The Pyramid-Model

A framework for user requirements of any payment instrument

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The Upid-Model is a framework to assist the design of a payment instrument like a banknote; Upid stands for Use-centered Payment Instrument Design, the topic of my thesis (De Heij, 2017). Presenting my work, people asked me how privacy and budget control fit into this Model. Good questions! My answer is that the Upid-Model covers the user needs of the product people hold in their hands, for example a banknote. The Model does not cover its larger context, the usage environment of a payment instrument, like for example access to ATMs in the case of banknotes. However, the questions did not let me go and I searched for an answer, for the missing link. How could the Upid-Model be embedded in another, overarching model? An answer is found in the presented Pyramid-Model, a framework for the user requirements of any payment system, cash or digital.

Payment methods and banknotes
In the past there was only cash, but nowadays people have a choice when they want to make a payment, ranging from online banking instruments such as bank cards to coins and banknotes. An overview of nowadays available payment instruments is provided in Figure 1.

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<th>Payment systems</th>
<th>Payment channels</th>
<th>Payment instruments</th>
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<tbody>
<tr>
<td>Non-cash</td>
<td>Bank account</td>
<td>Online banking (e.g. smart phone)</td>
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<td></td>
<td></td>
<td>Debit cards</td>
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<td>Credit cards</td>
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<td></td>
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<td>Paper forms</td>
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<td>Not-linked to a</td>
<td>Prepaid cards</td>
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<tr>
<td>bank account</td>
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<tr>
<td>Cash</td>
<td>Coins</td>
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<td></td>
<td>Banknotes</td>
<td>Banknote denominations</td>
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</table>

Figure 1.
Overview of payment methods, divided into payment systems, payment channels and payment instruments.

With a payment instrument, a user has access to a payment channel; a bank card provides access to a bank account. Similar, an ATM is part of the payment channel ‘banknotes’. On its turn, a payment channel is part of a payment system, such as non-cash and cash. Non-cash is wider than digital payments, as it includes also coupons, tokens and - still - cheques. And finally, payment systems are a subgroup of payment methods. The provided overview clarifies that the banknote designer may design banknotes, may design the payment instrument, but cannot influence the payment channel or system. A solution for user needs like access, fast transactions and an overview of expenses, are outside the reach of the banknote designer. A contactless payment with a debit card takes less than 5 seconds, while a cash transaction takes about 20 seconds.

Within reach is the usability of the banknotes itself. Indeed, the usability of banknote designs can be improved, illustrated by the score of 6.4 for euro banknotes on a scale from 1 to 10 (De Heij, 2015).
However, even a perfectly designed banknote will not be able to convince users to use banknotes because of a poor usage environment, such as uncomfortable access to ATMs (far, out of order, not clean), poor acceptance by retailers (PIN only) or a poor image (criminal money, money for elderly).

Managers know: Make the right decision and make the decision right. In designer’s language: find the right problem and find the right solution. The right solution should be based on user requirements, on which the first studies appeared in the 1960s, reporting on descriptive profiles of credit card users (e.g. Etzel, 1968). Studies on user preferences for cash followed much later, the first appeared at the same time that the usage of cash at Points of Sale (PoS) started to decline, around the Millennium change. A recent study by the ECB provides an overview of user preferences for both cash and bank cards within the Euro Area, shown in Figure 2 (Esselink and Hérnandez, 2017). This table shows that people find cards easier than cash. Also Dutch retailers prefer cards above cash. In a study done in 2018 reports that Dutch retailers are dissatisfied with cash first of all because cash deposits are too much of a hassle and secondly because of safety concerns, like robbery, theft and counterfeits (DNBulletin, 2018).

![Figure 2](image-url)

Overview of responses of citizens within the Euro Area on the question was: “For you personally, what are the two most important advantages of cash/cards for payments? Cash cards are…”.

Different levels of product development of tangible money
Cash is tangible money, known as coins and banknotes. This has grown so historically. Now that cash is being used less and less, the question is whether new banknotes have to be designed according to the templates of the previous banknote, or that a shift is required in design policy, like a transition from a technology-driven banknote design policy towards a use-centered one. This would be product development on level I in Figure 3. In total, this Figure discriminates three different levels, illustrated by some samples. Because of the decline of cash, one may argue that it is about time for new concepts of tangible money, represented in this Figure by level II. A third level is the most abstract one, representing theoretical concepts for paying each other tangible. To give an idea, such a concept could be based on divisible units, following a denomination scheme of 1, 3, 9, 27, 81 etc (powers of three).
Product development of tangible money

- **I.** Replacement of existing coins and banknotes by new designs
  - Graphic design of coins and banknotes

- **II.** New cash concepts
  - There is cash and how to improve it

- **III.** Theoretical concepts for paying each other tangible

  *Divisible and snapping units, powers of three systems*

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**Figure 3.**
Three levels of the product development of tangible money, illustrated by some examples (images of examples on the left: public domain, images of examples on the right by author).

