

APPENDIX B

Focus Group Comments

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Ashlar Village retirement center in CT- Elderly

D: Retinitis Pigmentosa, 100% vision loss, some light perception, no text at all, lives with husband in an apartment on the campus.

M: Macular degeneration & glaucoma in left eye, reads text with 3x hand magnifier, assisted living.

J: Macular degeneration, both eyes, reads text with CCTV and 5x hand magnifier, independent living (but gets meals every day).

M: Doctor didn't think removing the cataracts would help.

J: Has cataracts developing, but she's not up to surgery yet.

D: Doesn't use money most of the time – uses credit cards instead. Never takes bills over a \$10. She stores \$10 flat, \$5 folded in half. For \$1 bills she folds corners down. "When I get money, I have to trust people to tell me what they're giving me." The participants can charge a lot of daily items at the store that is located in the community where they live. "It's just more convenient to use the plastic, because I have been stiffed a couple of times."

M: She is not able to enter PIN because she can't see the keypad, and is concerned about that being insecure. She allows only her daughter enter the PIN.

D: Has a friend do it, trusts her with the PIN.

J: Doesn't use a debit card at all, only credit. She can see currency well enough to denominate them. She turns bills backward to have the large numbers showing. She orders bills by value, with the largest in back. She avoids paying with coins because they are harder to see, and she hasn't figured them out tactilely.

M: "The biggest problem I have is with change (coins). Big bills I can usually figure out if I hold them right up to my eye." She takes \$10 or \$20 cash when going out to eat.

J: "I've been stiffed in taxicabs" She's suspicious of them now. This was in New York City.

D: Six months ago, in a shop, the store teller argued over the value of a bill, but it turned out her husband told her incorrectly, not the teller (another sighted person at the store confirmed this).

M: The last time she received incorrect change was years ago, when she traveled more.

M: "There are very few places where I'm the one paying. When we go out, I let them pay the check and I pay to them." In the last few years she has been making fewer cash transactions. A weekly sighted helper comes in to read mail, etc. The helper is paid in ¼ hour increments. They're paid by cash.

D: Has the money pre-sorted and folded, so it is no problem. This is probably her most frequent cash transaction. She also has cash in a wallet for if they need to go to the hospital or something.

D: Says that if cash were easier to tell, she might use plastic less. She feels safer with plastic. She worries about drawing attention to herself. "Look. There's a blind old lady. She's an easy mark."

- D:** Says there was a taxicab incident: she knew (was suspicious at the time.) When she got home that she got the incorrect change. The driver gave her all singles after saying that one of them was a \$5 bill. Now she gives smaller bills so there is less change.
- M:** Says she has handed the wrong bill to the hairdresser, and at a restaurant. Both times they handed it back and told her she had given too much. “My hardest problem is getting a bunch of change.” – inconvenience factor. (J agrees.)
- M:** Has a daughter who takes her everywhere and does all the banking, so she doesn’t worry too much.
- M:** Likes getting her daughter’s help, so changing the money won’t change things for her much.
- J:** Can denominate U.S. banknotes without much difficulty, so she is not so worried about getting fooled. She can’t remember too many incidents of mistakes in either direction. Once, at a store, she gave too large a bill.
- M:** Says that once, while shopping, the teller insisted she hadn’t given a \$20. She called the manager, and they had to shut down the machine and count all of the money. It turned out that M was right.
- D:** “Once or twice you get people who do razzle dazzle you.” She is suspicious of people trying to skim to make up for something. At a toll bridge once, her husband gave a big bill but didn’t get the right change. The teller argued. They waited for manager, and it turned out her husband was right. “You have to have the gall to make a scene. You either decide you’re going to let them do it, or you make a scene.” Desire for speed and social pressure work together against you: “When you’re going somewhere, when they want to get you through, when you want to get through, that’s when you’re likely to get ripped off.”
- M:** 20 to 25 years ago was last time had problem with giving wrong bill. “I’m spoiled.” (because she has a daughter who helps out a lot.)
- D:** Only uses an ATM with sighted assistant. She usually uses 10s and 1s, rarely uses 5s. She uses multiple 10s, and avoids 20s. Instead of using the ATM she sometimes gets cash back when buying groceries.
- J:** Has never used an ATM. She writes checks for cash at the local bank. She generally uses cash at grocery store, and her credit card at the mall.
- D:** Says using her credit card also gets her rebates at LLBean. “Insurance, groceries, it adds up.”
- M:** “I use my credit card when I go to the mall to buy clothes or shoes or whatever. The main reason that I use it is because I like to feel independent – handing the card to the girl, running it through the machine, when I know there is plenty of money in the checking account. Then of course my daughter has to punch in the PIN. But even so I have a little feeling of independence.”
- J:** “You like to have something you can do.” [for independence] When asked if immediate denomination were possible, what might change.
- M:** Says she might feel more independence, but it might not be any different than right now, in that she’d still go out with her daughter. “My daughter is an angel.”
- D, J, M:** All say they never use vending machines.
- D & J:** “Don’t generally want the things that are in vending machines.”

- M:** Says having a credit card came in handy when flying. She ran the card through, and found her seat that way.
- D:** “We are becoming so dehumanized. I live with a computer geek. I truly believe that people don’t know how much they’re abdicating being human.”
- D:** Wants tactile features – a raised letter, or different texture for each denomination.
- M:** “But then you have to keep in mind that a 1 feels different than a 5 or a 10.”
- D:** Was at the Mirage hotel in Las Vegas. She could read room numbers because she knew where to look – they were hidden from sighted people. She suggests that tactile features for money could be unobtrusive in that way.
- J:** Says larger print would help her. She doesn’t really notice the pink tinge on new bills (very low color vision).
- D:** “They use lousy paper.” She says older bills had crisper feeling.
- When asked:** “What they would think if BEP changed the primary colors of the bills:
- J:** Says “It’d have to be darker than what is there for me to notice it very much.”
- M:** has color vision problems, but can tell Swiss bills apart (when showed samples) but says green is “white” or “flat”.
- J:** “Pink shows up better to me than green or blue or whatever the other was [green].”
- J:** Likes the idea of different base colors.
- D:** “When I could see, it wasn’t color so much as contrast. Contrast made visibility possible.” When asked what they would think about changing the sizes of bills:
- D:** “That becomes a problem with wallets.”
- J & M:** would prefer color changes only.
- D:** Ridges, smooth parts, having the bills embossed in some way, are all potential options. Perhaps raised symbols such as a triangle, circle, etc.
- We showed them:** Some newer Canadian bills and asked what they noticed.
- D & J:** Raised number is not noticeable. Both could feel the dots though.
- M:** “You’d have to remember that a five has... Again it’s a question of memorizing.”
- D:** “Less is more. If one corner had [the tactile feature], you’d concentrate on looking there.”
- D:** Has difficulty feeling the raised outline of the 10 on the Canadian bill. She says the raised dots are most “findable.”
- D:** Says the bill teller device she used in the past talks. “It’s wonderful, but it is something you have to carry around. If it was something that was soft, or you could put it in a wallet, I’d carry it around. But it’s a hard piece.” “If you had it (the magic feature) in the corner, you wouldn’t have to put in the whole bill. You could have a tiny little thing. Then all you need is a small device.”

M: Is concerned about the potential for losing a small device but thinks it might work. “It’s a way of giving you independence and security. You could wear it around your neck.”

M: Notes that wearing something around their neck is already common in their community – they have security buttons that call for medical assistance, which some people wear around their necks.

D: Hated Italian currency (years ago). She didn’t like having to fold bills to fit the US wallet size.

M: Says she had no problems in New Zealand. “When you’re got different sized money, you can’t just stuff the money in one place.”

We asked - “What they thought of the idea of using different widths for U.S. bills.

M: Was unconcerned about the possibility of different sizes. She said her daughter will take care of it in any case.

M: Says, regarding the raised dot tactile system. “I don’t think that would be that easy – getting used to it.”

J: “We’re still using money, but maybe not as much as we once did.”

J: Notes that special communities for seniors don’t require as much use of cash.

D, J, & M: Say they don’t use cell phones.

D: Says she would like a device that has output options – voice or beep – so she could use it in a dark restaurant.

M: “Having a little device? I think it would be cumbersome.”

M: Says she would not use a device at home because there would be no need when there are lots of sighted people around.

D: Has had a flatbed scanner, doesn’t use it now.

J & M: Don’t know what a flatbed scanner is.

D: “It’s a big thing. *You* have to go to *it*. It’s like using an elephant to swat a fly.”

D: “I will use any technology that I can find a use for.”

D: Guesses about what currency reader would cost: \$20-25. J says she doesn’t need one.

D: Says \$10 would get her to buy it.

