea for larger public features as the main object.
- ...

Much in this field still has not been researched or studied. Feeling this lack of perception research for banknotes, too, Schaede and Lokweg presented a paper on the public's recognition of security features at the SPIE meeting in 2006. One of their conclusions was that the optimum age for perceptual learning is between 6-14 years, which would argue in favour of including banknote recognition as part of the school curriculum [37, 38].

Human brains

Literature about perception usually starts with the workings of the human brain (much of which is still unknown). A well-known starting point is given in Table 7, which shows the main differences between the left and the right part of the human brain.

If the designs of the public security features are inferred from the main image by association, the following choice is obvious:

- 1 causal, analytic connection,
- 2 shape, expressive language, holistic unity.

Table 7

	Human brain	
	Left part	Right part
Typical function	Causal, analytic	Synchronic
Example	Language	Shape similarity

Typical function of the left and right part of the human brain.

Faces are – in general – processed in a holistic manner, while images such as chairs or buildings are usually seen as a composite of individual parts. If the main image on a note is a sunflower and an experimental subject is asked to choose a hat and a garden rake, he/she will usually choose the hat (same shape: right part of the brain) and a minority will choose the rake (analytical connection: left part of the brain). A good example here is the BEF 1,000 note, bearing the portrait of Adolph Sax. The causal connection to the main image is a saxophone. Also the name Sax is printed on the note (see Figure 25).

Still some reluctance is needed. People often don't notice it when a person has grown a moustache, has had a hair cut, removed a birthmark or started wearing glasses! And after some time, people might see the chair as familiar or see a banknote as a holistic unity.

Figure 25



BEF 200 note issued in 1995, showing the portrait of Adolph Sax. The saxophone, the music notes and the yellow colour lend the note a certain joyfulness. Causal connection: a note with a saxophone.

Perception research by DNB

One of the first lessons learnt from perception research was that the name of the main image should be printed close to the public security features. Research by Peeck [1] showed that this would help remembering the security feature. This principle was introduced in the NLG 25/Robin, issued in 1989.

The first time DNB was the initiator of a perception research dedicated to banknote design was in 1986 [5, 6, 7, 20]. Research was done to test the recallability of figurative and abstract image elements in complex pictures. In this test, the respondents were shown a main image amid smaller, surrounding items, in both a figurative and abstract version. The outcome was that the figurative pictures were more easily recalled than the abstract ones. Any relation between the main figure and the items was found to be of no influence.

Repetition of elements in security features like euro 20, euro 20 are not encouraging people to do a check. They do not know where to look, which one to check. Should they all be checked? Should they all be the same? Should I start at the top or just pick one?

Perception research by other central banks

One of the first central banks to conduct dedicated perception research was the Bank of England. Based on a ten-year study (1970 - 1980) under supervision of Dr. Ivor Stilitz of the University College London, the Bank of England presented in 1982 a 'Guide to the perception approach: a framework for banknote design' [2]. According to Stilitz 'banknotes should be designed so that forgery is likely to have a particularly noticeable effect on those features of a note that indicates its denomination and side'. This point of departure is made more explicit in 10 design principles. In general Stilitz advised to make the differences between the denominations very small. He advocated the same dimensions, same watermark, same security thread, same tactility and similar background colours. Only the denomination numerals and the portrait should vary per denominations. Within this fixed basic design, people will focus on the differences like the denomination numerals and the portrait on the reverse side. Similar dimensions for all the denominations were not introduced by the Bank of England, but the other advices were followed. However the small numerals had to be redesigned quickly in 1993, as is shown in Figure 26. Today this perception model is still used by the Bank of England, as can be seen in their latest new GBP 20 banknote issue (Figure 27).

Since the design advices of Stilitz came very close to the us-dollar designs, a similar study was done by Stilitz for the Bureau of Engraving & Printing [25]. But also the USD-designs have introduced larger denomination numerals, some colour and more differences between the portraits.

Figure 26



Left: part of leaflet 'The new £50 note' from the Bank of England, showing all the GBP notes, 1992.
Right: announcement by the Bank of England, 1993: the numerals on the GBP 5 will be made clearer.

The Bank of England was also one of the first to experiment with eye marker – or eye ball tracking – research (2005). This research was video-based and designed to collect eye positioning data. Already in the 1980ths eye marker research has been brought to further perfection. A video camera is positioned on the head of the observer. Banknotes are offered on a monitor and an infrared tracking device is registering the eye movements.

Figure 27



Recent GBP 20 banknote, issued in March 2007. Watermark and portrait according to perception model of Stilitz and for all denominations the same.

New developments: neurological measurements

There are several new developments that make it possible to learn more about human response to products like banknotes. Eye ball tracking has been known since the mid-1970ths, but recently a variant was introduced: emotion tracking. This tool serves to measure the enlargement of the pupil. Another development in this area is the measuring of facial expressions in order to determine the emotions evoked by looking at products, movies or advertisements. These services are offered by Sensory Logic, the company of Dan Hill, a pioneer of neurological behaviour. In all perception processes, according to Hill, we feel before we think. Buying behaviour is mainly steered by the old brain or emotional brain. Evolution-wise, the new brain or rational brain lags far behind the old brain. Often, respondents cannot put their opinion in words, while their faces express how they feel about something! The old instinctive brain is lazy, short-sighted, aggressive, greedy and sensitive to an attractive appearance and – of course – sexual stimuli [24].

Take care with perception advice!

When new designs are too much based on an idea like a perception thesis, the result may be disappointing. Perception is always influenced by the banknote design and by the context. People might dislike a public security feature because of an unattractive context.

6 Preset layouts

Recently, DNB explored the possibilities of new banknote layouts, giving priority to a clear and obvious position of public security features. While a report on this 2006 exercise is yet to follow in paragraph 6.11, below first several other principles of preset banknote design layouts are reviewed, following an historical time line.

Conception and design is the major phase in the production of a new banknote. However, often this phase does not receive the attention it should have.

6.1 Layout based on typography

The layout of the very first banknotes was often copied from a receipt form, which in the early days were largely hand-written and later fully printed with letterpress (Figure 28).

6.2 Layout based on portrait/main image and numeral (traditional)

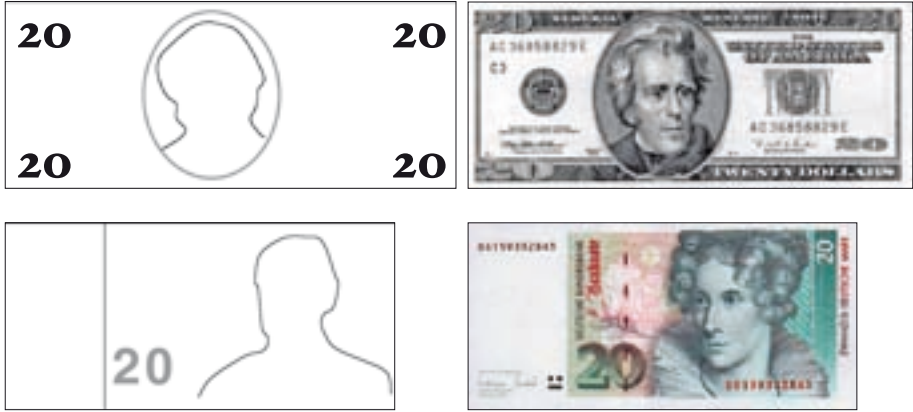
The typographic based layouts were succeeded by designs based on a main image and the denomination numerals (see Figure 29).

Figure 28



Example of a layout based on typography. The notes still reflect the receipt form and have a typical border, which often is the main security feature (like in the Dutch banknotes first issued in 1814 (Fleischman). Left a French 'assignat' banknote, dated 1813.

Figure 29



Two examples of a traditional preset layout for a banknote based on the main image and the denomination numerals. Public features are placed in the free area.

Top: USD 20, Series 1996, off-centre portrait, issued in 1998. Designer: internal Bureau of Engraving and Printing, original design goes back to 1929.

Below: DEM 20, issued in 1993. Designer: Reinhold Gerstetter.

6.3 Layout based on sorting (head - feat)

In the 1980ths, the Central Bank of Brazil issued designs optimised for banknote sorting machines (Figure 30).

Figure 30



Preset layout used for the cruzeiro banknotes, 1981. As the images on the note are mirrored, the note has no top or bottom.

6.4 Layout based on value

The designs of Oxenaar according to the preset layout based on one main image and numeral (paragraph 6.2) cannot be improved upon, Jaap Drupsteen believed. Searching for a new approach for the Dutch design contest in 1987, Drupsteen took the note's value as basis for a new design approach (Figure 31). The resulting design ensured that even illiterate users could still determine the value. The underlying grid should always be clear from the edges of the concept, so that the value can be easily seen in your wallet.

6.5 Layout based on tactile marks

Although the 25 guilder already had tactile marks along the short edges, this layout principle was carried further in the second note of the new series, the 100 guilder note/Little Owl (Figure 32). In 1990, DNB asked Drupsteen to design a tactility plan for the complete series [10]. Especially, the dots on Little Owl proved a great success, also for the blind (Figure 32).

The euro tactile marks on the euro 200 and 500 are also following this principle of a preset tactile lay out (Figure 33).

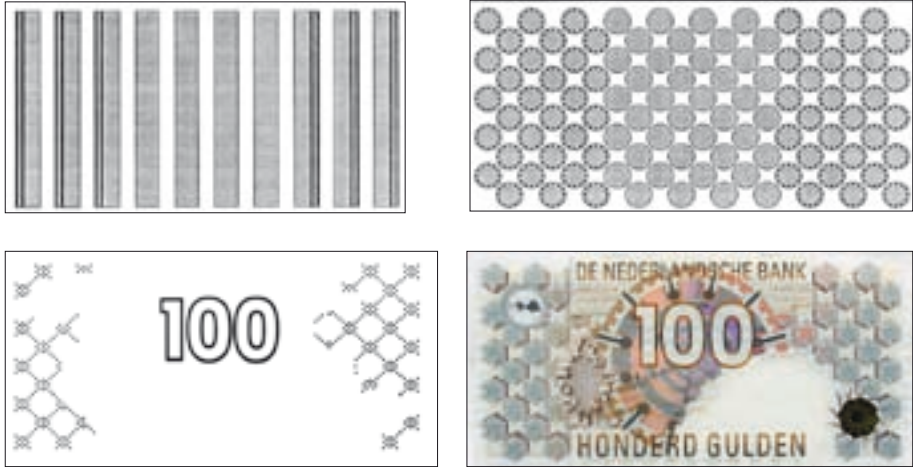
Around the year 2000, new computer to intaglio plate making techniques became available. With this technology it is possible to run the tactile areas up to the very edges of the banknote (Figure 34 and 35).

Figure 31



Banknote design NLG 25/Robin, based on a clear, preset lay-out of 25 value units. Issued by De Nederlandsche Bank on 27 March 1990. Designer: Jaap Drupsteen.

Figure 32



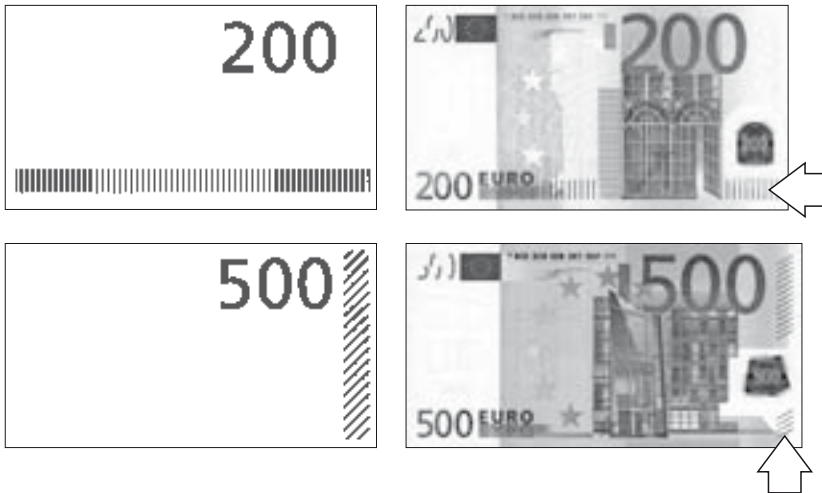
Above left: study by Jaap Drupsteen of preset layout with tactile elements NLG 10 [10].

