by technical revolution. Time waits for no man, it requires the wisdom and vision of the decision-makers to lead the way of revolution.

What advice would you like to give to the designers of the banknote of the future?
G.S: Frist, I think self-learning and perfection will be the key factors for future banknote designers to improve their own quality. From a professional perspective of artistic design to acknowledgement of the banknote printing technique, or even in depth study of digital currency, every single aspect should be addressed by the designer beforehand and be mastered in detail. As a banknote designer, one should pursue his or her mastery by following higher standards and in depth study on what have been changed and will continue to change in the future.

Secondly, a future designer should keep up with trends and evolution within our industry and learn more about the E-network. They have to possess sufficient user knowledge, with strong self-consciousness of the internet and become involved in this shared platform to be with other designers for exchanging ideas and concepts. The future banknotes will be circulated in parallel with both cash form and digital currency which will bring more intelligent elements into the banknote design. Fortunately, IBDA is acting as a bridge to connect all the world banknote designers through networking for sharing resources and having dialogue about the future of design to bring more surprises and possibilities to the world banknote society.

It is my hope that a "World banknote design studio" will be established in the near future, and a design team with all the top designers around the world will be created under the umbrella of the IBDA. The world banknote project will be organized under the supervision of the IBDA to provide a consulting service, and it will track and trace the entire process to realize a follow up system throughout the entire project.

The designers in the studio will follow one single target, no matter which countries they come from, which geographic territory they live in and which belief they serve. All the designers in the studio will devote themselves to world banknote design (virtual or reality) in an effort to realize a perfectly denominated document with the functions of both intelligence, artistic appreciation, security and environmental protection. This will be my advice to all future young designers.

Hans de Heij
Policy Advisor, Researcher by De Nederlandsche Bank

What is your vision of the banknotes in the future?
HdH: Future banknotes will have to serve the end user much better than today. Users turn their back towards cash, as other means of payments offer them better services. Today central banks do not face a counterfeit threat, but a usage threat. To support the usage of banknotes, central banks have to put the banknote user in front. Banknote design processes will therefore have to be transformed from technology-driven design to user-centred design.

Present banknote design is characterised by a technology-driven approach. The mind set of central banks is on new authenticity features. Understandable, as there have been three major threats in the history of banknotes, caused by the introduction of disruptive developments within graphic reproduction techniques, respectively the introduction of photography around 1850, the rise of offset printing around 1920 and the Digital Revolution, which started around 1980.

What will the banknote of the future look like?
HdH: In general, people would like to have user-friendly banknotes. To achieve this, banknote design has to be improved on all user functions, which can be split in interface and experience functions. User Interface Functions or UIFs are respectively recognising value (1), handling (2), checking authenticity (3) and receiving a communication message (4). Together these four functions are combined in a usability score, which came out for euro banknotes on 6.4 on a scale from 1 to 10. Obviously room to improve.

Public features were introduced in the 1980s, to involve the public as ‘a first line of defence’ against the spread of counterfeited banknotes. However, the world has changed and to date people do not see any need to execute an authenticity self-check. And they are right. Banknotes withdrawn from an ATM are genuine and do not have to be verified. Furthermore, retailers check incoming banknotes with devices, something that the public sees. And the probability that the public will receive a low counterfeited denomination is practically zero. So, why should the public do an authenticity check? Such a check is only required on special occasions, like in case of special festivities or a purchase from a private person on the internet. In such cases people may use an app on their smart phone to check a banknote.

Although people do not want to check banknotes for authenticity, the notes have to exude confidence. And they do. Studies in Canada and the Netherlands show that people have a high, stable and increasing trust in banknotes.