We asked - “How have you learned to deal with cash.

D: At Lighthouse for the Blind, they taught us that you could fold money, but they used a different system.

D: “If you live alone, you have much greater need to do these things. Also if you are working, or if you have to use public transportation. We’re all older than that – in the ‘step back and I’ll do it if I feel like it’ mode.”

NFB Focus Group – Children

R: Age 7, has a retinal blastoma, reads no print, her vision problems started around age 3, now has no vision..

A: Age 10, has nystagmus , caused by Leber's Congenital Amaurosis ,reads no print, has some color vision.

A2: Age 4, has cataracts, reads some print, has some trouble with dark colors of similar hues.

R: Folds bills to sort them \$1 is flat, \$5 is folded in half width-wise, \$10 is folded in half lengthwise, \$20 is folded in half both ways.

A: Says maybe she'd Braille the tops of the bills, but she doesn't do that now.

All say - They depend on people to tell them which is which.

A: Puts different bills in different places in a purse.

R: Used Canadian money in Montreal, bought peaches.

R: gets snack from Snack Shack after school. She uses cash then. She occasionally has \$5s but doesn't really use them, but instead saves them. She has a Lock Box - -bills are a jumble in there. She receives bills that have Braille on them – large-value bills that she gets from other people such as Grandma.

A2: She's just learning Braille, doesn't know much of it yet.

R: Says money is difficult when her mom insists that she fold it. (Mom wants her to learn the technique.)

We asked - How she knows what value a bill is.

A2: "I'd ask dad. I would make him do a mommy promise." [which is solemn promise in their family]

Parents confirmed: None of the children use ATMs yet, nor credit cards. They use vending machines occasionally.

R: Suggests adopting a scheme with different sizes, as with Hong Kong (where they had visited), and different bill shapes (circle, square, etc.).

We note that different base colors wouldn't help these kids (except perhaps for A2, unclear).

A2: Suggests sequins or crystals be attached to bills.

R: Suggests thick lines of different lengths to indicate values (though this method is not preferred over having different sizes).

A: "The sighted people might get confused [if they make different values different sizes.]"

R: "Maybe you could make talking dollar bills. You could make a little device thing, and stick it on the bill, and it would say '5 dollars'."

R: Has a color teller device (reads colors out loud, like a talking flashlight). She uses it for paper, clothes, etc.

A2: Has a color teller at home; she shares with a neighbor.

A2: "The thing is, most people don't have a color teller. Most people have a cell phone. So the cell phone might be better."

A2: Says using a color teller for currency would be best for her.

All liked: The RFID possibilities. (Theoretic ability to pass a device over a stack of bills and get an instant total.)

R: Would like to have a beeping feature for device output mode,

R: Guesses that a currency reader might cost \$200. A guesses \$300. No guess from A2.

R: Saw other blind people folding money, and mom said she needed to learn it.

A: Doesn't seem to have had much instruction on using currency yet.

A2: Mom is teaching her as it comes up (mom has vision impairment also).

NFB focus group – adults

R: age 58, totally blind

B: read no print, totally blind, age 64

W: reads print (2 pages max, then gets tired), age 60

J: totally blind, age 31

D: age 72, totally blind, reads no print

E: age 72, reads print, no vision impairment

A: age 51, partial sight, has Albinism, reads print with magnification

S: age 35 reads no print, has no color vision

M: age 58, reads no print

B: age 14, reads print for a while, vision acuity in one eye is ~20/300, the other totally blind

E: age 49, reads print, no problem (with wife)

R: age 44, totally blind

R: When he gets money, they tell him what it is. He folds it using his own method (5 and 10 reversed vs. most-common pattern). \$50 bill is folded in 3rds or quarters. He rolls \$100 bills like cigarette paper.

He doesn't get \$100s much. He has a note clipped to one now.

B: Is a vendor; she deals with a lot of cash. She runs a lottery machine. She folds her money (for her own use), or puts it in bands from the bank (business). She keeps cash in bundled batches in shoe boxes. She has a sorting system – a different # of rubber bands indicates the denominations, or stacks of different types.

W: Colors aren't too distinct. The new big purple 5 is good. "I love the 5". He could read the old one at nose-distance. He just sorts bills. When finding one he flips through until shape changes. He saves change in a bowl, turns in once a year.

J: She has her own folding system \$1 is flat. She folds the bill in half for \$5, into a triangle for \$10 (one corner down), double-fold for \$20 (length and width). \$50 is corners down. She keeps \$100s in a separate envelope.

D: He has run a convenience store for 52 years. He sorts cash in the tray. People just tell him what notes are when he accepts them. He considers this method to be no problem. He has a two-compartment wallet and uses both.

A: She has trouble recognizing \$50 vs. \$20 – smaller #s hard to read.

S: She folds bills for storage, and uses an Optacon [early optical scanning device] to denominate at home. She reads them herself, then folds them. She has had the Optacon since she was a little kid. "It's a pain in the butt to carry it." She noticed that the new numbers in recent years were bigger. She hasn't seen the new big 5.

J: Wallet has two sections. She folds bills to fit pockets. She uses a slightly different sorting method with a regular wallet. She uses a unique method for differentiating clusters of bills for each perusal: \$1 face up, \$5 face down, \$10 up, \$20 down.

M: He folds money now, but used to use staples in the cash (he had someone else sort them.) \$5 is folded once, \$10 is folded twice same way, \$20s not folded, put in separate section. He asks the merchant to identify one bill at a time, and usually has no problem.

B: He has no system; was folding but stopped. Has some difficulty with \$10s, but can't figure it out.

D: Trained to fold, but ends up with unknown bills in some pockets throughout the day, then asks whoever she's with. "Generally I just use my debit card so I don't have to fool with it. Plus I get points." She uses different storage places for different values. She knows coins by feel.

Some ATMs give bills other than \$20 bills -- typically \$20s and \$10s, not always under your control.

A & M: Both have KNFB Readers, both use for currency when needed.

R: Sorts when he gets the currency.

Others in the room also use debit cards for convenience. You can keep track of purchases that way. Not all ATMs are accessible.

J: Uses credit even with debit card. That way she just signs for it. She doesn't like having someone help with entering PIN for debit.

A: I don't want them to see my PIN. I want to sign for it.

Few of the participants have trust issues over getting charged the wrong amount (no one said yes when asked.)

Touchscreens (on some point of sale machines) present a different accessibility issue, regardless of orientation on the keypad. Using a credit card also avoids the touchscreen inaccessibility issue.

B: Only uses cash, had never seen a debit card.

J: The amount that's on the transaction -- they can't get that money anyway. Vending machines that take dollar bills -- such as getting on the bus They're a difficult, small target. Vending machines are also difficult when there are rejections (due to improperly oriented bills, excessive wear, etc. -- they can't tell). "I always seem to go away empty-handed."

B: Wants a top-left corner digit.

M: Says Brailled money is still going to taking time to denominate, and that method may not be faster than asking the merchant.

J: Suggests a simple texture would be more universal than Braille, and could theoretically be as easy as the tactile affordances now offered by coins.

M: Notes there is a plastic guide for Euros available.

B: Says money comes in incorrect orientation, and some 5s, even though the machine is supposed to reject them. "It's not just the sighted people who have trouble."

E: Suggests magnetic strip that has value encoded. Balloon shop, you just run your nail across it to hear a message. (taped to back of Mylar balloon.) [These are called Talkie-tapes.]

R: Says textured money would need to be more durable. He suggests shapes, lines, dot clusters, Braille, or raised numbers.

J: Says using different materials would be good--plastic for some? "It doesn't have to be fancy, just different. A variety of shapes might be OK."

Group consensus: Seems to be wanting features to apply to the whole bill, not just a corner. Except M (who is concerned about storage).

"It isn't a question of whether you know Braille or not. Whatever solution you use, you'll have to learn what it is. Whatever solution you use, you'll need to put in all four corners."

Various comments regarding putting Braille on bills

- "It serves another purpose – reminding the public that blind people use Braille."
- "[tactile affordance] needs to be really different between bills. You don't need a complex system."
- "Do we waste Braille on that? This is only for expressing a very small set?" She points out that you only have 1, 2, 5, and 0, and those aren't dramatically different characters.

B: "Why do we even have the dollar bill? Why not \$1 and \$2 coin?"

M: "Why paper money at all?" [There was then a side discussion about the high transaction costs of electronic purchases.]

M: Suggests an enhancement for partial sight: use a lot simpler font. "A lot of things disappear into the background. It doesn't take much for the background to overwhelm the number."