Above right: study by Jaap Drupsteen of preset layout with tactile elements NLG 100 [10].

Below left: final tactile pattern on NLG 100/Little Owl. Texture: dots. Dot diameter: 1 mm. Dot distance: variable, around 0,6 mm. Dot height: 70 micron. Dots are printed in transparent intaglio ink.

Below right: NLG 100/Little Owl, issued on 7 September 1993.

Figure 33



The euro 200 and 500 with tactile structure for value recognition and security. Both notes are issued on 1 January 2002.

Figure 34



Pre set lay out based on off running tactile areas. First notes based on this principle were issued by the national bank of Pakistan on 11 November 2006 (as far as known to author). The tactile pattern is the same on each denomination.

Figure 35

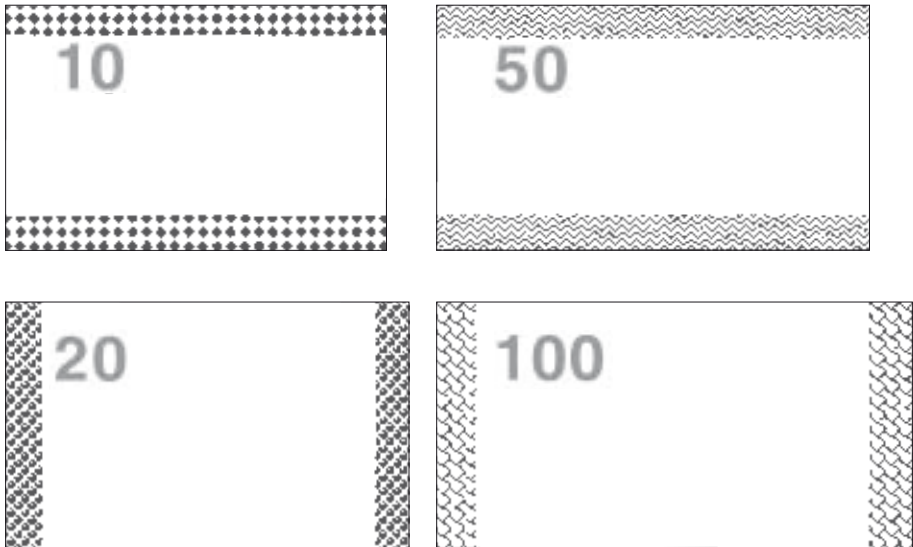


Illustration of a preset layout based on tactile marks up to the banknote's edges, with tactile patterns printed up to the edge and alternating along the length and the height of the note. Design concept by the author.

6.6 Layout based on linking denomination numerals and public security feature

In 1995, the Swiss National Bank introduced a completely new series of banknotes. The communication slogan for this series was 'Easy to check' [14]. Graphic designer Jürgen Zintzmeyer used the denomination value of the note as basis for the design of the public features (see Figure 36a). This concept was applied to all 7 denominations. This Swiss series may well be the first series design using a specially designed basic layout to accommodate the public security features. The layout principle, i.e. the denomination numeral (in this case 20), is repeated 8 times. The layout is further deepened with small pictograms based on the letters A - H. The accompanying communication strategy is that each denomination number is a public security feature, like the magic number (iridescent ink), chameleon number (optically variable ink) and glittering number (foil, hologram). Although very clear in set-up, the final result was lacking in clarity, probably because the origination was not strictly in line with the leading design principle (see Figure 36b).

Figure 36



In 1995, the Swiss National Bank started on completely new series of banknotes.
Left: the basic layout for the public security features of the new CHF 20, part of the new series.
Right: the final note design CHF 20/Arthur Honneger, issued in 1996. Designer: Jürgen Zintzmeyer.

6.7 Layout based on soiling and durability

In optimising the durability of cotton or paper-based banknotes, the four following design parameters must be observed:

- 1 anti-soil design,
- 2 high physical and chemical soiling resistance,
- 3 stiff corners,
- 4 high tear-resistance.

Parameters 1 and 2 are also relevant for polymer notes.

In 1995, DNB asked designer Jaap Drupsteen to make some anti-soil design studies for a new 10 guilder note (Figure 37). If the folded corners are taken as a lead for durability design, this would result in a preset layout as indicated in Figure 38. And if tear reduction is leading; a preset layout as shown in Figure 39 would be the outcome.

6.8 Layout based on way-finding features

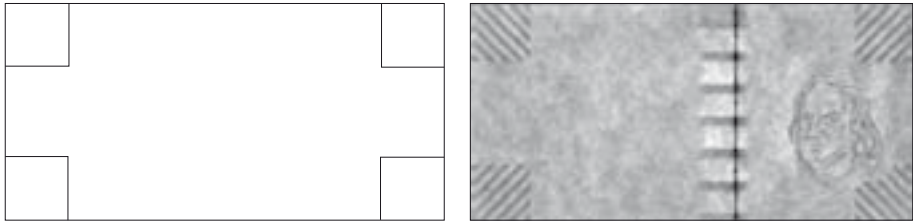
Today communication is increasingly being based on communication symbols, e.g. as used by MicroSoft. In security products the first pictogram is introduced on the ePassport in 2006 (see Appendix VII, Figure 6). The same principle might be applied to banknotes. The concept, analyses and design of such way-finding features on banknotes are described in references 21, 27 and 45. People would be helped in finding a security feature, as was demonstrated in a study conducted in 2005. Once people know that the symbols represent a security feature, they will find 4.7 features

Figure 37



Design study by Jaap Drupsteen for DNB (1995): anti soil-design, including proposed anti-soiling banknote patterns (right) [16, 27].

Figure 38



Cornerstone (2003) by De La Rue, with stiffer corners [23].

on a note with a pictogram (on a total of 6 features), versus around 2 features on notes without way-finding features [30, see also Appendix VII, Table 1]. In addition, people would know how to check a feature: by feeling, looking or tilting. Finally, they would know if they had found all public security features, since they are marked A to F.

While the designer has much freedom positioning them across the note, in general the pictograms should not be too close to each other.

Appendix VII provides details on these ‘feel, look and tilt’ pictograms

Figure 39



Econote by Giesecke & Devrient (2001). Long grain paper with two tear-proofing fibres on the longitudinal sides.

6.9 Preset layout based on colour of the public security features

New design concepts could be created on the basis of the analyses of the public opinion polls and other research. Colour is always found the best recalled design element in the Netherlands. This holds for both the guilder notes and the euro notes [20, 21, 44]. Figure 40 shows such a concept.

Appendix VIII shows the original 1995 series design based on colour, used for the colour attribution scheme of the euro banknotes [20].

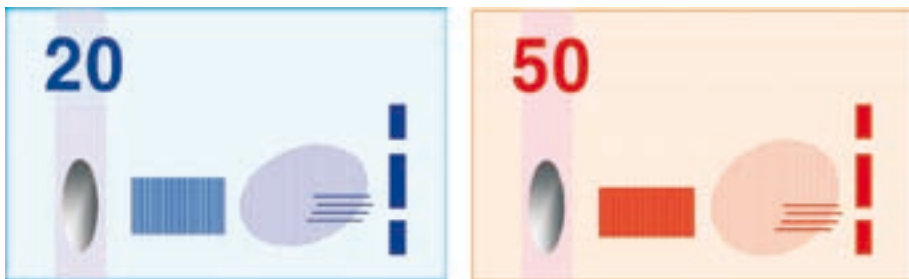
6.10 Banknote design based on preset layout for natural feeding direction

As reported before [44, 47], banknotes are increasingly being used in all sorts of banknote acceptors. This trend will result in banknotes designed to ensure that banknotes are fed accurately to these acceptors by intuition. Figures 41 and 42 show several concepts.

6.11 Preset layout based on public security features

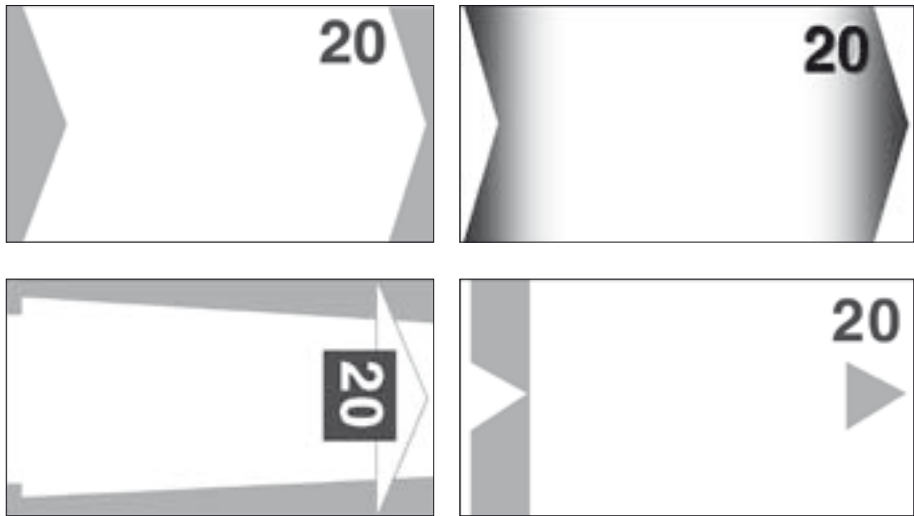
Taking the reluctance to use way-finding features on the banknotes into consideration (see paragraph 6.8), in 2006 Jaap Drupsteen conceived the idea to position all public security features in a row (Figure 43, top). At the same time, designer Inge Madlé positioned the public security features in an other mathematical figure, a circle (Figure 43, bottom left). Both designers used a variant of designer Louis Sullivan 's adage: 'Form follows function'.

Figure 40



Example of a preset layout based on colour. All public features in the 20 are blue-coloured: the watermark (blue paper partly overprinted with blue print), the intaglio feel/scratch pattern, the security thread (blue-windowed) and the foil stripe (including the silver hologram). Public instruction: Look for the colour! Design by author.

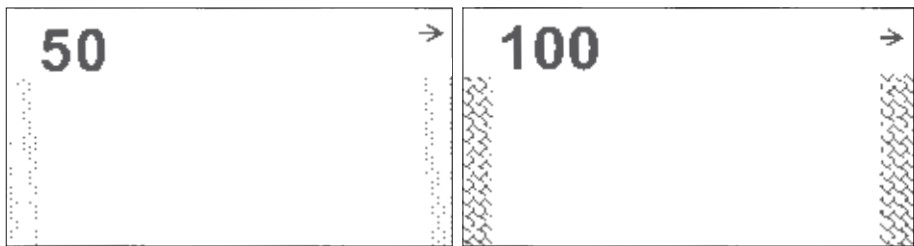
Figure 41



Four examples of a preset layout for a natural feeding direction in landscape-oriented banknote designs. Optimised for feeding banknote acceptor. Designs by author.

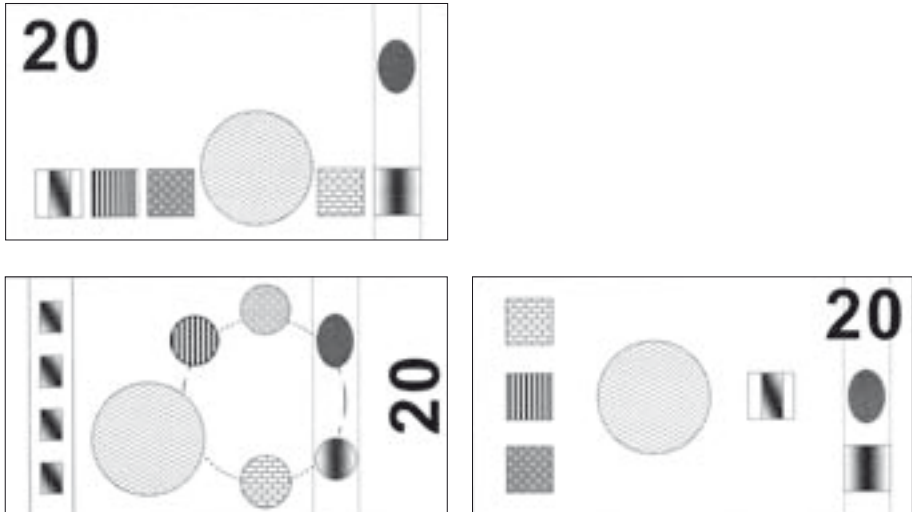
Roger Pfund is not attracted to such a mathematical starting point for a layout (Figure 44). He is advocating the introduction of ‘art’ into the banknote designs [83].