The banknote designer and the banknote design manager operate on product development level I.

**Double Diamond Model**
Finding the right problem and finding the right solution are two essential phases for any type of product development and also for the level of new banknote designs. The Double Diamond Model represents these two steps, shown in Figure 4. Both activities first diverge and subsequently converge. Furthermore, both activities have an analytical and a synthesis phase. In 2007, Buxton summarised this process by ‘Getting the design right and the right design’.

In this article, product development of tangible money on level II and III in Figure 3 are left for what they are and the focus is on banknote design, on level I. In this situation, the central bank is responsible for finding the right design problem, while the banknote designer is responsible for finding the right solution. To support this process, the central bank may appoint a knowledgeable banknote designer manager, who starts in the first diamond by questioning the problem of a new banknote design and will expand the scope of the problem by focussing on the different usage situations of banknotes. Then the model converges towards a single problem statement, laid down in a Programme of Requirements. The banknote designer operates in the second diamond of the solution activity, also characterised by a phase of diverging before converging and delivering a proposal for a banknote design.
Figure 4.

So, what is today’s main problem of banknote design? My answer is a usage threat instead of a new counterfeit threat. It is understandable that central banks (still) focus on technology of security features, as there have been three major counterfeit threats in the history of banknotes, respectively the introduction of photography (around 1850), the rise of offset printing (around 1920) and the Digital Revolution (around 1980). Threats all caused by innovations within graphic reproduction techniques. However, today there is no new reproduction threat, but the problem is that users have started to avoid cash payments.

Arriving at the second diamond, the question is: Where should the central bank find the right design solution? As said, a use-centered design policy is the way to go. More specific, my answer to this question is the application of the Upid-Model, a framework for the design of a banknote (payment instrument). However, user insights are also needed on the corresponding payment channel and system, insights which are offered by the Pyramid-Model. Before this Model will be explained, one should realise that for most people paying each other is a dissatisfier. After a debit card transaction nobody says: ‘Wow, this has been a beautiful PIN-payment!’ People expect payment transactions to be smooth and get irritated when this is not the case.

Pyramid-Model
A framework for the user requirements on any payment method is based on a general approach, on the well-known theory of Maslow (1943), on the hierarchy of human needs. Originally, Maslow distinguished between six levels, which are often reduced to the following three: 1) basic needs, 2) psychological needs and 3) self-actualisation needs. In case of product development and design the term user requirements is more appropriate than user needs. Filling Maslow’s pyramid with the user requirements of any payment method, results in the Pyramid-Model as shown in Figure 5. The depicted user requirements are based on studies of user behaviour concerning payment methods. One of the first to publish a list of attributes, characteristics that determine the user’s preference for a consumer payment system, is Hirschman (1982). A Dutch study on payment behavior by Van der Horst and Cruijsen (2016) delivers a ranking of seven attributes: fast (1), safe (2), easy (3), cheap (4), control of expenses (5), provides privacy (6) and well-accepted (7). What is striking about these studies is that there is no common terminology yet. Concepts like security, safe, safety, resilience and reliability are close to each other, yet different. Several studies report on the greatest determinant of a payment system, like convenience for the Danes (Jacobsen and Nielsen, 2011) and ease of use to the Canadians (Arango et al., 2012). A study on consumer preferences within the Euro Area is already reported above (Figure 2).
Figure 5.
Pyramid of user requirements of any payment method (De Heij, 2018). User requirements for any means of payment can be divided in three classes, similar to those of the Maslow pyramid. The red and the blue represent respectively the basic user requirements and the psychological user requirements.

Figure 6.
The Upid-Model (De Heij, 2017) divides the user functions of a payment instrument in User Interface Functions and User Experience Functions.
Basic user requirements are presented at the bottom of the Pyramid-Model. In the center there is the user requirement that the payment instrument should be *easy to use*. Other user requirements refer to attributes of the payment method, like access, safety and settlement time. In the center of the middle section of the Pyramid-Model, the psychological user requirements, there is the requirement that the payment instrument should be *nice to have*, surrounded by user requirements referring to the payment system, like privacy, risk of loss and overview of expenses. At the top of the pyramid is ‘peace of mind’, people want to be happy with their means of payment; above all, being a dissatisfier, a payment transaction should be hassle-free.