A: Wants a clear background around the numbers. Light on dark print offers her no advantage. "For money it's not a big deal." She says that in Denmark, which had different note sizes, there were symbols she could recognize printed on the bills – raised up a little. "If I couldn't see it, I'd definitely be able to feel it." She points out that Kenya also had different sizes. Also, Norway – sizes, Euros – sizes, Canada – tactile system. But she notes the tactile system could be counterfeited.

J: New Zealand has banknotes with different colors that are very bright, colorful. Also coins in Spain more distinct (pre-Euro). In Tokyo, when she visited, the ink was tactile, distinct.

J: Favors dropping \$1, \$2 bills. We ask: What if bills varied in length? "You want them to fit in the cash register." "Your hands could get used to that."

M: Says you need something to compare against.

B: Notes that some vending machines take \$5s, treat them as \$1s. Some machines take larger values, such as post office and transit machines.

D: "Getting sighted assistance is not a problem."

B: "A whole lot of times there isn't sighted assistance to be had"

B: Told a story of catching someone who repeatedly cheated her "One time I was sure I was going to be [cheated], so I pretended I wasn't paying attention, then asked the next customer what it was." Now her policy is to publicly shame people.

W: Gets in trouble with spouse for not checking prices. People don't try to cheat him. Some taxi drivers are a problem.

J: A bank made a mistake once, and her husband called them on it.

D: About 40 years ago, someone gave him a \$1 bill, but said was a \$5 bill. He discovered at the end of the day when totaling up.

Other responses regarding receiving incorrect change

- "Once when I was a teenager at McDonalds, I came out with the wrong amount of change."
- "Once a couple of years ago, I figured out that taxi driver had claimed a \$5 was a \$1."
- "It's now a lot better because with the KNFB Reader I can prove it on the spot."

- “It happened once, but I don’t remember the details. [got \$1s when expected \$5s]”
- “I always asked where the [bigger bills] are.”

We asked - What other social situations might prove to be difficult.

J: “When taking a cab, I try to have enough different bills to be able to not need a lot of change.”

Two participants have cell phones with cameras.

Some participants didn’t know what a banknote reader device is. Merchant said she’d have one if it were free. She wouldn’t run everything through it; that would be too slow.

D: (other merchant) also considers bill recognizers too slow.

J: I’d use it for confirmation.

R: I’d use it as a backup. He would carry it with if small enough – the size of cell phone is OK. Some participants want the device to vibrate if used in public.

R: Says he doesn’t use cash for large purchases. “Currency has devolved to lunch money or gambling money.”

R: Uses an OCR flatbed scanner. Three others participants also do, but have never used it for money. One participant says it is not accurate for money. “You guys change the money every several years.” (Implying that this breaks the software.) We ask what an effective banknote reader might typically cost. “A couple hundred dollars”

- \$180
- \$50 would be nice.

We asked - what would you pay?

- “It’s the speed. Speed matters.”
- \$100

J: Doesn’t want to carry the weight. “It would be good to have the confirmation, but unless it was super-great, I would still use my folding system.” “There is no electronic system that will replace folding money unless you completely do away with money.”

We asked - about putting RFIDs in money, and pointed out the potential for instant counting with a device:

- “Now that’s compelling.”
- “yeah”
- “That would be more interesting. I’d have the problem of carrying another device, but it would be more interesting.”
- “Would it also do other RFIDs?”

W: Says shopping on the internet saves time. He doesn’t use a grocery service. All needed groceries are within walking distance.

R: is shopping more on the web these days.

We asked - would a color identifier be adequate? Some say yes, some no. “It’s still another device.”

J: “I’m really concerned about carrying other device. And more batteries.”

W: “I really think it has to be a multi-dimensional thing (color, texture, etc.). There are redundant differences for sighted people. We want to make sure that there are redundant differences in different modalities.”

M: Cost issues are important – “Given whatever it costs to change currency, you could just buy everyone KNFB Readers. Everybody has cell phones. Then you’ve got it all on one device. There is technology available. All you have to do it make sure everyone has it.”

R: “M is absolutely right.”

NFB Open forum

There were around 20 participants in the open forum. The session started a little late, so we weren't getting names for most comments.

One participant suggests adopting a system of uniform widths but different lengths for banknotes. We pointed out that Switzerland and Australia do that. We are not sure what would be the minimal size differences for reliable recognition.

"20 – don't change those, then ATMs don't have to change (except the odd ones)

"Don't change \$1s; you'd save a lot of money."

RSA Vendor: Points out that the ergonomic aspect of managing currency after taken out of machines (count, stack, organize) is important. He wants to do it on his own, not hire a sighted person to do it. Banks will only take cash oriented the same way.

We pointed out that the vending industry is being included in the requirements gathering process. Also, we want to know about human factors of working with Blind people. Vendor says blind vendors may have special considerations.

"Some machines require bills oriented one way."

One person notes that what looks like a "machine issue" might be a currency issue or human factors issue.

One person noted that raised features may make bills not stack well.

Vendor: Some bill validators accept bills any way they are oriented. It may be a software feature. Basic machines don't have the sensors needed.

R: Asks about Euros. "Is a plastic ruler such a bad thing?"

R: wants a small currency identifier – small, instant response. A few people in the room own color identifiers, but most do not. "Good ones are \$200 – expensive."

We asked - - What if you could use a color identifier (because some portion of the bill had distinct colors?"

Most participants are not very enthusiastic about this idea.

One suggests foil patch to authenticate as well as identify – it's a flat feature that wouldn't affect stacking. We talked about large print numbers being universally appreciated.

One person suggests cutting out notches – square, triangle, etc. – to distinguish the denominations. "Fabric cuts indicate different pieces. It could work for blind people."

We pointed out that cutting or notching could possibly work, but might add wear.

One participant asked about when money will go away. We suggested never, based on high transaction costs. One participant claims that another country has.

One participant asks "How long would it take to implement any new idea?"

We explained that there are several factors that generally contribute to the schedule for new currency roll-outs, and this is a special situation. Factors include:

- Implementation of new features.

- Phase-in determined by longevity of bills. We don't decommission bills as some countries do.
- Court's decision about what is reasonable.
- Counterfeiting pace.

One participant mentions that there are a lot of machines that would need to be upgraded.

We pointed out - some upgrades require software (anything on surface changed), some require a mechanism change.

We asked - : How much does a bill validator cost?

- Multiple vendors say about \$400 each.
- A software upgrade is a \$65 module that the owner can use on multiple machines, or \$10 per flash if someone does the upgrade for you.

There are other devices in addition to the simple bill validators: A "stacker" might have to be changed. Some validators "recycle" bills (give smaller bills back as change when accepting larger ones). Those might need to be changed.

One participant notes that US bills are about as long as they get.

Another notes that casinos may be concerned about the total upgrade cost.

What if \$50 and \$100 are wider?

- "I don't carry those."
- "Once you get past a \$20, most people go to the credit cards anyway."
- "Some people don't accept the larger bills anyway."
- "Even if wider, that shouldn't be the primary way of telling the difference between one of the other."

We asked - - What if there were two widths and three lengths?

- "Yeah, that'd work."
- "With Euros, unless you have [multiple denominations in hand] to compare, it's not very obvious."

One participant says a mass-produced banknote reader device should be available for \$20, and even if more expensive it would still be cheaper to society than conversion of all those machines.

One vendor retold his experience of being in Europe: "It was very quick to sort money out, because it was all size differences (visiting several different countries.) It was easy to manipulate. I didn't have to look at the money to know what I had in my hand. I hesitate to say you should go that route, because it comes back to the bill acceptors, validators, etc."

We asked - - about size vs. tactile feature: what would be their preference?

"I want to be able to tell orientation as well as denomination. I want it to be dramatically different between the bills."

There is a speed issue. Different scenarios have different requirements. Size seems fastest.

"What we do right now works for most of us."

"No, it doesn't."

"There are times when you get money and you don't know and you need to check, but not very many people get into trouble every day because of currency problems."

"In the computer division I took half the money in. Half the people didn't have a clue what money they were handing me (blind members). We had to get a sighted guy to tell us. If you don't have a sighted person around, you're not going to know what money you've got."

"The most dramatic way to change the bills would be size, color, large print, and tactile features."

"Surface texture will matter for people who use their fingers for a lot of things."

"You should use all of the strategies."

"Why not print the front and back with the same design?"

"Speed is the issue. I don't want a bunch of different sizes, and I don't think tactile is going to work. My SmartCard tells me immediately how much I have." "Those machines have to be connected to a centralized database."

There was a brief side discussion about how smart cards work and how that RFID technology could be used for cash.

J: Wants a reader device to tell how much value is left on a smartcard. "Some of us don't have cell phones." "That's the key. Having it be reliable. A lot of the things out there today are not reliable [referring to existing banknote reader devices.]"

We asked - – "What's too expensive [for a banknote reader]?"