Figure 42



Preset layout for tactile marks running to the banknote’s edges and an arrow symbol for the feeding direction of the note in a banknote acceptor. Design concept by author.

Figure 43



Top: Example of a primary layout of seven public security features, as proposed by Jaap Drupsteen in 2006.

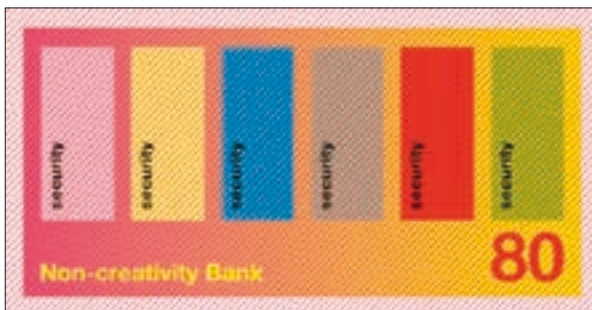
Slogan: All features in a row.

Left: Example of a primary layout of seven public security features, as proposed by Inge Madlé in 2006.

Possible slogan: All features in a circle.

Right: Example of primary layout using 7 public features. Design by author.

Figure 44



Concept note 'non-creativity Bank' van Roger Pfund [83]. Six security features in a row. May be 'non-creativity' for Mr. Pfund, but for the author the path to go in the future. A challenge for conceptual thinking and design!

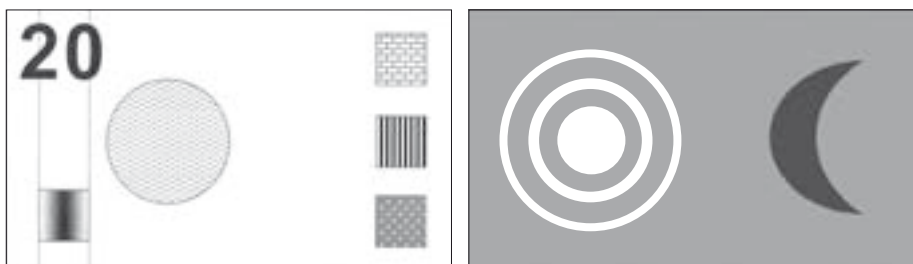
6.12 Preset layout based on front (public) and reverse (retailer)

Retailer key player in preventing counterfeits

From a customer requirements point of view the retailer is very important, perhaps more important than the general public. On average retailers check around 200 notes a day, wants to spend a maximum of 2 seconds per feature and would not like to check more than two features [44]. Research done by the National Bank of Romania reported that 8 out of 20 cashiers check the authenticity of the banknotes regularly, more often than the population who seldom check their notes [45].

Today a retailer has to check both the front and the reverse side of the note on uv-features. If all visible uv and the IR-view features are positioned on one side, the security check would be more time efficient and less obvious. Since the public is looking to the front side of the note, the retail features to be verified with the human senses could be positioned at the reverse side. See Figure 45.

Figure 45



Front for general public
All public features

Reverse for retailer visible under uv
lamp or with IR-viewer

Concept note based on user group per side: front for the general public, reverse side optimized for retailer.

7 New public security features

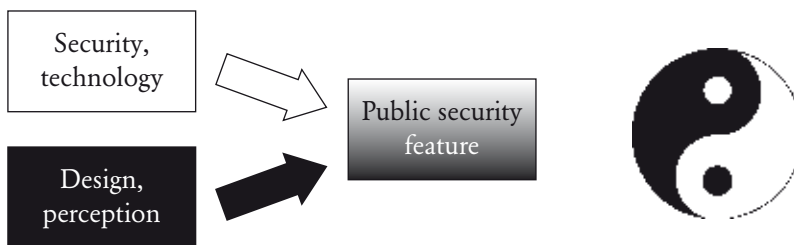
7.1 New public security features offered to the market

In the period 2003-2006, the following five promotion banknotes with new public security features were made public (see Figures 47 - 51):

- 1 Transparent window in a cotton banknote with foil element,
- 2 Transparent window in a cotton banknote with liquid crystal element,
- 3 Polymer note with a large transparent window covered with ovi,
- 4 Floating images in a windowed security thread,
- 5 ovi-pigments with a metal kernel.

Although the security technology behind the features is new and innovative, the design of the feature is not. An innovative feature would be much more striking if also the designs were explored more deeply. New techniques call for new designs! (See also Figure 46).

Figure 46



Left: A public security feature is only effective if it is well designed. Both ingredients – security technology and design – should be well balanced, e.g. 50% security and 50% design. Today, many features seem to be more in the range of 90% technology and 10% design.

Right: The Yin-Yang symbol is illustrative of a balance between security technology and design.

Figure 47



Transparent window in a cotton banknote with foil element, Modular Banknote Concept by Kurz (2003). Registered transparent area – shaped as a butterfly – in the cotton paper-based banknote. A holographic butterfly can be seen in the transparent area. Design by Gerstetter Consulting.

Figure 48



Transparent window in a cotton banknote with liquid crystal element: Varifeye by Giesecke & Devrient (2005). A transparent hole in the banknote is covered with a wide foil stripe that is transparent in the window. This transparent window is covered with a line pattern printed with liquid crystal ink. Typical of this ink is that it will become visible against a dark background. To ensure that the liquid crystal remains visible against a white background, a camouflage pattern, in this case a v-letter pattern is used. In September 2005, the Central Bank of Bulgaria was the first to issue a commemorative 20 Lev note using the Varifeye concept.

Figure 49



Polymer note with a large transparent window covered with ovi. Guardian by Security (2006).
Chief designer: Roger Pfund.

Figure 50



Floating images in a windowed security thread: Motion from Crane (2005) [32].

A security thread uses small magnifying lenses (diameter about $30\ \mu\text{m}$) to enlarge a micro-printed symbol (diameter about $20\ \mu\text{m}$). The focal point of the lenses is about $20\ \mu\text{m}$. Moving the note will create a sensational effect, so-called floating images, as if you are able to look underneath the surface. The movement of the images is opposite to the tilting direction. In 2006, the Central Bank of Sweden was the first to issue a 1,000 Kronor note using the Motion thread. The central bank of Mexico announced that the Mexican banknote to be issued in 2008 will feature the Motion element, too, as will the next USD 100, also foreseen in 2008.

Figure 51



ovi pigments with a metal kernel: Spark from Sicpa (2006).

During the printing process the ink pigments are oriented by a magnetic field. The pigments are produced through a high-precision vacuum deposition of 7 ultra-thin layers, the central one of which is magnetic. The advantage over the existing ovi is that a dynamic effect can be created; several options are available. The demonstration note shows the rolling bar. Designer: Roger Pfund [65].

7.2 Analyses of new public security features

Marketing approach

Analysing the features by a marketing approach, the new features should fit in a balanced mix of old and new public security features [44]. Based on e.g. Feel Look Tilt the three best known features from the previous series could be kept. In case of

Table 8

Public use	Public security feature	Public knowledge in %
Feel	1 previous (e.g. improved tactility)	5
	2 new (e.g. nail scratch element)	-
Look - through - at	3 previous (e.g. improved watermark)	65
	4 new (e.g. secure window)	-
Tilt	5 previous (e.g. hologram)	43
	6 new (e.g. floating image or colour shifting feature)	-

An example of a set of public security features based on a 'marketing mix'. Public knowledge of the existing features is taken from Table 3.

six public features a total of three new features are needed, preferably also divided over Feel Look Tilt. Just as an example, Table 8 is provided.

Matching with user requirements

Which of the new public security features would best match the user requirements as described in paragraph 11.3 of Public feedback for better banknote design? [44]. The Varifeye concept seems to follow the user requirements best. It is quick (less than 2 s), easy to use, discreet (to look at), striking, univocal and easy to communicate. Whether this feature is reliable is open to debate, given that liquid crystals are also commercially available.

The Motion concept also matches most user requirements, especially since it is striking. People call it cool and often produce a smile when checking the banknote. However, some might find this feature not serious enough, too playful. Another point is the repetition of the windowed element. Which one are we to check? All 5 of them? Should they be identical?

The Spark concept could be questioned on the same grounds as are often adduced in relation to ovi. In a recent research from the National Bank of Romania the ovi was spontaneously recalled by just 4% of the respondents [45], confirming earlier research findings that ovi is an unpopular public security feature, as also in the DNB 2007 poll [44]. While adding motion to the feature will certainly meet the ‘striking’ criterion, it may also reduce the reliability since people may only have eyes for the motion and forget about the colour-changing element.

Table 9

User requirement	Modular window	Varifeye	ovi window	Motion	Spark
	Tilt	Look at	Tilt	Tilt	Tilt
1 Fast (< 2 s)	-	++	+	o	-
2 Easy to use	o	+	o	o	-
3 Discreet	o	++	o	+	o
4 Reliable (e.g. durable)	?	?	+	?	?
5 Striking	o	++	+	++	+
6 Univocal	o	++	+	o	o
7 Easy to communicate	o	++	+	o	o

Overview of the pro-and-cons of 5 new public security features offered by the market, scored to the user requirements as defined in paragraph 11.3 of Public feedback for better banknote designs [44]. Since the reliability of some features is unknown, a question mark is used.

Table 9 also shows that 4 out of the 7 new features are designed to be checked by tilting and just one by looking. As concluded before, tilt features are not popular; they are not easy to use and not discrete. What is really needed from a stakeholders' point of view are new 'feel' features, for reasons as indicated in Public feedback for better banknote design [44]. Secondly, more attention should be given to 'look' and, especially, 'look at' features, since they allow for more discreet checking.

Worldwide convergence of public security features in banknotes

De La Rue asked themselves: 'What is the next public security feature?' They foresee an evolution and optimisation of existing technologies in the area of security techniques rather than a quantum leap to a totally new technology [64]. This is in line with Robert Schafrik, chairman of the latest report of the National Research Council for new us banknotes: 'We're not going to make a dramatic change in one fell swoop in the appearance of our money.' [72, 79]. However, central banks would like to issue new banknotes that have one or two new, innovative public security features (for obvious reasons like being ahead of counterfeiters).

And this is presenting more and more of a problem, since worldwide public security features are becoming increasingly uniform. The world is flat, also for public security features. Almost every newly issued banknote features a watermark, a tactile relief, a security thread, a foil and a colour shifting ink (although the latter is not part of the new GBP 20, issued early 2007, see Figure 27). If all notes get the same technical features, the design and communication elements are going to make the difference, is Douwe Brongers's message [62]. Indeed, future public security features could be developed much more from a design and perception point of view, as indicated in Figure 46.

7.3 Basic principles of detection by the public

The first watermark goes back to the year 1282. Since that time many public security features have been developed (see Table 10). What will the future bring for public security features? The answer to this will depend on what we can do with our senses. After Feel, look, tilt, some interactive features might follow, e.g. features that react to the temperature of the skin, or are activated when the banknote is being shaken. The daily use of electronic devices like mobile telephones also presents a new area of interest. With almost everybody carrying mobile phones these days, this device might almost be considered a new human sense (Figure 52).

Table 10

Human perception of security feature	Human action	Introduction year	Security principle	Examples/ remarks
1 Static	look-through	1282	line watermark	Bologna, Italy
	look-at	1772	copper plate engraving for banknotes	Saxony, sharp lines, blind embossing
	look-at	1814	unique print master (letter press)	NLG Robin, Music Notes Fleischman
	look-through	around 1920	shadow watermark	
	look-through	around 1925	see through register	
2 Dynamic	feel, rub finger	around 1930	graveure- thick layer	
	nail scratch	1982	buzzing bee (NLG 50)	
	tilt E-W	1988	foil, hologram	ATS 5000, Mozart
	tilt N-S	2005	floating images	Motion in Bulgaria (2005) and Swedish 1000 kronor
	rotate clock wise	2002		DID from Hologram Industries.
	rotate anti clock wise	?		
	tilt	2005	pigments with iron kernel	SPARK 'self organizing' pigments
3 Interactive, intelligent	body temperature	2006	thermo chromic ink	'Feel' from G&D
	body radiation?	???	nanotechnology?	self verifying?
	shake the note?	???	add energy	
	smell?	???		
	???	???		
4 With tools	mobile phone	???		

