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Designing a CBDC for universal access

Staff Analytical Note 2020-10 (English)

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Universal access is a Bank of Canada policy and design goal. The Bank has a history of making bank notes that are accessible.¹ They are available in Canada's urban, rural and remote communities. Users of cash do not need a bank account or a digital network and do not pay fees. The Bank designs every note to be easily used by everyone, including people who are blind or partially sighted. Our current research explores how a central bank digital currency (CBDC) could also be designed for universal access, should the Bank decide to issue one.

Key messages

- **A CBDC should be as accessible as cash.** A CBDC is a digital product that can be designed to include many of the attributes of cash (e.g., ease of use, portability, offline function). Using a CBDC should be a positive and inclusive experience—from acquiring it, to using it in transactions, to being assisted by its support services.
- **Multiple formats for a CBDC can embody the design principles of universal access.** The Bank is exploring multiple formats for a CBDC, including conventional online and mobile technologies, as well as custom devices and deviceless solutions. We will consult widely with stakeholders and users on these options.
- **A CBDC could be used through a dedicated universal access device (UAD).** One potential concept the Bank is investigating is a custom device that is engineered for universal access while securely storing and transferring a CBDC. The device could incorporate attributes of cash and take advantage of specialized technologies. Such a device should be manufactured at a low cost and issued by the Bank to ensure maximum inclusion.
- **A UAD could be resilient in ways that a smartphone is not.** A UAD could embed a local, secure store of value, be network-independent and operate for long periods on a local power source. If there is an infrastructure failure, a UAD may prevent the interruption of digital transactions.

Universal access

Maximizing inclusion

The Bank seeks to design a CBDC that would maximize inclusion and usability. It should be able to serve people with or without smartphones. It should also support online and offline transactions. A CBDC needs to serve:

- people of all ages
- people who are blind or partially sighted
- people who have physical or cognitive challenges that could affect their ability to use technology
- people on low or fixed incomes (i.e., using a CBDC needs to be affordable)
- new Canadians who have not yet established bank accounts or credit
- people living in remote locations where network coverage is limited
- all Canadians when network coverage is temporarily or persistently unavailable
- all Canadians during power outages

As with bank notes, the Bank would consult widely with these communities to ensure the solution responds to their needs.

Serving everyone

A CBDC should be designed for the entire Canadian population. Care must be taken during the design phase, as small problems can become significant implementation issues. The Bank has committed to a design methodology that seeks to:

1. understand user groups through extensive consultation
2. analyze their specific needs
3. consider multiple design options
4. develop a prototype for early feedback and improvements

We recognize that good design should benefit the entire population. For example, a design that serves the needs of people who are partially sighted would benefit everyone in conditions of low lighting or visibility.

Cash plus digital

A UAD with cash-like attributes

A CBDC is a digital product that could be designed to include many of the attributes of cash. A UAD could embody the following cash-like attributes:

- a single-purpose design dedicated to cash-like functions
- an appropriate size (i.e., fits in a wallet alongside cash or cards)
- the efficiency to conduct small transactions (e.g., a parent giving lunch money to a child)
- the token-like ability to store and exchange value offline
- visual and physical features that facilitate budgeting
- a low cost per unit

A UAD as “cash plus digital”

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people with disabilities. For example, unlike accessing cash, loading value to a UAD can be done without leaving home.

Conventional and custom devices

Technology options

A CBDC could offer users a choice of technologies, including conventional online browsers and mobile devices. Conventional devices already have accessibility features. For example, internet browsers can be configured to display text in large fonts and mobile devices allow voice commands and accommodations for limited visibility or colour-blindness.

The Bank continues to research custom devices and technology that can increase inclusion and accessibility. Options for technology formats include single-component devices, dual-component systems and deviceless solutions, each potentially including biometrics.

Single-component device

The Bank undertook an exploratory design process to develop a conceptual single-component device with universal access features. Beginning with the persona of a seven-year-old girl, we identified various use cases, such as receiving allowance, buying lunch at school and purchasing games online. We created an interactive simulation that had a large onboard display for balance and transfer functions and that allowed both point-of-sale and device-to-device payments. Accessibility features included large fonts, audio guidance and single-handed operation. Thicker than a credit card, the device could still fit into a wallet.

Dual-component system

We also explored a dual-component system. A proof-of-concept UAD design consisted of a stored-value card with an embedded e-ink display showing the current balance. Such a card could be used on point-of-sale devices or paired with a smartphone for online and peer-to-peer transactions. The card could also be inserted into a compact peripheral device for direct, peer-to-peer transfer between cards.

Deviceless solutions and third-party designs

Multiple design choices are possible for both single- and dual-component systems. Other deviceless designs also exist. Innovation is improving the usability and security of biometrics (e.g., fingerprint and facial recognition). The Bank's approach is to prototype multiple designs and evaluate their performance. It may be possible to allow third parties to provide additional designs if the Bank supervises them to ensure they meet standards for privacy, security and universal access.

Resilience and cost

Resilience in crisis

A UAD is resilient in times of crisis. It could be designed to carry a local store of value, use a local source of power and operate without a centralized network. Devices could be designed to operate for long periods on local power alone, with potential access to natural sources of energy (e.g., sunlight). Alternatively, if power is lost, funds may still be recoverable from the embedded value store. However, allowing long-term offline storage of value on a device has certain security risks that we are investigating (Minwalla 2020).

Minimizing costs

The cost per UAD should be minimized to enable widespread distribution and periodic replacement as required. If not attached to individual users, UADs could be exchanged for their held value. Keeping the cost of the device low should make this type of exchange easy. This functionality can be further supported by dual-component systems, where whole cards could be exchanged for goods or services.

Recognizable and reflective of Canada

Canadian bank notes instill confidence and pride; a CBDC can do this too. Bank notes are designed using a set of principles that allow them to be secure, functional, immediately recognizable, inclusive and accessible. Bank notes combine art and technology. They integrate visual content with security features and functional requirements. The result is aesthetically pleasing bank notes that have a broad appeal among Canadians. The design of a UAD could follow similar principles and incorporate visual and security elements from current bank notes. This would allow Canadians to recognize the device as a Bank of Canada product and adopt it with confidence.

Reference

Minwalla, C. 2020. "Security of a CBDC." Bank of Canada Staff Analytical Note No. 2020-11.

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1. See the Bank's "[Principles of Bank Note Design](#)."[\[←\]](#)

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