- Nothing
- <\$100
- \$50
- Wouldn't buy anything.
- I really don't want one, so \$20.

When asked about what people thought of the KNFB Reader:

- "Technically it's great, but it's slow (bill reading)"
- "It's too expensive."
- "If you're walking through the checkout line, you're not going to take a picture of it and wait."

Someone suggested "If you had a reader that you could just wave over the bills..." And "You should be able to make a reader that would work for other purposes."

Someone suggested "What about different textures for the actual papers?"

Different participant: "Or different [hologram/smooth] foils?"

"As I understand from reading, the countries that did do tactile marking found that they were very easily counterfeited."

"Look at the practicality, what would cost the least. Start from there."

"You don't think blind people would counterfeit bills?" There was a brief discussion about ease of counterfeiting embossed tactile features made of raised dots. The consensus was that it is a non-trivial concern.

Someone asked about embossed tactile features: "Wouldn't the Braille wear out?"

We replied about halfway through the life of the bills.

"I like folding them. Then they always fit in the same place."

"Folding is fine. We all fold money. The problem is when you get a bunch of money and you don't have somebody to tell you what they are. If you assume there is always going to be somebody there to tell you what they are, then you don't have a problem."

We asked - What about if BEP combined symbols + another affordance? Such as Braille plus something else? The idea of redundant affordances (which would not require anyone to understand Braille, but would be useful as such if they did know it) was not clear to many people in the room.

"If somebody tells you that putting Braille on the bills is the solution, it's not the solution. Less than 20% of blind people know Braille. Putting only Braille won't work."

Someone suggested cutting corners.

Consensus seems to be against Braille – other tactile features might work better.

"Braille is useless to older blind people."

"I like the idea of one bar, two bars, three bars."

"or Square, triangle, circle?"

"Different bars of different lengths?"

"I prefer a different number of bars."

"Numbers of bars would be easiest to feel."

"What if it were indented / recessed instead of raised. A recessed shape?"

"You'd have to have really thick bills." (tactile graphics expert)

We asked - What about using super-smooth features or textures?

"If separated by a sufficient amount of space, like ¼ inch, it may be OK."

"Smooth, then a rougher separator, then smooth might work."

"I'm not really convinced that I could find these things."

"I can tell you that smooth surfaces are easier to feel things on than rough surfaces."

We showed participants a test sheet that included a security feature (not originally intended as an accessibility affordance), and asked whether people could find the feature (to determine if it could also be used as an affordance).

- "That is not tactile."
- "I can feel it perfectly fine. It could be more pronounced. Of course I'm strange."
- "I think it's great."
- "Once you pointed it out to me, I could tell where it was. But if I crumpled this up more, I doubt I could tell."

Consensus is that if detectable, the security feature is very subtle.

- "Even if you could feel it, it's too slow."
- One participant suggested putting raised ridges around the stripe, to enhance contrast.

One participant suggested talking to Braille instructors and tactile artists.

We asked about use of devices.

Consensus was that they don't want to carry something. But if it were small enough that you could put it in your pocket, it might be OK. [There seems to be considerable variation in responses to this question, particularly regarding threshold of portability.] "If it fits on key chain, then OK." "I don't want to dig into purse to find it."

Regarding the security feature: "If you're talking about something that is really going to be useful to the blind, it can't be subtle." "You're talking about people who use their fingers for lots of little things, and people who never have to use their hands for anything."

ACB Open Forum

There were around 50 participants at the ACB Open Forum. Some but not all participants offered names.

Ken: The Fall 2000 issue of Vision Access magazine reports on a meeting at ACB convention 2000 with Tom Ferguson, former BEP head. A high contrast number idea came up then. In that discussion they mentioned putting the number in the upper left corner instead of lower right.

A participant met with the gentleman who sponsored the [Catherine Skivers Currency for All Act], which calls for cutting corners of banknotes in specific ways as a primary method to discriminate values. She says feeling corners would be difficult for those with neuropathy. She says she likes Canadian tactile system and color differences (regardless of durability issues).

Pete Starks (?) of CA sponsored the bill. Jeff Thom (?), president of CCB, and Dan Kaiser (?) met with him.

"Suppose you dropped all of your money on the floor. How on earth are you going to be able to pick it up. They all look alike, they all feel alike. I don't think it's good enough, just to cut the corners."

R: "Sometimes larger is not better. Numbers need to be darker as well as larger."

K: "Sizes seem to work well in other countries. Cutting corners won't work for vending machines, but most only take dollars, so it's a moot point (i.e., the vending industry is wrong)."

"Purple five won't work for a lot of low-vision people due to contrast problem."

One participant says the Canadian tactile system "won't hold up." Regarding cutting corners: "Anybody can cut a corner and tell you it's something different."

There was a lot of initial confusing about possible modification to change the perceived values under a corner-notching scheme. We assured people that we were under the impression that a system had been devised that prevented upgrading of values, but we didn't know anything about the usability of the system.

We asked - How much are they worried about forgery of tactile features only? No clear consensus emerged.

"Somebody can rip me off now, so I'm not any worse off." (re counterfeiting dots). "There have already been an number of studies on this. I hope the intent is not to study this to death."

R: Favors different sizes, and leaving \$1 as it is.

C: Skivers bill has provision for lowest denomination would have all corners removed. Next up, smaller notches. Hence there would be no value upgrade possibility. "Color and color contrast obviously is important. We favored black on white. The treasury did not do that, did not give us the kind of contrast we wanted on the redesigned 5. But they'll be redesigning the 5 in another 7 years." "How many of us blind folks carry around \$100 bills on a regular basis?"

E: I'm concerned about my money, not the Treasury's money.

K: I think the banking tray thing is a red herring. Other countries deal with different sizes. I think the vending concerns are also a red herring. They can get used to it. I think different sizes is the way to go. And regarding the cut corner system Do you want to have to remember the system of different corners? What if you have a bad day and you forget? It could happen. There's too much to remember, and an older person might not remember all of that. Let's go for something simpler than the cut corner system.

K: Sizes is the way to go. That's the easiest way to go. You can put them together and know which size is which. I don't like the idea of cutting corners because bills tear.

M: The tactile thing to try is different thicknesses.

O: Having not seen what currently exists, my ideas are limited. I think the size thing is probably the way the go, without altering the \$1 bills (so vendors don't have to change their machines.)

O: suggests \$1 coin out of the mix. Group consensus seems to be against.

W: I already have a purse that weighs 20 lbs. I can't handle any more. "The banking industry makes plenty of money. I think they can afford to change their ATMs. They're constantly changing and they can certainly afford trays. I think they can afford to do a few changes."

We pointed out that circulation of different denominations is primarily determined by what's in the cash register. Also, 2/3 of ATMS are owned by small businesses.

M: Is the BEP considering more than one changes? Yes. 2) What about plastic bills? We noted that plastic substrates seem to acquire texture with use.

J: Has neuropathy, says she wouldn't be able to tell one weight of paper from another.

E: Americans don't have any less ingenuity than the Europeans. We should be able to do just as well. Likes the foils feature [security strips] on the Euro. We're a world now, we're not just the United States.

B: Is extremely against getting rid of \$1 bill. He says it didn't work with Susan B. Anthony dollars, and the current President coins also didn't work.

W: For the \$20 bill, you have to pull that bill all the way out [of your wallet], so what my husband and I do, is we turn them upside down, then it's [large number] up on the top. You have to pull it all the way out of your billfold before a low vision person knows what that is.

E: Wants a tactile feature if it doesn't wear down (with same sizes for all denominations), and different base colors. A third option would be changing the size. Aside from that, put number on the top edge.

Five people in the room out of around 50 have a banknote reader; 3 or 4 use them. 3 take them out shopping.

M: We've been studying this for 30-some years, litigating for 6. It seems to me that if we're really going to get to the remedy phase, the federal government has to stop and allow that to happen.

E: 1) He wants dollar demoted to a coin, 2) Size is the best scheme for banknotes, 3) Just get something done.

G: He likes dollar coins, likes the old big ones, and doesn't like cut-corners idea so much.

M: Regarding the proposal to change the size of bills: many people use folding methods, so they have already devised a virtual size system that seems to work. "Whatever other countries are using is better than what we have."

L: "How could what we want benefit the sighted world? Different colors would help to ensure that money is not mis-sorted in the cash register. Sizes might also help for this."

J: He likes the size differences scheme, also having different base colors. Regarding vending machines: slot machines take higher-denomination notes. So he suggests talking to gaming organizations to learn about their concerns.

“Transit is also one place where higher denominations are commonly accepted.”

W: She suggests we visit senior centers, and consider the best solution overall. Consider tactile loss too. That is going to be a bigger issue as time goes on.