Overview of the use of human senses and perception of security features [e.g. 22, Appendix F].

7.4 Virtual banknotes

Many young people are attracted to Second Life on the Internet. Avatars (virtual personalities) use Linden dollars (LD) for payments. There is even an exchange value between this virtual money and the real world: 1,000 LD = around 4 euro (2007). Counterfeits are not known yet, nor are the security features of the Linden dollars. An opportunity to educate people in security features?

Figure 52



Left: Many people carry both banknotes and mobile telephones – equipped with a camera – on their body. Connecting the two would lead to new possibilities for features for general public or other user groups. At least two main areas of applications seem to be possible: information or a security feature. Information could be directly incorporated in a code (e.g. barcode or two dimensional codes) or indirectly via a link to a website which can be activated by the scanned code, like e.g. the code on the right, the ‘ecb.de press key’ (2004). A new public security feature could be based on the spectrum of the camera, e.g. metameric colours, something appears on the note, or in the near infra red. Ideas are developed by Mr. Alwin van Gelder (DNB) and author.

8 Synthesis: New banknote concepts

The product development process of new banknotes is similar to any other product development process in the industry. After problem-setting, information gathering and analyses comes the synthesis phase, in which solutions are found. Below, some directions are provided, demonstrating that different presetting will give birth to innovative banknotes.

After a focus on the design of the public security features, different banknote concepts are presented.

8.1 Design of public security features

Checking a public security feature on a banknote will always be a 4-step process [21]:

- 1 Orientation – where is it?
- 2 Navigation – how to get there?
- 3 Identification – what is it?
- 4 Information – what do I have to do?

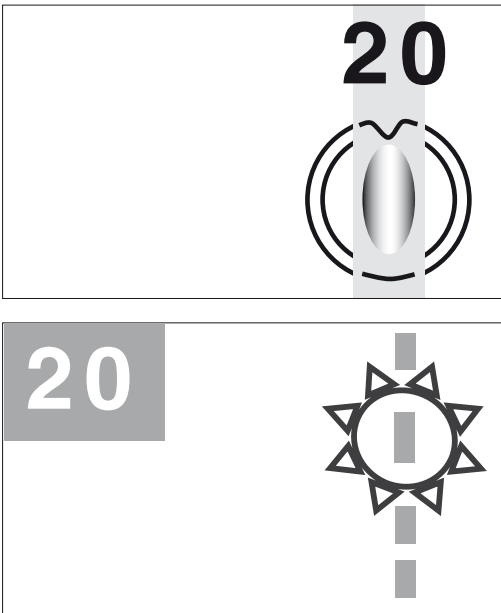
For the steps 1 and 2, in particular the public features could be supported with additional printing (see Figure 53). The human eye will be led towards the centre of the concentric circles. This principle will lead to new design concepts for public security features (see Figure 54). This may also bring cost savings, as the surfaces requiring expensive semi-finished materials like special inks or foil can be made smaller. To be effective, a feature need not measure more than 10 mm by 3 or 4 mm; enough for verification by the human eye (e.g. an element in of the Motion-thread is 9 mm x 4 mm and in the recent Colourshift thread Yvonne, with two colours such an element measures 10 mm x 3 mm (Figure 57).

Figure 53



Example of initiating the eye tracking path (example taken from an advertisement for watches of Tissot in 2006).

Figure 54



Examples of integrated design concept with optimal public perception.

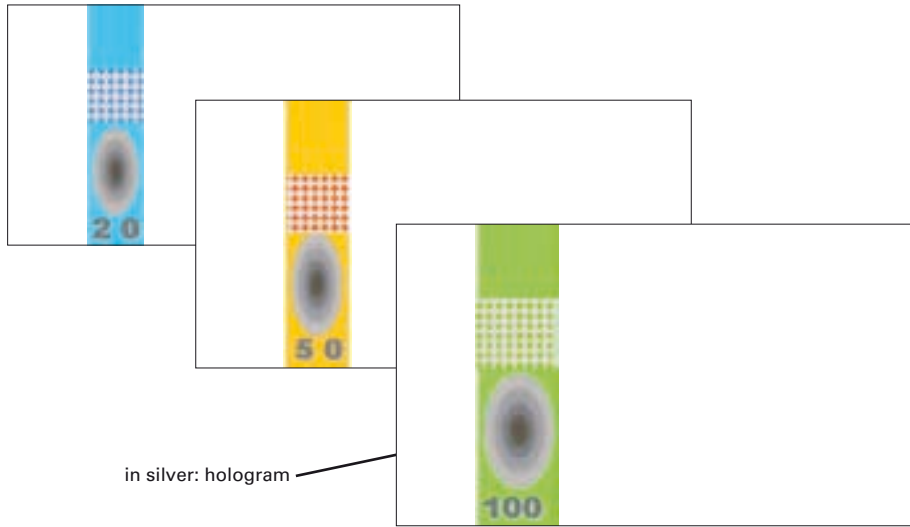
Above: foil design (stripe with public part) [31].

Below: thread [33]. The human eye is helped to focus on a specific window of the thread.

Design concepts by the author.

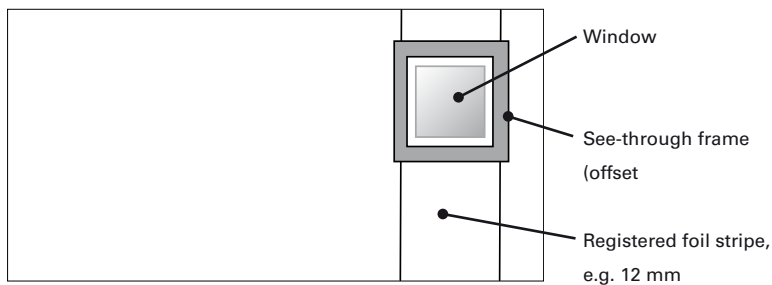
Leading the human eye to the security features can also be done by colour, an example is given in Figure 55. In Figure 56 an additional see-through window is printed around a window in a foil, to catch the human eye to the window.

Figure 55



Seven different transparent colours for the foil stripe, one for each denomination. The human eye is lead to the silver hologram, the public part of the foil stripe [31]. Design by author.

Figure 56



See-through frame – front and reverse – in register around transparent window. This idea would also be covered by the patent 'Authenticity mark' [33]. Design by author.

Foil with public appeal, improved hologram

Holograms and foil receive a high score on spontaneous public knowledge, despite the fact that they are often too complex to be understood [44]. A recent promotion banknote with an improved hologram from a perception point of view is shown in Figure 57 [84]. One of the images in the hologram matches with the main image, something people understand and appreciate.

This promotion note is also interesting because of a consistent communication concept: the portrait of Yvonne is used for the watermark, main intaglio image and one of the images of the hologram! The communication concept also involves the retail features: with a polarisation filter the text Yvonne becomes visible (Figure 58).

The portrait doesn't have to be as large as in the Yvonne-note. The same concept would work with a smaller portrait, like e.g. used in the 10 Tunisian dinar (Figure 59).

Figure 57



Promotion banknote Yvonne, by Papierfabrik Louisenthal. Design by Gerstetter Consulting (2007).

One of the images of the hologram matches with the printed image. For the watermark the same design is used; a fine example of a consistent communication strategy for the public features. Motto: Look for Yvonne! [84].

Figure 58



With a polarisation filter (POLE) the text Yvonne becomes visible [84].

Figure 59



Two examples of a small portrait in a banknote: NLG 5/Vondel, Netherlands (1966) and TND 10, Tunisia (2005).

Integrated 'dotted' electrotypes in watermark

The search for a watermark for the new ECU notes started already in the early 1990ths, when Portals presented a watermark called Europa (Figure 60).

Watermark innovation started as an element to make the see-through register more visible. The proposed portrait watermark design has a very light background, a so-termed 'digitised area'. The watermark should also have integrated electrotypes. The best available example for both techniques is one prepared by Arjo Wiggins Security (see Figure 60).

The digitised area will increase the resistance to counterfeit of the watermark. This light part is more difficult to counterfeit (with grease or with laser burning) than the dark parts (with white print or toner). The details in the counterfeited watermarks are usually rough; so the sharp dark dots will also be a problem for the counterfeiter.

The security of the watermark is also increased by adding printed elements (Figure 60). This will also attract the human eye to the watermark. Finally the reverse side of the watermark could be (partly) overprinted with light offset line structures.

Figure 60



Left: watermark Europa by Portals, based on the mythical character Europa, combined with an image of the bull of the myth, which is seen when the watermark is inverted (around 1992) [11].

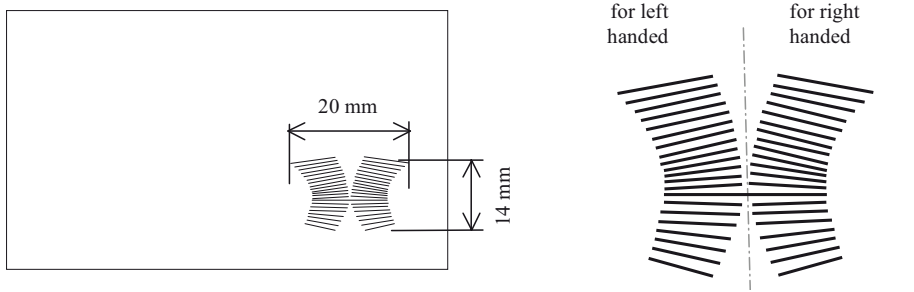
Middle: Mona Lisa watermark by Arjo Wiggins Security, presented in at Banknote 2006. Further integration of digitised areas and electrotypes.

Right: same watermark with added print elements like jewellery and folds in register over front and reverse. Of course the design should incorporate the register between watermark and offset print of e.g. ± 3 mm. Design by author [33].

Nail scratch pattern

The ISARD on the euro notes is used by the public to check the intaglio relief [44]. Again, seen from the stakeholders' view, the central bank has an eye for this public use. The ISARD pattern on the euro notes was not designed in the first place for nail scratching. A new – optimised and more secure – nail scratch element could be developed. This element should not be combined with other tactile elements. The thickness of the nail is about 0,5 to 1 mm, while the fore finger bed needs at least 1,5 mm. The scratch movement for the ISARD-pattern is east-west. A more optimised pattern would be to use to north-south axis, as indicated in Figure 61.

Figure 61



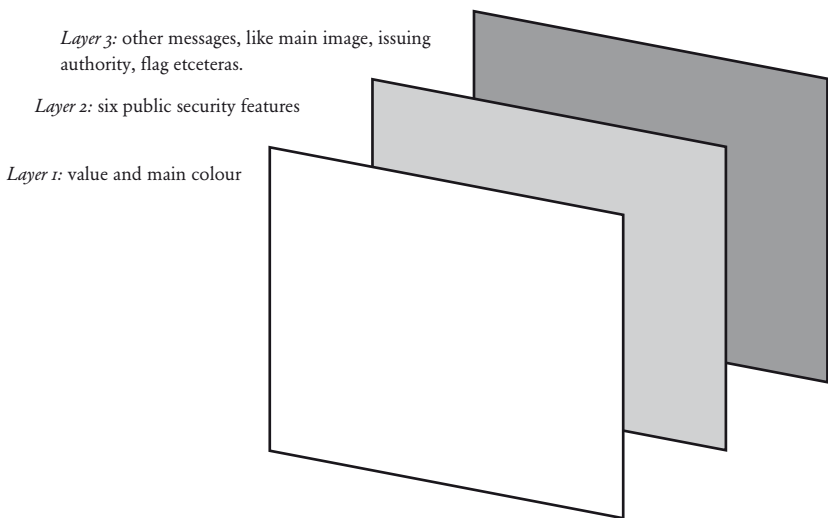
Design proposal for nail scratch element. Motto: Feel, Look, Tilt and Listen!