My conclusion is that public features as we know them today will disappear and will be replaced by confidence features, a new field of interest for banknote designers! On the other hand, central banks will have to focus on retail features.
Next to the interface functions banknotes have to fulfil User Experience Functions or UXFs, like recognising identity and judging aesthetics. Identity topics of the future will be filled in by forward symbolism instead of backward symbolism, such as historical persons. An important future UXF will be green banknotes, as people will expect more than today that their payment instruments are sustainable. Banknotes, and especially cotton based banknotes, are not. Each year, about one third of their volume is destroyed and replaced by new. The water consumption also weighs heavily on the environment; a few litres of water is needed to produce the paper for just one banknote. Studies on Life Cycle Analysis show that synthetic banknotes are more sustainable. Furthermore, future banknotes will have to interact much more with Information Technology, especially with smart phones. The first QR-code was printed on the 100 naira, issued in Nigeria in 2014 (figure 1). Reading this code by a smartphone, a brief history of Nigeria appears. Such a code on each denomination will also make it possible for banknote users to receive online actual information on the circulation of counterfeited banknotes, information provided by the website of the central bank, including information on how the counterfeit can be detected. The banknote number will receive a new role. Banknotes will be verified online, by real time number equation. However, the banknote user remains anonymous.

What forces will shape and define the banknote of the future?
HdH: The daily use of banknotes will shape the banknote of the future. Daily use is typically driven by withdrawals from ATMs (1), wallet use (2) and payments at a banknote acceptor (3). The number of denominations can be brought down. Instead of six or seven denominations, central banks may issue three or four. The ATM offers three denominations, enough for daily payments, as known from Japan and the United Kingdom. The note-coin boundary will be the lowest ATM note. Including one saving denomination, the number of denominations of a future banknote series would be four. The saving banknote will receive a much larger format and cannot be used in machines. These saving denominations, ‘criminal money’, can only be handed in at banks or at other controlled environments.

Older people store a bank card in their banknote wallet. Young people do no longer carry such wallets, instead they opt for card cases (figure 2a). The youngsters do keep some banknotes in their case but no coins. These banknotes are there to be a fallback, for example in case a digital payment instrument does not work. Similar, people may store some banknotes in the etuis for smartphones, which also provide a function for storing cards (figure 2b). These new handling habits will have consequences for the design of future banknotes. Banknote sizes, folded or unfolded, will have to adapt to the ‘credit card format’ of 86 mm x 54 mm.

Banknotes withdrawn from an ATM are received in a horizontal position (figure 3a) and are also stored horizontally in a banknote wallet. As the public does not pay attention to the reverse of a banknote, this horizontal front will be the public side. The reverse will be the retail side and this design receives a vertical orientation as retailers store their banknotes in cash drawers in a vertical position. Furthermore, when banknotes are inserted into the slot of a banknote acceptor, the banknote has to be oriented in portrait style (figure 3b).

Figure 1
First banknote with a QR-code, 100 naira. Issued in Nigeria in 2014.

Figure 2
a) Metal card case by Troika (2017). Special clip to hold banknotes.
b) Leather etui for smartphone and cards (2017). Notice the euro 10 banknote stored in a sleeve behind the cards.
What is your vision of the banknotes in the future?
AY: One commend world - wide banknote series

What will the banknote of the future look like?
AY: Denomination, size, value and colour will be the main focus

What forces will shape and define the banknote of the future?
AY: The fact that we all live and breathe under the same sky

What changes will our industry need to adopt to develop the banknote of the future?
AY: Nothing special...

What advice would you like to give to the designers of the banknote of the future?
AY: Think international- liberated from any national pathos- text will be unnecessary.

Future banknotes will increasingly go in machines and will also come out of machines. Therefore a standard banknote height is efficient. Almost all currencies have a single note height. Exceptions are the euro and the British pound. A single note height of 72 mm, the height of the euro 20, is to the Dutch the most practical one.

Furthermore, the production processes of banknotes have to be modernised. Simultane presses are outdated - already for more than 20 years - and do not add any authenticity features, let alone new features. These presses could be replaced by standard offset presses, which have a higher quality and offer more flexibility and possibilities like adding taggants or spot varnishing. As said, the banknote number is the heart of a banknote and it is time for a digital code like a barcode type.

What advice would you like to give to the designers of the banknote of the future?
HdH: Banknote design management should invest in user needs. When cash is no longer an attractive payment instrument, banknotes will disappear. User needs will lead to other design requirements as applied today. For example, banknote designers could opt for a usage layout instead of a technical layout for all machine readable features. Furthermore, banknote designers should focus first of all on the User Interface Functions, instead of spending their creativity to User Experience Functions like connecting to a main image.

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