W2: Older people also lose their hearing. It could be difficult to hear what a money teller says to you.

We pointed out that some new banknote readers also vibrate.

M: He’s in favor of different sizes for banknotes. He says that at a previous convention, there was a thing that had holes, with something that pushes through, to show what value it is. [We didn’t understand how this would work, particularly for bills that are the same size.]

We had the impression that redesign of \$1 coin to be more discernable might changes several people’s opinions about use of coins vs. banknotes for the \$1 denomination.

E: She suggests that we try to think of ways of helping other disabilities, to maximize benefit from the coming changes.

D: She wants to keep the \$1 bill, but different bills should be in different sizes and colors. The big numbers should be on multiple corners (at least two).

W: She’s in favor of different sizes for bills. She notes that a Braille embosser for bills is sold by MaxiAids.

M: “If we had a real silver dollar [having actual silver], we’d have something of value that we could be proud of. Colors could help low-vision people. They’ve been studying it since 1983. Maybe now the Treasury will talk to blind people.”

We asked - What if the bills were the same except for tactile feature, and they took the worn ones out of circulation faster?

There was some concerned that this plan might not cover everyone (particularly those who have tactile difficulties).

M: “Consider other disabilities? Why? We’re the only ones having trouble with the money.” He has no problems with current dollar coins.

J: “ACB found that there was a time before 1995 when Marc Maurer (President of NFB) said we should have accessible bills. Now that ACB started pushing [the issue in court], NFB’s position changed. She wants different lengths, with a folding card adapter like the one used in Australia.

W: “The Australian system is too cumbersome.”

E: We have devices that can already read. We don’t want that. We do not want to manipulate our bills through some machine or something. We want to be able to tell our bills without someone telling us or showing us or putting it in the machine etc.

We asked - Is mostly-good good enough?

- I think we should have it so we can all get it.
- If we’re going to a new system, let’s do it whole hog. Let’s make it simplified, not more difficult. Let’s get rid of the penny, and move to dollar coins. As long as we do it piecemeal, we’ll never get it done. Everybody has to work together.

- Need \$10?
- Yes

G: Regardless of units, suggest that the lowest denomination should stay the same size, and the \$20 should also be that same size. If it would expedite things, I'd accept getting help with those (two denominations that might be confused) until the lowest is taken out of circulation.

M: No, we need to have something that works with every denomination.

M2: More people are having vision problems, particularly with macular degeneration [and the aging population]. "I'm 53 years old now. I've been working since I was 13. I'd like for someone to hand me some money and have the ability to tell what that money is. I'm so tired of asking someone. Folding bills is great; you can organize your own money, but I want to do it independently. I've been ripped off before."

F: She traveled around a lot, but we don't know how other blind people feel about their currency.

C: She suggests BEP keep the \$1 as it is, and get rid of \$20, \$50, and \$100. She also suggests a new form factor for a banknote reader. Make a credit card, where you can press a corner and hear what is there.

J: Make things tactilely identifiable, visually unidentifiable.

M3: He suggests using Tyvek as a substrate.

W2: She suggests leaving the \$1 bill as it is, and change all the others.

W3: She was ripped off by a bank guard. The FBI was there. The guy lost his job. The story made it into the papers.

W4: "Can't you embed something in the paper that would talk when you squeeze it?"

ACB first focus group

- M:** 53, works at Lighthouse in St. Louis, has RP, cataracts & glaucoma, reads no print.
- R:** Lives in St. Louis, age 48, has congenital cataracts & glaucoma, reads small or large print, can read U.S. bills, though sometimes the \$20 and \$50 are confusing. Low light is difficult.
- E:** Lives in Kansas City, age 57, has optic nerve atrophy, can read U.S. bills in good lighting with close scrutiny, but not out in public.
- D:** Age 58, has Retinitis Pigmentosa, “low partial” sight level, he can read some text with very bright light, but can’t generally see features on U.S. bills. Higher contrast is better. Has color sensitivity issues.
- L:** Lives in Colorado, age 56, works as an administrative assistant, has no vision, caused by congenital defect (recessive), no light vision, no reading experience, but knows the shapes of numbers (she had an Optacon).
- J:** Age 58, lives in Washington DC, works for DC Dept. of Health, has Retinopathy of Prematurity, some light perception, doesn’t read U.S. bills, knows number shapes, uses Optacon still, uses a banknote reader, and has the money Braille from MaxiAids.
- R:** Lives in Chicago, works for SSA, age 53, right side is prosthetic, hole in retina & deformity. Left side had corneal transplant & cataract removed. The glasses she uses are the lens for her functional eye. Standing still with very bright light, she can read U.S. currency. But it is hard to find the numbers. She has nystagmus as well.
- T1:** Lives in Chicago, age 62, totally blind, retired.
- A:** Lives in Austin, TX, has Retinopathy of prematurity, doesn’t use any print, has no light vision.
- M:** Lives in Topeka, KS, age 53, “high partial” vision level. He has 20/200 acuity due to congenital cataracts in one eye. The other eye has structure problems. He has “the opposite of glaucoma” – low pressure in the eye. He can see U.S. currency well, has good color vision, but very low contrast perception for the amount of acuity he has. He likes the new bills’ colors. With new large numbers you need to orient the bills first. He uses an Optacon. “If you’re going to use a large number, I wish you’d put it on all 8 corners.”
- J:** Lives in Indianapolis, Indiana, age 59, has Retinopathy of Prematurity, his light perception is diminished now. He is effectively totally blind. He has a sighted assistant he trusts.
- T2:** Lives in St. Louis, age 32, he does transcription of interviews and focus groups. He is totally blind from Retinopathy of Prematurity. Optacon was before his time. He hasn’t learned letter shapes.
- Most other people in the room didn’t know a money Braille existed.
- When asked, we noted that there were two owners of portable banknote readers, five had flatbed scanners, two had KNFB Readers, and four were CCTV users.
- One participant reads bills for her husband as well with the CCTV.
- R:** Uses a portable video magnifier, but says it isn’t very practical for using in the field. “You don’t want to be standing in line in a crowded place looking at your money with [video magnifier].”
- D:** Has a Black & White CCTV, and says it doesn’t help so much with money.

- A:** Uses OCR scanner at home, but it isn't very accurate with U.S. currency.
- M:** Has lens-mounted magnifiers [telescopes mounted on his glasses] that help with denomination. Another participant has portable magnifier, but doesn't like taking it out.
- M:** Sometimes feels insecure about putting money up to his face, so uses lens-mounted telescopes to read from arm's length.
- R:** "I already have a Braille Note [portable Braille note-taker/computer] and a cell phone, and a dog guide. Where would I put another device?"
- M:** Says he would not use KNFB Reader software if it were free, because he disagrees with NFB philosophy. "I would not use it because I think that telling blind people that we have to have any kind of special device in order to read our money while sighted people can walk up, get their money, and walk away, is an act of discrimination." "The price will never be right."
- D:** (Regarding banknote readers) "You have to put the money in just right, and sometimes it doesn't work, and you can't understand what it's saying, and it costs \$300, and you have to get updated software every time the money changes." "Even if you have the software on your cell phone, you may be in a place where you don't want it out there; you don't want to be messing with your money. You just want to be able to reach in your wallet and get it out really quick." "Any time you have a device that requires speech output, you're closing out our deaf-blind friends. And maybe you're in a place where you don't want the whole world to hear what you've got." "The NFB Reader does not do it quickly enough to be able to use in situations where you have to handle money as part of your job."

One participant's family has a business (Quiznos). She says they could purchase a talking cash register, if she could sort the money. "There's no way that we could possibly use any of the equipment that is available now. We'd be spending two and a half minutes just at the cash register. Different color bills would make it easier for sighted workers to avoid mis-sorts."

We asked - - Are there any greater-than-arm's-length situations that we should be concerned about?
None were suggested.

"I want to be able to reach in my wallet, feel what I've got, and be able to hand it right over, rather than to be going through it where people around me can see what I'm doing. I'd like to be able to do it the way other people do it – reach in, there's 20, there you go."

One participant suggested that the immigrant population might benefit from color differences.

One arms's-length scenario is talking to the bank teller, when there is glass between you and the teller. But at that distance low-vision person can't see current U.S. bills.

One time when one participant lost money, he couldn't tell difference between a \$50 and a \$20. "The only solution to that is if I have a quick way to recount the money when it is handed to me – a way that I can tactually and/or visually recount that money immediately. That's not practical if I have to get out a device."

Several participants noted that there is pressure from the people behind you. "Maybe they're on lunch." "Colors make a difference for speed. When you go to a casino and change out, they count it behind the glass – another arm's length situation."

One participant had a sighted person in line behind her at Wal-mart catch a \$5-for-\$20 switch once (3 years ago).