Suitable for right handed and left handed people. Shape: following the natural movement of the finger in north-south. Printed line width: 200 μ m, white line: 120 μ m. Printed line can be adapted to create a smooth visual impression. Design by author.

8.2 Banknote design based on preset layout for public security features

New banknote concepts can be generated by creating different visual layers, with different functions. If the banknote philosophy poses that the value of the note should be the first message to be received by the public when looking at the banknote, this value should be set in layer 1. If, in the second place, the public should be able to find the public security features with ease, this should become layer 2. All other features would be designed in layer 3. This principle is illustrated in Figure 62.

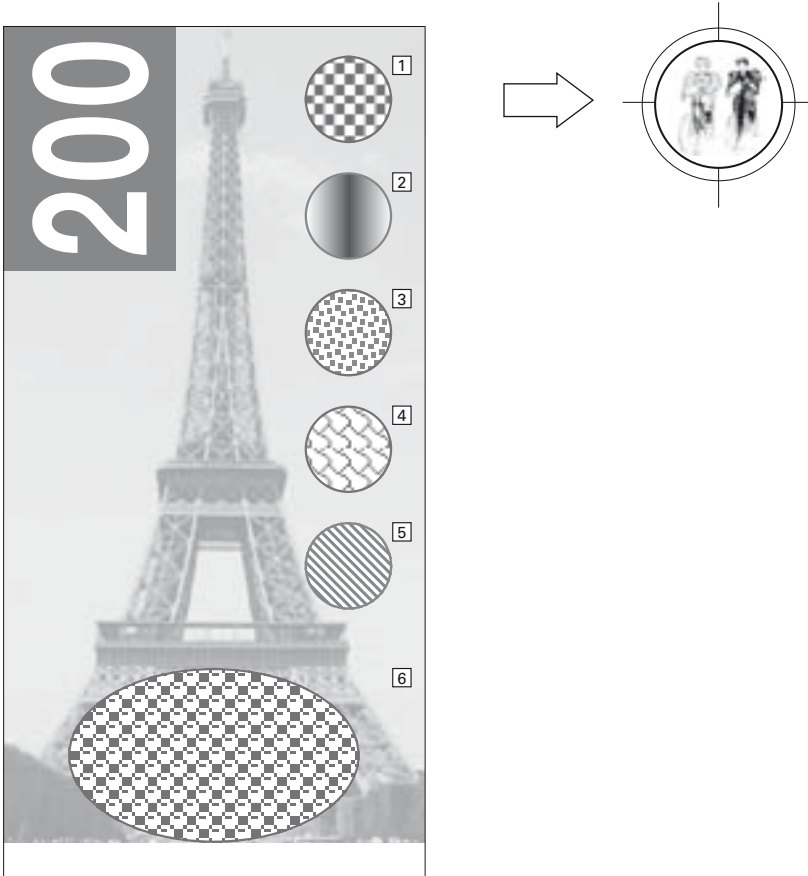
Figure 62



Example of setting the visual layers for a new banknote concept. Identifying, and priority setting of, the different layers is the key to new banknote concepts.

Figure 63 would be the final synthesis of this paper. As early as in 1997 a Dutchman said wouldn't it be nice to have the Eiffel tower, the Acropolis and the Coliseum on the euro banknotes? But no, the bloodless bureaucratic Europe decided: 'everybody nothing' [17].

Figure 63



Example of a concept note using different layers for 1) value, 2) public security features, 3) main image. The first layer has the most contrast, the third layer the least. Using the All features in a row layout in a banknote design with the Eiffel tower, including six public security features, a little story must be told. For example: two ladies went out cycling in Paris in the year 1910 (feature 1). Design by author.

9 Conclusions

- 9.1 The average knowledge of public security features has dropped from 2.2 in 2005 to 1.9 in 2007. On the other hand, the confidence in euro banknotes has gained 0.3 points (from 6.8 to 7.1). Probably there is a correlation between these two parameters.
- 9.2 In periods when the number of counterfeits detected is low, public knowledge of security features will decline. Central banks should develop a proactive strategy to keep the public alert to the security features.
- 9.3 New banknote concepts are possible if the client, i.e. the central bank, collected the information for, and watched over, the stakeholders' approach. All requirements of the different stakeholders should be listed by the central bank and should be reflected in a Programme of Requirements.
- 9.4 To instruct the graphic designer, the central bank should develop:
 - a design philosophy,
 - a communication strategy.Finally, all instructions for the new banknote design are laid down in a Programme of Requirements.
- 9.5 New banknote designs should start with the analysis of the previous design. Collect and analyse criticism, both from the public as from professionals like communication experts.
- 9.6 New banknotes concepts are possible if:
 - banknote design proceeds from perception layers like 1) value recognition, 2) public security features, 3) main image and 4) other features.
 - the order of the layers is changed, e.g. public features over main image and other features. The designer could make a preset layout for e.g. the public features.
- 9.7 Take care with perception advice. The only, ultimate perception test is to offer the public several complete (proof) prints.

- 9.8 After 5 years the appreciation of the Dutch for the euro notes seems to stabilise. The euro 5 is ugly The Dutch guilder notes are found more beautiful.
- 9.9 The Dutch are not familiar with the themes of the note. All seven main images are perceived as 'an old building'. Also the images of the watermarks are unknown.
- 9.10 The Dutch seem to be ready for famous European images on the banknotes like the Eiffel tower or the Acropolis. Also famous European people like Copernicus and Leonardo DaVinci are acceptable for the Dutch.

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Appendix I

The 1996 design contest for euro banknotes

The €51 design by Robert Kalina was selected with the help of the European public. End of 2006, the European Central Bank released on their website the internal documents from which the winning design was to be selected (the author used the data provided on 14 December 2006) [A1, A2, A3, A4, A5]. Not everything has been fully disclosed yet, like the original winning designs of Robert Kalina (the actual banknotes were shown). The jury ranking has never been officially disclosed either.

The 1996 design contest

At the time of the contest there were 15 EU members, 14 of which submitted one or more design proposals. Denmark did not participate because of the opt-out position. There were two categories: Abstract/modern and Ages & Styles of Europe. Entrants were free to select one category or submit proposals for both categories. A total maximum of 3 proposals per country was allowed.

There were 44 design entries in all, which were made public in September 2003 [A6, A7, A8].

Selection by the public

The public selection phase comprised two stages. First, however, a jury made up two shortlists of the five best design series for each theme, choosing the design by Klaus Michel and Sanne Jünger, in the category Abstract/modern, as the best entry [A10].

The selected 10 designs were presented to the public in 1996 (Figure 1 and 2). Within this scope, 1,896 interviews were held in 14 EU countries (not in Denmark). The interviewees were first shown just one note from each set (50 euro), then the full set. It was only in the third and fourth parts of the questionnaire that respondents were shown several different sets: first 5 sets from one category, then the 5 other sets and, finally, both sets for an overall comparison.

Table 1

		Best set in each theme [A5]	Country of entrant	Score in % [A5]	Set [A4]	Page [A6]
Abstract/modern design	1	Maryke Degryse (BNB)	Belgium	52	G	76/77
	2	Robert Kalina (OeNB)	Austria	18	H	84/85
	3	Terry Thorn (Harrisons & Sons)	United Kingdom	12	F	42/43
	4	Klaus Michel and Sanne Jünger	Germany	6	I	62/63
	5	Roger Pfund None	France	3 9	K	90/91
Ages & Styles of Europe	1	Robert Kalina (OeNB)	Austria	30	B	82/83
	2	Ernst and Lorli Jünger	Germany	26	C	60/61
	3	Inge Madlé (Joh. Enschedé)	The Netherlands	16	A	58/59
	4	Yves Zimmermann and Anna Alavedra	Spain	11	E	98/99
	5	Daniel and Johanna Bruun None	Finland	10 6	D	24/25

Two short lists of designs for euro banknotes on basis of the preferences of the European public. Only one answer was given for each theme [A5].

The winner

The highest score (52%) was assigned to the designs by Maryke Degryse from Belgium (set G). Ms Degryse is always among the top two in all 14 countries. The designs by Robert Kalina (set B) scored 30%, and his design proposal is among the top two in 8 out of the 14 countries. Third place is for Ernst and Lorli Jünger from Germany. Their designs were preferred by 26% of the respondents and are among the top two in 6 out of the 14 countries.

The designs by Maryke Degryse and Robert Kalina were only rejected by a very small number of people: fewer than one person out of 10, while there is consensus on this point across all countries surveyed. Set K, designed by Roger Pfund, was massively rejected, by nearly 8 out of 10 people.

Cultural differences between the EU countries were not perceived. There was a ‘High degree of consistency in their preferences’ [A6]. There were no watertight barriers between the two themes. Whatever the subject, the best sets of notes (and the least attractive ones) are never all in the same theme. It was concluded that no category was clearly favoured over the other (see Table 2).

Figure 1



The 5 designs selected by the European public in 1996 in the category 'Abstract/modern designs'. Only the euro 50 design is shown. Designed by, from top to bottom: Maryke Degryse, Robert Kalina, Terry Thorn, Klaus Michel and Sanne Jünger, Roger Pfund.

Figure 2



The 5 designs selected by the European public in 1996 in the category 'Ages & Styles of Europe'. Only the euro 50 design is shown. Designed by, from top to bottom: Robert Kalina, Ernst and Lorli Jünger, Inge Madlé, Yves Zimmermann and Anna Alavedra, Daniel and Johanna Bruun. The euro 50 note by Robert Kalina is the real note and not the original design, which has not been published yet.

Table 2

Order of the public's preference for designs from the two short lists [A4, A5]	Country of entrant	Score in % [A5]	Category
1 Maryke Degryse (BNB)	Belgium	35	Abstract/modern design
2 Ernst and Lorli Jünger	Germany	23	Ages & Styles of Europe
3 Robert Kalina (oENB)	Austria	23	Ages & Styles of Europe
4 Robert Kalina (oENB)	Austria	17	Abstract/modern design
5 Inge Madlé (JEZ)	The Netherlands	13	Ages & Styles of Europe
6 Daniel and Johanna Bruun	Finland	12	Ages & Styles of Europe
7 Terry Thorn (Harrisons & Sons)	United Kingdom	11	Abstract/modern design
8 Yves Zimmermann and Anna Alavedra	Spain	9	Ages & Styles of Europe
9 Roger Pfund	France	5	Abstract/modern design
10 Klaus Michel and Sanne Jünger	Germany	5	Abstract/modern design
None		7	

The public's preference for designs from the two shortlists. The question was to indicate the two preferred designs; more than one answer was possible.

Figure 3



Part of the 1996 design proposal for the new euro banknotes by Inge Madlé [A6, A7]. Category Ages and Styles. Portrait – or vertical – note positioning. Classical period on the euro 500 note, and the modern age on the euro 5, note. If the euro 5 note were ever to become a coin, the classical period, i.e. the first period in the history of Ages and Styles as featured in the euro banknote series, would not be lost.