**Upid-Model**

So, user requirements of a payment instrument are divided into ‘easy to use’ and ‘nice to have’, respectively a basic and a psychological user need. Easy to use and nice to have are container concepts and can be divided into more specific user requirements with the help of the introduction of *user functions*. The Upid-Model divides ‘easy to use’ and ‘nice to have’ into respectively four User Interface Functions (UIFs) and six User Experience Functions (UXFs), shown in Figure 6. The terms User Interface Functions and User Experience Functions are derived from the developments within the information technology, especially by the domain of interaction design of screens.

**User Interface Functions (UIFs)**

The main user function of a banknote is recognising value (UIF 1). When searching for a banknote in their wallet, people are primarily interested in the banknote’s value. Also, when they receive a banknote as change, people’s first interest is if the correct denomination is offered. Subsequently, people will take the banknote, arriving at the second function in this category, named handling (UIF 2). People use banknotes to pay each other and not for authenticity self-checks, something central banks sometimes seem to forget. Therefore, user functions like value recognition (UIF 1) and handling (UIF 2) are more relevant to the user than checking authenticity (UIF 3); nobody uses banknotes only because they are genuine. Still, people should be able to do an authenticity self-check, in case they do not trust a banknote at offer. People do want to know what the themes, images and features displayed on a banknote represent (UIF 4).

The *usability score* of a banknote is the average public score of a banknote on these four User Interface Functions.

**User Experience Functions (UXFs)**

The first UXF is recognising identity; people are interested in their own banknotes, not that much in others. Second, people very quickly make a judgement on the aesthetics. They either find the banknote beautiful or ugly. For this reason, judging aesthetics is listed as UXF 2. Whether a new design looks like a valuable banknote or a cheap coupon is a matter of maintaining confidence, function UXF 3. Furthermore, the main image of the new design is noticed instantly, is it a portrait, a bird or a tower? Reacting to the main image is therefore one more user experience function (UXF 4). Two upcoming User Experience Functions are positioned on the bottom rows. People expect their banknotes to be ‘green’ (UXF 5) and expect that they can check a banknote by using a smartphone or by any other linkage to information technology (UXF 6). When a banknote designer does not pay attention to any of the User Experience Functions people may still be able to use a banknote for a payment. However, when the psychological user needs are also fulfilled, the design will receive a high *experience score*.

**From user functions to design requirements**

How to arrive from user functions to design requirements is explained in Figure 7. In three stages, the design requirements are derived from user functions by abiding questions about ‘what’ and ‘how’. An example of ‘retaining confidence’ (UXF 3) has been added (what 1). The next step is the formulation of the functional requirement, for example a ‘confidence strip’ (how 1), which is in this example a wide glossy strip (what 2). Collected user preferences on such strips are input for the design requirements (how 2), for example that the strip should match the banknote’s value.
From user functions to design

<table>
<thead>
<tr>
<th>Role of the central bank</th>
<th>Role of designer</th>
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<tbody>
<tr>
<td>User functions</td>
<td>Functional requirements</td>
</tr>
<tr>
<td><strong>What?</strong></td>
<td><strong>How?</strong></td>
</tr>
<tr>
<td>Retaining confidence UXF 3</td>
<td>Confidence strip</td>
</tr>
<tr>
<td></td>
<td>2) On the right side</td>
</tr>
<tr>
<td></td>
<td>3) Match with value</td>
</tr>
<tr>
<td></td>
<td>4) Complex patterns*</td>
</tr>
</tbody>
</table>

*) The user expects complex patterns to be there for the counterfeiter and do not have to be checked by the user.

Figure 7.
Schematic representation of the derivation of user functions to design requirements, including an example of the user function ‘retaining confidence’ (UXF 3). To arrive at design requirements, functional requirements should be identified first, followed by user requirements.

Concluding
Nowadays people avoid cash because other payment methods fulfil their user requirements better, especially on transaction time, handling and safety. This problem will not be solved by the traditional approach of a new banknote design. New banknote designs should be based on user requirements of the banknote denominations (payment instrument) and its usage environment (payment channel, payment system). Coins play a crucial role; people may not use banknotes because of the poor usability of coins.
Banknote design managers and designers should focus first of all on the two main User Interface Functions (recognising value and handling), and less on User Experience Functions like connecting to a main image. Remember, people are not using a banknote because of its authenticity features. Instead of a traditional set of coins and banknotes, central banks may start looking for alternative concepts of tangible money, building further on the user needs of back-up money, a means of payment which can be used when digital payment systems fail.
References