We asked - - "What people thought of use of color on banknotes."

"Color-differentiation of digit is nice but not enough."

One participant wasn't aware there was any color in money. "Black looks kinda grey."

One participant liked the corner-cutting solution in the "Skivers bill" because it prevents upgrading bills.

Most participants were not sure if they'd continue to fold the bills if they were immediately accessible using the Skivers method. They would need to examine all 4 corners to denominate.

S: Keeps \$1 bills separate in a money clip, then \$20s flat, \$5s and \$10s folded same way, but stored with the crease facing in the opposite direction. \$50s and \$100s are stored separately.

M: Likes the new \$5, will turn it so digit is on the outside of fold. \$50 and \$20 and stored in a separate place. Twice paid with \$50s, got change for \$20s. He realized later (in a restaurant). He didn't look until got home -- cost \$30.

"Numbers are currently not in the most convenient corner."

A: \$1s straight, \$5s in half. \$10s folded length-wise, \$20s flat, \$50s stored separately.

A: Is not worried about potential problems with money paid out. Receiving money is the issue. "The change I get back, I want something that I can tell immediately. I don't want something that you have to lay on the table, or rub on, or pull through your fingers, or anything like that."

When asked, most people at the table said they had given someone the wrong bill at one point, some "frequently". Usually they didn't know why. Sometimes they wondered if they had been cheated in a previous transaction. "You don't know how to sort that out."

For some participants, if there is a dispute about the value of the note handed to the merchant, the blind person might have the merchant hand it back, then give the merchant another bill. "But then you might get back the wrong one."

Consensus: Sometimes forcing a cash count will go in their favor, but most of the time they might not force it.

M: "You think you know what you have, but then you second-guess yourself."

One participant says if told "You've given me the wrong bill," she'll switch to use a credit card or switch bills. "It does happen, some people working in a store will deliberately say the wrong thing."

"Some of the cashiers will argue back, 'then what are you going to do?'" "The last thing you want to do is say, 'well look through your drawer' and then everybody else behind is yelling and screaming."

D: Says he's pretty sure what's in his wallet, unless he was away for a week and hasn't check his wallet with CCTV.

E: Doesn't carry cash at all. "With credit card, if there is a dispute, there is a paper trail."

A: Uses a folding system (most typical methods), with different places in wallet to put them.

A: Says the metal in his signature guide causes touch-screen point of sale system to fail, so credit cards are not always good either. "Which side of the cash register you are on determines how often you have problems." He says he has friends in the RSA program, and people try to rip them off frequently.

Consensus from discussion: KNFB Reader is disliked because they're putting it forth as the solution and they don't agree that it is viable. Aside from the politics, it wouldn't matter who put out the device.

"If you purchase the NFB Reader you won't have any money to read."

One blind participant has a custom folding system. She asks for 1s at the bank. She is not as careful in her own neighborhood.

The others feel that keeping a lot of change (small bills) would be too inconvenient.

One blind participant has wallet with multiple slots (called a French waiter's purse), because she was cheated so often. She keeps all bills separate, has lots of ones, and few 20s.

Consensus: They fold each bill separately. So they don't have to re-fold the others again.

J: Braille is good because "What if you want to use a money belt? You can't because of the folding." The money Braille allows her to use the money belt, keep all money flat.

J: For \$50s and \$100s, she folds them small to tuck away. Her wallet was missing when she got off the bus in Ohio the day before. She lost \$200+.

M: "I wasn't sure what I do because it's so automatic." He keeps bills folded flat, but in groupings. He generally knows how many of each denomination he has. He just needs to remember how many of each. If he forgets then he holds it up to his face and nose-distance. When receiving change, he puts it all in his wallet, then goes somewhere out of view, and "sniffs each bill", and re-sorts it. A cab driver told him he got the wrong bills once: the "Accessible ATM" gave him \$10 bills because it was out of \$20s.

T2: There are places that I would never give my credit card info, such as pizza delivery. They can run any amount they want, and I'll sign it and my \$15 pizza becomes a \$30 pizza. Also a lot of cabs won't accept credit cards. Most transit won't take cards. (There was agreement from some others at the table over this.)

M: He puts money in different places in his wallet, and also uses the folding method. "\$2s and \$5s are just as hard to differentiate as the \$20s and \$50s."

W: Uses bank for getting cash, and rarely uses ATMs. She doesn't want all \$20s.

Most participants at the table ask for specific money at banks. Most also use ATMs. Most pull more than \$40 at a time. "Can you imagine standing there at an ATM, in the rain, or in the hot sun, and you pull out your device and you're supposed to read all the money?!" "No, you take it and go somewhere else."

Most participants said they are more likely to use plastic for large purchase (more than \$50).

A: Uses online banking for bill payments.

Most participants avoid using point of sale terminals due to inaccessibility. "I avoid them because I don't know what I'm doing."

[ACB apparently recently negotiated some agreements with some companies to make PoS machines accessible.]

Most participants use debit cards as opposed to credit cards.

Most participants don't use vending machines much because they can't tell what is in them. Also bill orientation problems are annoying. "There are three wrong ways to put a bill in."

We asked - what accommodations people would prefer. "Size is quickest. If not that, tactile features that are long, short, or diagonal. Circles or squares would be OK too."

A: Says the new \$100 is supposed to have tactile filaments (false claim). He says tactile threads would be the quickest, best way for easy recognition.

One participant wants sizes to be a lot different. He said the Italian Lira were too close to each other. "My concern with the different sizes of money is that unless you have a full range of different sizes in your wallet, you still can't tell which is which."

There was some disagreement over expected durability of tactile features.

T1: Suggests Red on white is best – red is the first color on the back of the retina. "It jumps off the page."

"Color isn't going to work for everybody. Color and size works best. Better than half an inch different."

M: Suggests using a different substrate material for each denomination.

We asked - if anyone would like to be able to use a regular color identifier for currency. There was no support in the room. "I don't get it." "You'd be carrying another device."

Consensus of low vision people They want different base colors.

One noted that Retinitis Pigmentosa patients sometimes want light on dark.

ACB focus group #2

A: Age 23, from Texas, has some light perception

S: From Rockville MD, age 35, totally blind

S2: Age 15, from Missouri.

B: Age 22, from Tennessee, has Lebers Congenital Amaurosis, no depth perception, is sensitive to light, central vision is a problem, Colors are weak.

J: Age 24, from Kentucky, blind, has Retinopathy of Prematurity.

S3: Age 36, Indiana, has Retinopathy of Prematurity, some vision for navigation, can't read print. Can't read U.S. bills.

C: Has no iris, from Oklahoma, has contrast perception issues, is sensitive to light.

E: Has night blindness, light sensitivity, can read print in optimal conditions (Navy).

K: Age 20, has glaucoma, uses Braille money marker, from Tennessee, has low vision, can't read all U.S. bills in all lighting conditions.

T: Has nystagmus, myopia.

S3: Almost never carries cash, always uses Amex.

E: Uses credit most of the time, but carries \$1s when possible, doesn't risk bigger bills.

S2: Folds her bills. Says electronic bill identifiers are a pain to carry. She tries to give out bills that are close to the right value.

S2: Has a money marker/Brailier, but mostly folds hers.

B: Favors credit cards. "Cash makes me very uncomfortable because I never know if I'm getting correct change back or not."

J: His wallet has three compartments. He folds money different ways, and tries not to carry larger than \$20. He usually uses a debit card.

S3: Forgets the folding technique. She uses cash when some places don't take debit. Starts with \$20s, at the back, folded in half. She remembers how many she has of each denomination. She tries to get \$5s as change. Once in a while, she checks (confirms her inventory) with trusted sighted people. "A lot of times I forget."

T: Doesn't like to carry cash, no more than \$20 or \$25. It bothers her most not being able to see from far away. She hates having to take all of the money out of her pocket and look at it very closely, where everyone can see. She tries to use her debit card, but has some difficulties with touchscreens.

K: "It puts you in a state of dependence, because you have to ask someone what that is. You're putting it in their hands, to be completely honest or not make a mistake. It's not the most expedient option."

It takes the option away from you of truly knowing what your money is, and being sure it is accurate.”

We asked - : “When was the last time you gave out the wrong bill?”

S3: So many times I can’t count them. One reason she switched to Amex. The last time was probably sometime this week, because she had to carry cash this week.

E: She gave taxi a \$50 this week coming from the airport, thought it was a \$20 – big tip! She likes to charge, and usually takes busses. She can do that with a change card.

S3: Her taxi company at home takes cards.

S1: It has been a while since she has given out the wrong bill. She can remember the last time she was given wrong change though (it was too much). “I remember thinking, gee, I really wish I was able to make this distinction on my own. I wish I didn’t have to depend on my mom for this.”