References Appendix 2

- A1 'Selection of Design Features *** Report of the feature selection advisory group to the European Monetary Institute's Working Group on Printing and Issuing a European Banknote' no date (1995?)
- A2 'Interim report to the European Monetary Institute's Working Group on Printing and Issuing a European Banknote on the Selection of a Theme for the European Banknote Series' by the Theme Selection Advisory Group, May 1995
- A3 'Design Brief for the Design of a Series of Euro Banknotes', 12 February 1996
- A4 'De-coding table for Gallup Europe report', (ECB website 14 December 2006)
- A5 'Euro Banknotes Test Results and Comments Final Report' Gallup Europe, 6 December 1996
- A6 'Euro banknote design exhibition' European Central Bank, ISBN 92-9181-393-1, September 2003
- A7 'Euro banknote design exhibition' European Central Bank, CD-Rom, September 2003
- A8 'No design, no banknote. The euro - from design brief to printed currency' Keesing's Journal of Documents, Issue 4, Amsterdam 2004
- A9 'How the euro became our money. A short history of the euro banknotes and coins' European Central Bank, ISBN 92-9181-985-9, Frankfurt 2007
- A10 'Hoe de euro er ook uit had kunnen zien' Het Financieel Dagblad, Amsterdam 21 May 2007

Appendix II – overview of stakeholders of modern banknotes

Generic Stakeholder Group	Stakeholder	Subdivision	Numbers in %	
Primary users	1 General public		100	
	2 Visually impaired	2a Colour-blind people	4.2	
		2b Partially sighted people	1.3	
		2c Blind people	0.03	
		3 Retailers *	3a Super markets	
			3b Small shops	
			3c Restaurants, bars	
	3d Detail non-food			
	4 Society	3e Petrol stations		
		3f Fashion & shoes		
		4a Environment		
	Professional Cash Handlers	5 Commercial banks Exchange offices, Casino's	4b Health and Safety	
			5a Front office	
6 Cash in transit companies		5b Back office		
		6a Cash processing		
		6b Safety and security		
7 Central banks		6c Logistics		
		7a Sorting department		
		7b Cash department		
		7c Communication department		
Banknote Production		8 Graphic designer		
	9 Manufacturers of banknotes and semi finished products	9a Paper mill		
		9b Printing works		
		9c Manufacturers of other semi finished products		
	10 Central Banks	10a Cash Department		
		10b Governor, Secretary		

Remarks

Main interests

possible use of machine cash processing, (pay machines and back office equipment)
 use wide range of authentication devices methods, including devices.
 e.g. mobile devices
 taxis, home delivery of large goods (large cash payments, even up to 20,000 euro)
 raid risk

complete lifecycle (process, product, waste, ...).
 Life Cycle Analysis (LCA)

rules by central bank (if any)

rules by central bank (if any)

rules by central bank (if any)

absorption of inks into banknotes

smooth reliable high volume processing

practical mutilated notes policy

education, information

register marks, quality control marks
 e.g. foil, thread, inks

graphic design, project management, specifically incl. quality management

general acceptance, easy authentication, user safety
 as 1; colours easy to distinguish
 as 1; easy to distinguish between denominations
 as 1; easy to distinguish between denominations
 general acceptance, easy authentication, user safety, good processability

easy authentication, especially with mobile devices

minimal impact on environment

no impact on health and safety

stability / low variability, good processability, good authentication, low weight

substrate fit for use with degradation systems
 dimensions fit for efficient use of space, low weight

low variability, good processability, enabling of fitness sorting

efficient use & logistics (uniform dimensions), low weight

features easy to find, understand and use

designer name on the notes
 producibility, low investment
 company name on the notes
 contracts, preferred supplier status, visibility

responsible for finished product; promote unity; public identifies itself with banknotes; durability
 signature on the notes

Generic Stakeholder Group	Stakeholder	Subdivision	Numbers in %	
Equipment Manufacturers	11 Manufacturers of cash processing equipment	11a	Banknote dispensers	
		11b	Banknote acceptors	
		11c	Authentication devices	
		11d	Banknote counting machines	
		11e	Banknote sorting machines	
	12 Manufacturers of reproduction equipment and tools	12a	Digital cameras	
		12b	Copiers	
		12c	Scanners	
		12d	Printers	
		12e	Software companies	
	13	Manufacturers of cash degradation systems		
	14	Manufacturers of cash destruction systems		
	Secondary users	15 Law enforcement	15a	Police
			15b	Europol
15c			Interpol	
15d			Justice department	
15e			Forensic laboratories	
16		Central banks outside euro area adopting Euro		
17		Keepers of custodial inventory		
18 Press		18a	News papers	
		18b	Television, internet	
19 Advertisement agencies		19a	Non-profit, e.g. governm.	
		19b	Profit, e.g. banks	
20	Collectors			
Financial interest	21 Share holder	21a	Ministry of Finance	
		21b	Coordinating central bank	
		21c	National Central Banks	

Remarks

Main interests

Automatic Teller Machines (ATM)	good process ability
Cash In Machines (CIM), Cash Recycle Machines (CRM), vending machines, gambling machines, with/without authentication	stability / low variability, good processability, good authentication, low unfit rate in circulation approval, recommendation of central bank
no deterrence measures implemented yet	stability / low variability, good processability, good authentication, enabling of fitness sorting
counterfeit deterrence systems	good readability, low variability
counterfeit deterrence systems	
counterfeit deterrence systems	
counterfeit deterrence systems	
inking of banknotes, staining of banknotes, other techniques	good absorption of inks into banknotes
granulators, de-valuators (drills, hole punchers), other techniques	good destructibility, no hard parts, no melting parts
plate number	traceability (ransom money), hard to counterfeit, special banknote smell for dogs
	sophisticated, enabling forensic research
	sophisticated and discriminating forensic features
	see primary users and professional cash handlers, durability
	enabling efficient logistics
video images	
images of euro banknotes	public need for reproductions of coins and banknotes
catalogue of all different coins and banknotes	production variants (signatures, plate number, banknote number, producers, ...)
monetary income (seigniorage)	efficient use, low cost, high confidence, durability
fixed % of seigniorage (e.g. ECB)	
seigniorage	

Appendix III

Key information public polls by DNB

Table 1

Research variable	Specification	Remarks
1 Sample size	2,000 (2002, 2003) 1,500 (2005, 2007)	In 2005 reduced to around 1,500 with preservation of appropriate accuracy.
2 Method	All the inhabitants (general public)	18 years and older, opposite to selection of target groups
3 Interviews by	Telephone	Until 1999 NIFO visited the interviewees at their homes. Since 2001, only interviews conducted by telephone.
4 Reliability	Around 95%	All market research has a reliability of 95%, independent of the sample size. The accuracy margin of the answers depends on the sample size.
5 Accuracy	+/- 1.7% (at 82%)	At 2,000 interviewees and, e.g. $p1 = 82\%$ (meaning: 82% gave a certain answer to the question). For other sample sizes and $p1=82\%$, the following margins are valid: n = 300, margin is +/- 4.3% n = 1,000 margin is +/- 2.4% n = 1,500 margin is +/- 1.9% n = 2,000 margin is +/- 1.7%
6 Sample period	February	4 weeks in February, each week 500/375 respondents
7 Frequency	Every 2 years	In odd years, except 2002, for additional poll for the introduction of the euro.
8 First measurement	1981	1981: only appreciation; since 1983, knowledge and appreciation; since 2002, euro banknotes.
9 Longitudinal research	1981 - 1999 (NLG) 2002 - 2005 (EUR)	Covering clear trends and incidents, like the introduction of uv-lamps by the Postbank in 1987, and the introduction of the euro in 2002.
10 Anchor note	NLG 100 EUR 50	Anchor note = banknote model that is each time part of the research as a reference. Important for qualitative judgements.
11 Control questions	Yes	
12 Report time	6 Weeks	
13 Costs	Around EUR 30,000	Including report. Research costs are low.
14 ...		

Overview of the different research variables of the DNB opinion polls for knowledge and appreciation of banknotes.

Table 2

	TNS NIPO 2002	TNS NIPO 2003	TNS NIPO 2005	TNS NIPO 2007
1 Total number of respondents	2,002	2,015	1,501	1,506
2 Total number of answers	4,770	4,463	3,515	3,109
3 Average number of security features	2.38	2.21	2.34	2.06
4 Don't know	226	372	220	294
4/1 (number don't know/total number) in %	11	18	15	19.5
5 (2-4) / total number of respondents	2.27	2.03	2.19	1.87
6 Wrong: Wadden island not depicted	6	1	0	0
7 Wrong: Printed barcode	3	3	3	0
8 Wrong: Signature	10	3	3	6
9 (2-4-6-7-8) / number of respondents	2.26	2.02	2.19	1.87
Rounding off of item 9.	2.3	2.0	2.2	1.9

Overview of the data used.

Table 3

Security features	TNS NIPO 2002	TNS NIPO 2003	TNS NIPO 2005	TNS NIPO 2007
1 Marks for the blind	196	229	179	159
2 Type of paper	150	166	147	112
3 Banknote series numbers	26	38	40	0
4 Washable, colour fast	4	5	1	0
5 Cannot be copied on copy machine	2	3	3	0
6 With felt tip, a colour appears (or not)	0	0	0	7
7 Barcode against the light in the paper	0	0	0	38
8 Other answers	46	127	66	50
9 Total	424	568	436	451
10 (9) / number of respondents	0.21	0.28	0.29	0.30

Overview of partly and not correct security features mentioned by the public.

Table 4

Series appreciation 'beautiful'

Denomination	TNS NIPO 2002	TNS NIPO 2003	TNS NIPO 2005	TNS NIPO 2007
5	54	49	45	44
10	64	65	67	67
20	69	72	74	76
50	68	65	71	74
100	68	72	76	77
200	69	71	75	77
500	68	71	77	79
Total	460	465	485	494
Total/7 in %	65.7	66.4	69.2	70.6

Calculation of the series appreciation, based on the 'beautiful' scores of the individual notes.

Appendix IV

Phrasing of the new questions

In 2007, four new questions were proposed by DNB and several others where deleted. The phrasing of the new questions is as follows:

1 Question related to the appreciation of former NLG notes and EUR notes

Today the euro notes have been in use for 5 years. Before that, we used to have Dutch guilder notes. Which of these two series of banknotes do you like better, the series of euro banknotes or the last series of guilder notes?

<interviewer reads the categories>

- [1] last series of guilder banknotes are more beautiful
- [2] Euro banknotes are more beautiful
- [3] no preference for one or the other
- [4] do not know/no opinion

2 Questions related to knowledge of the different periods of ‘Ages and Styles of Europe’

This question is asked twice. Once for the euro 5 note and once for the euro 50 note. The relevant question is asked directly after the question about the watermark image.

Each euro note represents a certain style period, a certain architectural time. Do you know which of the following style periods is shown on the euro 5 note?

<interviewer reads the categories>

- | | |
|--------------|------------------------|
| [1] Classic | [6] Renaissance |
| [2] Greek | [7] Baroque and Rococo |
| [3] Roman | [8] Steel and glass |
| [4] Gothic | [9] Modern times |
| [5] Medieval | [10] Do not know |

(answers are given randomly)

3 Question about the preference for themes on new euro banknotes

The images on the euro banknotes are bridges and doors. Suppose you are the designer of the next, new series of euro banknotes. Which of the following themes (with a European character) would have your preference?

<interviewer reads the categories>

- [1] Images of bridges, windows and doors (same as in the present series)
- [2] Portraits of well-known Europeans
- [3] Images of animals
- [4] Images of plants or flowers
- [5] Images of existing buildings, like e.g. the Eiffel tower or the Acropolis
- [6] Images of musical instruments
- [7] Something abstract, no real meaning
- [8] No idea, I do not care

(answers are given randomly)

Appendix v

Analyses of ESI and design contests

Two basic, opposite views

Former ECB President Duisenberg wrote: Banknotes are reflecting the soul of the nations issuing them. Our banknotes represent values to which all Europeans are deeply attached [A6]. But what does this mean? There are two basic, opposite views on the outcome of the design contest 1996 for the euro banknotes:

- 1 'The choice of the euro design is the best one, offering the users the possibility of interpreting the images in any way they like.' [81]
- 2 The euro design is the lowest common denominator and therefore Europeans will not recognise themselves in this design. The euro is about money and not about people [44, 81].

Journalists also referred to dull euro banknote designs in articles on the occasion of the celebration of 5 years of euro coins and banknotes [55].

Communication message euro

The communication message of the Euro Series 1 is complex [27, 44]:

- 1 gateway: window or door (message: openness to others),
- 2 bridge (message: bridges linking people),
- 3 EU flag, ring of stars, EURO logo and the map of Europe (message: European banknote).

Furthermore, the whole series communicates:

- 4 even 'Ages & Styles of Europe': Classical (euro 5), Romanesque (euro 10), Gothic (euro 20), Renaissance (euro 50), Baroque and Rococo (euro 100), Iron and Glass (euro 200) and 20th Century Architecture (euro 500).

Analyses of the security features ESI

People feel insecure about the public security features of the existing euro banknotes. The public features are hard to find and, if found, people do not know what

to do. What should they check? Afraid to make a mistake people give up checking. Research has shown that people feel embarrassed not being able to check their own money (while feeling they should be able to). Other emotions in this context are irritation and disgust [44].

How to make people more confident in their ability to check a banknote for authenticity?

180 suggestions for improvements on ESI

- Although the ESI wants to tell the story of the Ages & Styles of Europe, the drawing style of all seven euro notes is the same: i.e. technical. The doors and bridges might have been represented in the construction style of that time. The building blocks of the bridges in the euro 5 are not hand-hewn, but uniform in shape. Only the drawings on the euro 200 note are in the right style. Adding a human touch to the notes can be achieved by hand-drawn images (instead of technical drawings).
- Keep the main colours, but make them less muddy.
- There is nothing to see in the windows (see also Figure 1).
- There is no relation between the euro coins and the euro banknotes. There is a lack of uniformity in the shapes of Europe as they appear on the euro coins and banknotes (see also bullet point 'Map of Europe').
- Life is not culture-specific. Make the notes more universal. Increase engagement.
- Enrich the context of the notes and people will remember more.
- Make the metaphors clearer (especially the bridge).
- Bridges are better to decode than doors or windows.

- Place the bridges in a context by:
 - Introducing people walking across the bridge, a water lily in the water, an angler near the bridge, or a bird flying by.
 - Showing the bridge from the perspective of someone sitting in a boat.
 - Showing the bridge from the perspective of someone standing on the bridge.
- Windows-and-doors, enrich the context gate/window
 - Show the face of a woman in the window (Figure 1).
 - Look through the window and you will see ...

Figure 1



Euro 50 banknote with girl in the window. Design by author.

- Europe
 - Celebration of diversity through unity. Since this is done on the national side of the euro coins, this seems not necessary (again) on the notes (see Figure 2). The notes could be seen as a higher hierarchy over the (divers) coins and could therefore express unity first.
 - What is the phone number of Europe? (Henry Kissinger)
 - Nationalism is still too strong; the map of Europe could be seen as patronizing.
 - ‘Turkey is already part.’ ‘You’re a European (if you want it or not)’

Figure 2



Examples of ‘celebration of unity through diversity’ in coins.

Left: quarter dollars in the USA (first issued in 1999). Right: national sides on euro coins (issued since 2002).

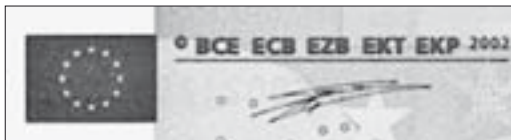
Figure 3



Currency indication on the coins just EURO (or EUROCENT), on the notes EURO and EYPΩ.

- Word EURO
 - On the coins there is just EURO, while on the notes there is EURO and the Greek wording for EURO (EYPΩ). See Figure 3. From a communication point of view, a different language stresses the (cultural) differences between the EMU-countries, while one (English) writing would point more to its unity.
- Issuing authority: BCE ECB EZB EKT EKP
 - See Figure 4. Who will recognise their own language in these abbreviations? Certainly not many. Same remark as for the currency indication: make a choice between unity and diversity. In case of unity first, use the English, juridical name: European Central Bank. The diversity could be expressed by printing the full name of the European Central Bank as a mini-text (e.g. 1 mm height) in all languages. An other solution would be to use the name of the note e.g. Renaissance.
 - The combination with the copyright symbol and the year makes the abbreviation even more cryptic. The standardised way of a copyright indication would be © EUROPEAN CENTRAL BANK 2002. This could be designed in a mini-text on the reverse side of the note as is e.g. done in case of the GBP-notes.

Figure 4



Cryptic communication of issuing authority on euro banknotes.

- Map of Europe
 - Different maps of Europe on banknotes (Figure 5) and coins (Figure 6, top). Some countries are missing on the coins (e.g. Norway) and make Europe less recognisable.
 - New coin designs were issued in 2007, including Malta and Cyprus. Also Norway is now clearly visible. See Figure 6, bottom.
 - What is the identity of Europe, if there are already so many different maps on the coins and notes? ('Europe does not even know its own geography.')

Figure 5



Map of Europe on euro 20 banknote (2002), without Malta and Cyprus, but with Iceland.

Figure 6

2002



2007



Different maps of Europe on euro coins in 2002 and 2007. New coin designs were issued in 2007, including Malta and Cyprus. Also Norway is clearly visible in the 2007 issue. Both coin designs do not show Iceland.

Ask the people, and you will hear that a new banknote design is not necessary

As concluded in 2006, the public at large is not interested in banknotes as such, except if there are reports of counterfeits circulating or when a new note is issued [44]. They are inclined not to welcome a new series of banknotes. Why should the appearance of the notes be changed? They still look all right to me, why waste all that money? might be the dominant thought.

When people need a new camera or deodorant they are interested in a new product. If you need something you get interested. If you do not need a new camera, why bother? The tendency to keep things the way they are or – if changes should come – to keep such changes small is a natural psychological reaction. A quiet new note would be favoured over more eye-catching designs. Combined with a negative attitude to the European Union the reaction of the public to new, innovative banknote designs may be negative. A typical reaction would be: This one looks like a real banknote. I wonder if we say this because it comes nearest to what we are used to. Designs with minor changes seem to be more acceptable. Showing designs to the public is therefore dangerous. Ask the people, and the majority will tell that there are no changes needed in the banknotes. Some proof for this statement comes from Hymans, who analysed the public opinion polls in Japan for new banknote designs:

Japan

In 5 annual surveys conducted between 1995 and 2001, 70% or more of the public consistently replied that the bills need not be redesigned, while fewer than 7% felt that it did. Another finding was that the percentage of Japanese feeling no need for a human figure on the new notes rose by 10% each year to 36,7% in 1998 [34].

No referendum on new designs for public sector

To involve the public in new coin or banknote designs had never been before in the Netherlands. In the early 1980ths there were several debates on this policy in the Dutch Parliament, but the final outcome was that innovative, good design is not suitable for asking the public's advice.

And if you do you will often receive poor remarks

If you go the public with draft designs by way of electronic prints, make sure that the prints are of very good quality. The fact is that people will first of all react to colours, and have a strong dislike for pale colours.

Be cautious in attaching conclusions to people's comment, especially in focus groups. People might indicate that they find a given banknote's design rather dull, they may nevertheless say that the banknote in question is their favourite. What to do with such an answer? Or people may tell that the design looks cheap just because

of the pale reproduction colours, or that the design looks like Monopoly Money (which is seen as a compliment by the author, see Reference 20).

If you show new banknote designs, be careful

Art galleries usually have no difficulty selling a work of art that is known from posters, for the buyer was already familiar with it before setting eyes on the real thing. And what is known will - in general - receive more appreciation. But was it the best piece of art available? And is it still liked after a few years?

Showing designs to the public is best done during in-depth interviews [44]. Put a limited number of designs on a table and ask people to take one. Next, ask them: why did you choose that one? Then ask the respondent to place the design back on the table and take another one. Repeat this procedure until the interviewee has singled out every design. Now take a break and after that, ask the interviewee to have another look at the most favoured. Ask again: Is this the one you like best?

Again, be cautious with such research methods. It is better to go to the public with two or three complete proof prints and study the interaction of the respondent with this note, while applying in-depth interviewing techniques.

Good practice: Swiss and Danish publication policy on banknote design contests

To avoid direct involvement of the public in the design selection process, central banks opt for the indirect method, as was recently done by the Swiss (2005) and Danish central bank (2007). Both central banks published all the designs entered within a closed competition. In the case of Switzerland, 12 designers were invited, and in Denmark, 8 designers took part.

Both central banks put the designs on display by means of an exhibition and by posting them on their websites. Both central banks said that they selected two or three designs for further print study, keeping the final decision open. This is good practice, for the public is informed about new banknote designs without being involved in the eventual selection. Public and media reactions can be taken into account. The Swiss central bank was not afraid of a biased public discussion on the embryo featuring on the winning design for the new 100 franc note. In February 2007, they decided that the designs of runner up Manuela Pfrunder should be the basis for the new Swiss banknote series (Figure 7). A few months later, the Danish central bank published their choice for designer Karin Brigitte Lund (Figure 8).

Quite often, the runner up in a banknote design competition is eventually selected as the winning design. This was earlier the case in the 1970ths in Switzerland, but it also happened in the Netherlands in the 1980ths.

Figure 7



Draft proposals for new Swiss banknotes from Manuel Krebs (left) and Manuela Pfrunder (right). First prize winner is Manuel Krebs. Ex aequo second prize winners are Manuela Pfrunder and Martin Woodli. On 26 February 2007, the Swiss National Bank published their choice for the design proposals of Manuela Pfrunder.

Figure 8

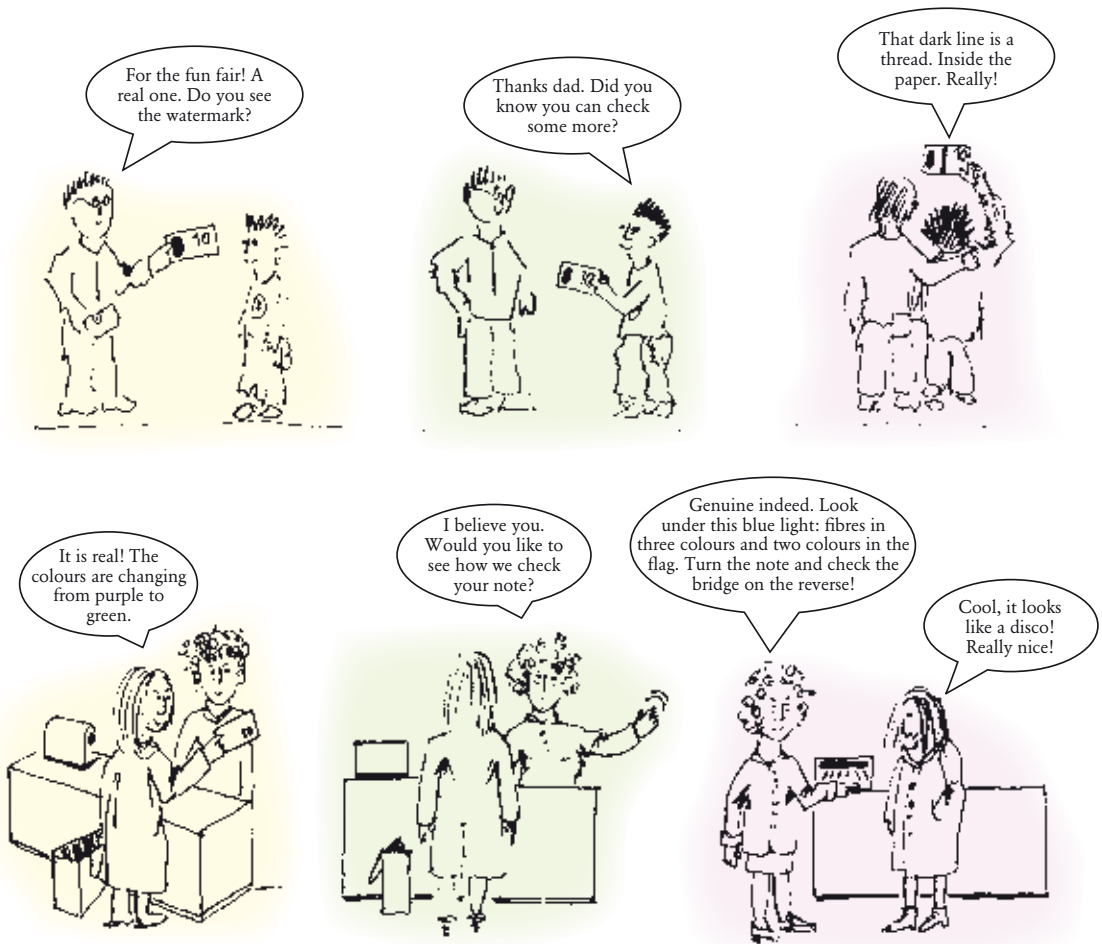


Eight draft proposals were exhibited by the Danish central bank from 11 January 2007 to 2 Feb 2007. Two designers were selected: Karin Brigitte Lund (above) and Kasper Bonnen (below). In the period until 1 May 2007, the two artists elaborated their proposed designs. On 14 May 2007, the Danish central bank published their choice for Karin Brigitte Lund.