S2: She gave someone a \$5 that same day, but thought it was a \$10. Her mom was there with more money.

B: The cab on the way to the hotel was last time she gave out the wrong bill. “I had a bunch of old money in my purse, and I don’t fold successfully.” The bellman helped sort it out.

J: He once gave a cab driver the money, though it was two \$5s, but it was two \$10s. The driver told him the correct values.

S1: “I don’t consider myself all that old, but about 10 years ago I felt very confident that if I was over-giving, I was going to give it back. There aren’t as many honest people these days. I feel far less confident that I’m going to get my money back. I was fairly certain that I wasn’t going to get cheated most of the time before. Now I don’t like knowing but I’m fairly certain I’m not going to get my money back at least some of the time.”

S3: “The last time was probably this week. I’ve learned to check my bills before I give them. I probably pulled out a \$1 when I needed a \$20 this week. I started folding two stacks instead of one. I now have a little stack of \$20s and a big stack of \$1s. I will usually ask, ‘what is this?’ even if I think I know.”

K: She says she probably gave someone at a meeting (at the convention) the wrong bill.

K: Once, in a store, she confused a \$20 and a \$50 (which look a little similar to many low vision people). She gave someone a \$50 when thought it was a \$20. That’s an example of when visual denomination isn’t an option. “The person happened to be nice, but I could have been out \$30.”

S3: Once, in NYC, a taxi driver meant to give her the wrong change. She thought she gave the guy two \$10s, and four \$1s, but actually gave him two \$20s, four \$1s. “I usually confirm, because I have discovered that the older I get, the less short term memory I have. So I said, ‘this is 24 dollars, right?’ and he said ‘yes’.”

K: She once handed a \$20 for a \$4 item, got back \$6, but she corrected him. The guy apparently didn’t realize she could see some.

S1: “Maybe two years ago. I gave him \$20, the thing was \$2. The man said I had only given him a \$10. We argued over it. He didn’t realize that my friend and I were together until he said, ‘I saw her give it to him.’ Then we called the manager. After a cash count, I got my money back, and got the thing I was buying for free.”

- S2:** She got incorrect change at a Barnes & Noble, thought it was an accident.
- B:** She was once at a Chic Filet, and gave them a \$20, but thought it was a \$10, and got change for \$10.
- J:** He purchased computer at electronics store. He returned it. The wanted to give him part in cash, part as a check. He didn't have any way of knowing if the check amount was right. He had them bring the manager, got company to send a check for the full amount.
- S3:** Two incidents stick in her mind. 1) A pizza delivery guy shorted her two dollars. He took his tip without allowing her to decide. Her ex-husband didn't agree with her that this was improper. 2) Food delivery again. This time she was shorted \$10 in change. She called back later. The record said how much it was supposed to be, and she said she didn't get correct change. The delivery guy lost his job. But she needed the money more.
- A:** Can't remember the last time. "What's important is that I may not even know. In an event like a convention, you might have a lot of money on you. You deal with a lot of bills, and it's kinda difficult to keep an exact count of inflow and outflow. So it probably has happened to me."
- S1:** "It is demeaning to walk into a store, and pay, and have someone say, 'I'm honest, but how would you know?' And you don't have a response. There's not a good answer. That's why we need the accessible currency." When asked who at the table uses a banknote reader device: Three do. One other used it at a training event. None take it out shopping.
- S1:** She says she's old enough to have gone through the advent of them. I can remember several versions where the money that you fed to them had to brand new. "I say this doesn't help. I can do this myself."
- S1:** "It's still something else you have to carry. Nobody sighted has to carry anything to tell their money."
- S3:** "I don't really want to go to a bank or the store, and have it go 'ten dollars' so everyone can hear. And then stand there while everybody else waits. As a practical consideration, it's just like pulling out all of your money and showing them what your money is."
- T:** "And if you're been cheated, using it later is not going to help."
- M:** "Immediate access. That's the point."
- S3:** "Accessible currency is really important, but it's also really important to take responsibility and ask."
- S1:** Accessible currency would take away my dependence on somebody else's being honest. I've been cheated often enough to know that everybody is not honest. I don't think it's unreasonable to have accessible currency. Many other countries understand the need to equal accessibility to currency by their blind people."
- S1:** "Technology is very helpful, but when the technology breaks down, if there is not another way to do what you want to do, you're dead in the water. Something as vital in our society as money, I don't think we can rely on a piece of technology. Money is the way that we live. What do we do for people coming from other countries to the U.S.? Give them the technology? What about washing bills? If you have different sizes, you can't change the denomination." "What about adding a couple of different accessibility features? Wouldn't some of the accessibility features be considered safety [anti-counterfeiting] changes?"
- R:** "With sizes, it seems like you cover all of the bases you need to cover."

Consensus on use of Braille : not everybody can read it, and regardless of what you put on it, it wears off too quickly. “Many of us are in favor of Braille, but not to the exclusion of other differentiating feature.”

A: Some people have neuropathy in their hands and they can't feel Braille.

A: Everyone has different disabilities, and the Treasury is going to have trouble satisfying everyone. Some people don't have hands.

T: Size is going to cover more people than the Braille.

J: Regarding Canadian tactile feature **S:** “Unless it's new money, it's not there. Even if we find a way to make the Braille more durable, if someone is determined to scratch away the dots, they can.”
“Could you also print money on a different form of paper, such as plastic?” Or as an overlay?

S1: Points out that multiple affordances might ensure against upgrading through Braille-stamping.

S1: Lived in UK for 6 months, got used to the size differences without using the guide. “Eventually you get to know the sizes and you dispense with the card. I lived there for six months and could do it after two weeks.”

S1: A low-tech solution like that might be more tolerable. “If you have 5 bills, you only need to change 4? Forget the 1 and 100.” Same width, different lengths seems OK to most but not all at the table.

A: “Even 1/8 inch. – No way.”

We asked: What colors are ideal?

Consensus on colors is that Color on white/blank is better than color on color, if the foreground color is dark enough.

M: Suggests light on dark in one corner of the bill, dark on light in the other. “Denominate and facing both important, but don't want to have to do so.”

J: Suggests having a tactile feature an inch away from the tail edge, down the back part of the bill. He suggests using the anti-counterfeiting foil as a “which end is up” indicator. Also he suggests doing usability testing with post-wear-test bills when they come up with their tactile features.

J: “I've had more problems with delivery people than with taxis. But I know the taxi drivers [in my town].”

S3: In NYC, most delivery places take cards.

Maryland Chapter of NFB focus group

- F:** Age 73, low vision, can read money OK with large numbers, but it's a struggle compared to 10 years ago.. Can read \$1 and \$100 OK, but with more difficulty.
- A:** Age 53, low vision, reads bills under most circumstances. Low light -> can't read it. Can't read at arm's length. She uses non-visual techniques in handling currency – folding. She considers this more reliable just in case.
- E:** Age 43, no useful vision. Folds to keep track.
- L:** Age 52, totally blind, folds bills to keep track of them. Doesn't deal with \$50 or \$100 bills. (Doesn't get them much.) "Sometimes people will tell you what you have. I like to try to stay on top of things when I'm releasing my hard-earned money."
- K:** Age 37, low vision - can see , but mixes up \$20 and \$50, so he avoids \$50s. He really likes the new Big Purple \$5 – it's easier to see. \$1s, \$5s, \$10, \$20, \$100 are OK.
- S:** Age 35, totally blind, uses the most common folding method.
- S2:** Age 25, has almost no sight (light only), uses bill folding method.

M: Low vision. She uses her vision at arm's length based on silhouette. She says she could read the numbers from a couple of inches but silhouette is easier. The changes with tinted bills didn't mess her up. Her eye doctor says her vision is not measurable any more. She has color vision, can see the tinting on the new \$5 bill.

B: Age 70, low vision [20/1200]

F: Says the new color of the BP5 is OK the way it is – doesn't need to be darker. He'd like to see something like that (larger colored numbers) for other denominations as well.

K: Wants each bill to have different background colors.

M: Agrees; she wants hot pink, yellow, etc. She says this would help seniors. She says it wouldn't impose excessive costs implementation, and would help everyone with some vision.

K: Wants notched bills as with the Skivers Act. He says this wouldn't be difficult.

F: Wants BEP to Braille the money.

M: Wants different corners cut in a code/pattern (as with Skivers Act).

B: Wants to ensure that notching ensures no counterfeiting – no upgrading to different values.

B: Uses the print. Has a bit of trouble with \$100, but the other denominations are OK. He'd prefer to have larger numbers on the \$1 and \$100.

M: Suggests different textures to the papers, or weights. [We mentioned that there is a bit of a difference, and it's on the list of possibilities.] She wants one very slick, one rough.