Appendix VI

Cartoon concepts to promote security features

Figure 1



Two cartoon concepts to promote the checking of security features in banknotes.

Above: promotion of special ink (ovi) and embedded security thread.

Below: retailer with customer. Attention for uv.

Design by author (2003, 2007).

Appendix VII

Communication symbols

The principles of communication symbols on banknotes and in information tools are explained in paragraph 6.8 and described in Public feedback for better banknote design [44]. See also Figures 1, 2 and 3. The way finding features have recently been extended with a Look at and a Look through symbol (Figure 4).

Printing communication symbols on banknotes will considerably simplify finding the public security features, as is shown in Table 1 [30]. The instructions to the public should be clear. It should be explained that each security feature is marked with a communication symbol. Once people have identified a symbol they will also have found the security feature. Furthermore, they will know what to do next, i.e. ‘feel’, ‘look’ or ‘tilt’. Finally, they will know if they have found all security features, since every feature will be marked by a letter.

Table 1

	Find security features (France, Germany, Ireland)	Find communication symbols (Ireland)
Test note without communication symbols	1.8	2.2
Test note with communication symbols	1.6	4.7

Overview of research into communication symbols on banknotes. In this case the test notes had six public security features, 4 on the front and 2 on the reverse side of the banknotes. If the public is not properly informed about the communication symbols, there is no effect (column 1). However, after being told that each security feature has a symbol and invited to look for these symbols, people found on average 4.7 symbols/security features (instead of around 2).

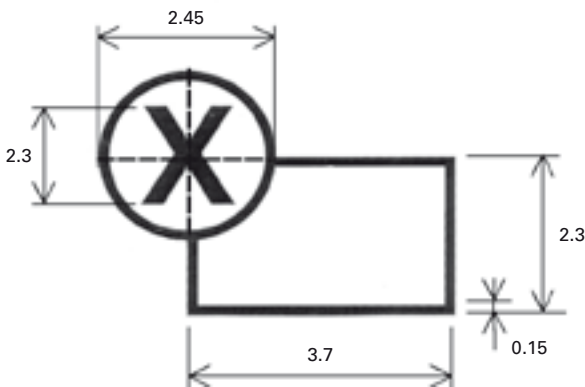
The fact that many interviewees omitted to look at the reverse side of the test note explains the average of 4.7 symbols/security features found. Furthermore, two symbols were – on purpose – a bit hidden, to see if people would find these anyway.

The developed symbols seem to have a high universal clarity, judging by the fact that they were adopted by other central banks (see Figure 5). However, none of these central banks copied the symbols exactly as they were designed, but introduced changes. The central bank of Korea changed the ‘tilt’ symbol from frontal to side view. The central bank of Chile added an additional hand to all symbols. Finally, the central bank of Mexico created a mix of the images used in Figure 5 on the bottom, introducing a drawing of a human eye and a finger.

For the electronic passport, the ICAO decided in 2004 to use a symbol on the cover of the passports (Figure 6). This symbol tells there is an electronic chip inside the passport, usually for biometric features (e.g. picture of the face, fingerprints).

Figure 7 shows a prototype for so called ‘pocket information’ making use of the communication symbols.

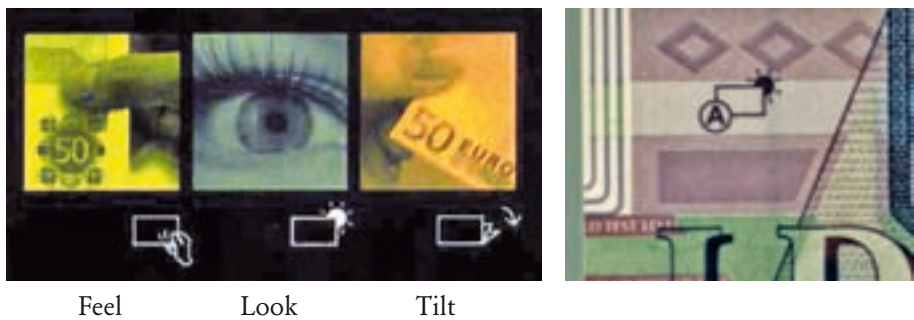
Figure 1



Basic construction reference and dimensions in mm of a way-finding feature (in mm).

The letter should be visually centralised into the circle, letter type Frutiger 65 Bold, font size 5,5 pts (capital height: 1,3543 mm). Design: Paul Mijksenaar in cooperation with DNB.

Figure 2



Left: Communication symbols used in ecB leaflet 'The Euro. Our Money - Feel, Look, Tilt', introduced in May 2004.

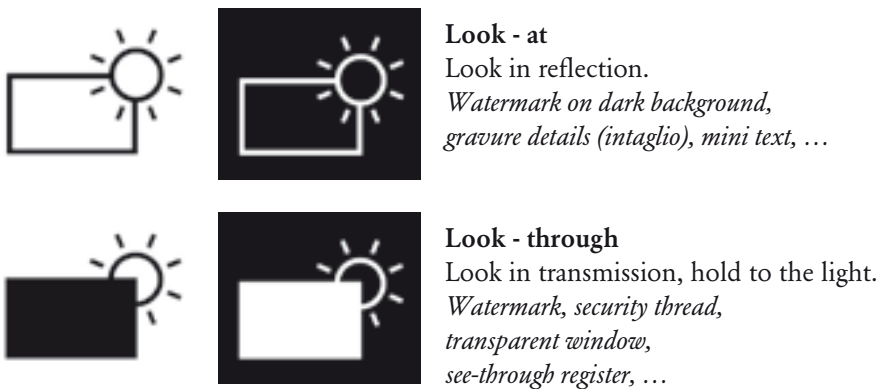
Right: Example of a way-finding feature look printed on a dummy note (2005).

Figure 3 Look symbol (2004)



Left: look symbol printed in positive. Right: look symbol printed in negative. Design by Paul Mijksenaar in co-operation with DNB.

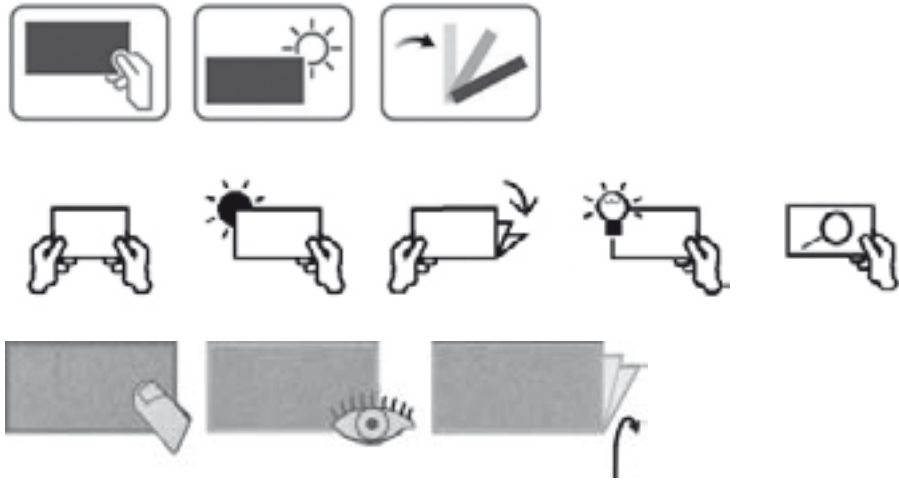
Figure 4



Further development of look symbol into look-at and look-through symbols (2007).

Left: the 'look' symbol printed in positive. Right: look symbol printed in negative. Design concepts by the author.

Figure 5



Above: Communication symbols 'feel', 'tilt' and 'look' as used in information leaflet on 5,000 Won, Bank of Korea (2006). Side-view to show effect of tilting, instead of frontal view. Dark notes.

Middle: Communication symbols 'touch', 'look', 'tilt'; uv lamp and magnifying glass as used by Banco de Chili on the Internet and in leaflets (2006). Additional hand to illustrate how to hold the note during 'feeling', 'looking' and 'tilting'.

Below: Communication symbols 'feel', 'look' and 'tilt' as used in information leaflet on 50 Pesos, Banco de México (2007). Introduction of human elements, like a finger for the 'feel' symbol and an eye for the 'look' symbol. Dark notes.

Figure 6



ePassport or ChipInside symbol, designed in 2004 by the Dutchman Joost van Roon.

Dimensions 9 mm x 5.25 mm, size A (ICAO Doc 9303, Part 1, Sixth edition, Volume 2, 2006).

Figure 7

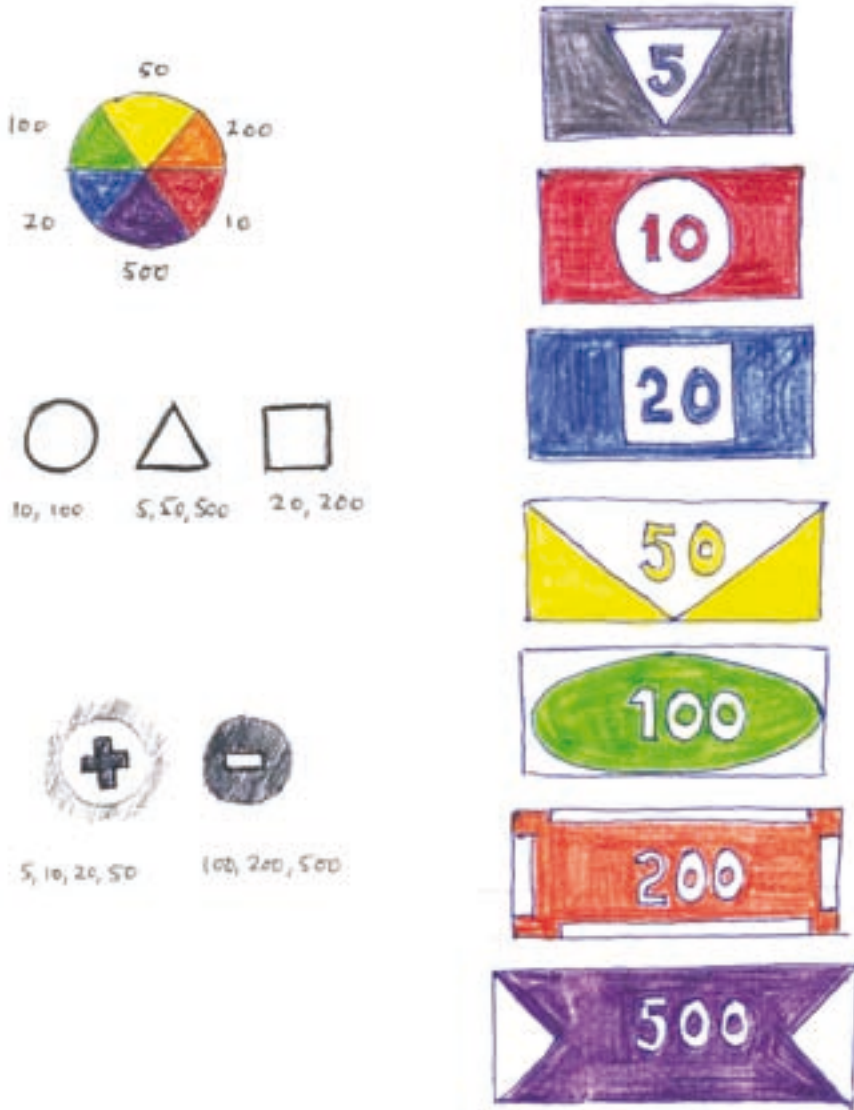


'Pocket information' on banknotes, using both printed and electronic information. Credit card format 85 mm x 54 mm. May be kept in personal wallet. On the printed card three public security features, using communication symbols. Hybrid dvd: both MircoSoft and McIntosh compatible. Concept and design: De Nederlandsche Bank, 2007 [86].

Appendix VIII

Preset layout for the poor-sighted

Figure 1



Concept for a series of banknotes based on the basic principles of recognition: 1) colour, 2) elementary shapes like circle, triangle and square and 3) positive negative. Design by author (September 1995, used for colour proposal euro series 1).

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