F: Says Tyvek requires a special ink, but is durable.

F: Uses a lighted (LED) hand magnifier for reading print. No one in the room, when asked, thought the BP5 is too big.

M: Insists there can be no “too large”.

M: “Contrast is an important part. It’s why these darker numbers are better.” She says the purple in the new 5 is probably not better than the previous dark green. For M, light on dark is better.

A: Has worked concessions. For speed, numbers on recent generation were fine. But with practice she started using silhouette. So it’s a combination. But in her purse she keeps bills folded.

We asked - when was the last time you received incorrect change?

A: Says she was ripped off once in 20 years that she can remember. She wants any changes to happen once – so make it in some tactile manner. She wants some other method besides just color. “I don’t care if we change the money, but if we do, I want to be able to reach into my billfold and be able to tell something tactilely, for speed and efficiency.”

K: Says he generally doesn’t have trouble with currency.

S1: Says changing edges or shapes might work. Colors are also good.

K: A couple of days ago, someone gave him a \$5 instead of a \$10, but he caught it visually. “Every one makes mistakes.”

E: Receiving change at a restaurant at convention (a few weeks earlier). Her change, put on the table, was \$5 short. She insisted that he come back and identify it, and caught the error.

M: At BISM two months earlier: An old man gave her a \$100 to buy some soap (she makes it). He thought it was a \$20. “If I had not been an honest person, he would have been out \$80 right there.”

M: “We really do have to come up with more than just the colors and markings on the bills. That would help the majority but it wouldn’t help the totally blind.”

B: “No matter what is done, you’re not going to help everyone. No matter what you do, there will be someone who won’t understand it, won’t follow it.”

B: Doesn’t recall having an issue with getting the wrong change. Low light is a problem for him, but he carries a flashlight. Even in bright sunlight it can help him.

A: Regarding older people (she’s a gerontologist). She wants the government to think about colors with regard to aging, and consider typical color vision loss patterns with Macular Degeneration in particular.

E: She had an incident earlier this year with another blind person who gave her \$100 bill. Just today, she was dealing with another blind person, but didn’t know how well that person handled their money, so she felt obligated to have a sighted person check it.

We asked - when was the last time you gave someone the wrong type of bill?

M: When it was very dark once, she gave someone a \$100 instead of a \$50. The taxi driver told her at the time (being honest). Lighting can cause such problems for her.

F: “The \$50 is a very difficult bill.”

M: If it helps us, it is going to help seniors. If we do something basic like changing colors, it can also help people who have different kinds of learning disabilities.

K: Again wants a corner-notching system.

A: Doesn't fold \$50s and \$100s; instead puts those in a different place. M and F agree.

F: Says he put \$50s in a different place to avoid confusion with \$20s. **We asked** - "Do you avoid using ATMs?"

A: Avoids ATMs that give \$10s.

E: Only requests units of 20s.

A: Avoids using debit cards in order to avoid using the touch-screens. She runs debit through as credit.

B: A decision should be made about changes – make one change [scheme] to last a long period of time.

M, F, and a couple of others: Typically use credit cards for large transactions. For F, \$25-30 is top for cash.

E: Likes the idea of embossing bills, or cut out holes.

E: "How well would having different sizes work? Hard to tell."

M: Suggests says changing shapes too if BEP is going to change sizes. **K** agrees.

B: Wants an additional tactile feature on back of bills, (as opposed to or—less preferred – in addition to) size.

E: Suggests cutting or notching corners is not optimal because it would cause excessive of wear.

E: Points out that checking all 4 corners is slow. There was a discussion of how size differences might be received.

A: " If the sizes are distinctive enough, then it could very easily work. There would have to be enough significant difference between the two. Otherwise it does make a difference if you have something to compare it to."

M: "Some people require more dramatic differences than others to find it useful."

A: "Whatever change is made, I'm still not likely to use that method. I'm more likely to use some tactile measure – size, texture, etc."

M: "The problem with holes is that after the thing has been through a machine a few times you would have trouble feeling the edge of the hole."

B: "Wear-out, how long the bills are expected to last, makes a difference on these tactile features."

We asked - How many of the participants had used foreign currency?

A, E, F, M: Have all traveled abroad.

F: Used UK pounds, but didn't get used to it. "It was a little difficult. About the time I got it down, I was out of there. Constant use helped. It was not easy. I had to look and look. It was tough because I wasn't used to it."

- A:** “I’ve probably used paper currency in a dozen different countries.” She has seen colors, sizes, print designs, tactile features, and Braille in a different country.
- A:** “The Braille and stuff is useless. That kind of tactile identification is totally unnecessary. It’s so risky to rely on exactly what you’re reading. [referring to an older Dutch system] . They all thought it was wonderful, saying ‘look! It has Braille.’ I’d say, ‘ That’s very nice, but so what? It doesn’t mean anything.” In some cases, she used a combination of feature (if the sizes were too close). In countries where sizes were close together, it wasn’t enough unless she had something to compare it. If she had color, texture, etc. in addition to the size, then it was OK. Still, she folded them for reliability to feel confident and secure in knowing what she had. “If there was enough of a size difference, I could do that quickly.” Enough is hard to define.
- E:** Agrees that the Dutch tactile markings were insufficient. Sizes of older German Marks were not sufficient for her either. The little CashTest currency-measuring device would be useful though.
- S:** She lived in Canada for a while, but at that time they didn’t have the tactile system. She got a banknote reader device from CNIB. It worked well enough, and she carried it around with her. She also used the typical folding method. Was it time- consuming to use the device? Yes.
- F:** Once used a talking cash register; it voiced the amounts. But he hated it because he didn’t need all that chatter.
- K:** Asks The KNFB Reader – does it work with money? Yes.
- E2:** Says he wouldn’t use it in checkout line, because it is too slow.
- A:** Recognizes that practice could help a lot with size schemes.
- M:** Doesn’t believe people would get used to 4mm differences.
- E:** Points out that the CashTest is reliable.
- We asked:** Is requiring use of the CashTest device an acceptable solution?
- A:** “I don’t want to have to carry a separate device with me. I want speed and accuracy. I want to be able to reach in, whether I can see it or not, I don’t want to have to care about the lighting. I want to be able to reach in, get exactly what I want quickly, do my business, and go on.”
- M:** “Just like we used to be able to do with coins. It has gotten harder with recent changes. It has to be something that is as easy as it used to be with coins.”
- F:** “People must like the devices if they’re asking for them.”
- M:** “You don’t know.”
- A:** Says Braille-like method is not helpful. There’s a difference between Braille and tactile identification.
- We asked -** Is real Braille (as a redundant tactile feature) a potential bonus? Or should they just avoid it.
- E2:** Favors including Braille if redundant.
- A:** Doesn’t want to have to search all over a bill to find the tactile feature. Also, she wouldn’t rely on the actual Braille anyway.
- A:** Suggests using a simple symbol system – line, circle, etc. – instead of Braille.

K: Believe lines would be easiest.

E2: Says Braille or not doesn't matter because you have to look for it anyway.

F: Agrees.

K: Says lines could be helpful to low vision people.

A: Wants tactile choice (if there is one) to not be Braille-only.

M: Suggests lines or bars – count them as with the Canadian bills (but print on both edges). She wants to be able to reach in wallet to feel them.

E: Says it has to be pretty easy. The problem is that (adding tactile features) means it bulks up the money.

B: Counterfeiting (of the tactile feature) is a concern. Consensus in the room is that counterfeiting of blindness-specific features (to fool only blind people) is a real concern, though perhaps not more than for other people.

F: Says people inside a government agency where he worked for years would steal from others. "You have to watch everyone." Everyone in the room uses cell phones. All of the low vision people use CCTVs occasionally except M.

F: Prefers speech output for a currency reader device. M and A prefers none of the above. But A says speech is preferred if forced upon her.

K: Says using a device is fine at home.

E: Says the device doesn't help you prevent rip-offs.

A & E2: Say that they don't get ripped off as much as is rumored.

M: Says people in vending businesses are the ones who are getting ripped off.

E: Says she wants something that she can do at the time she's receiving the money. Now she asks the merchant what it is. She assumes she may have to do that with a new system for maximum speed. But she wants to be able to check right there if she needs to.

M: Says frequency of incidence of mistakes and short-changing has a lot to do with how you project confidence, etc.

We asked - How people were trained to use U.S. currency.

A: Was shown in rehab.

E: Was shown in rehab. Before that she struggled with reading it visually. Learning the folding method earlier would have helped.

A: "The government isn't going to come up with a system that will please everybody, but we'll learn to live with the new system however it is."

Consensus: Whatever is done should be for a long-term solution, not immediate stop-gap.