Question: 22. Are there additional design principles that should be considered? Are there tradeoffs around any of the identified design principles, especially in trying to achieve the potential benefits of a CBDC?

Return to CBDC Benefits, Risks, and Policy Considerations

Question

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1. **Are there additional design principles that should be considered?**
2. **Are there tradeoffs around any of the identified design principles, especially in trying to achieve the potential benefits of a CBDC?**

Answer

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Non-Functional Requirements Design Principles

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Overview

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Some major design principles missing from the White Paper are the specification of Non-Functional Requirements. The Distributed Immutable Data Objects - Reference Architecture (DIDO-RA) provides a list of Non-Functional Requirements applicable to the CBDC. The following is an outline of the **Non-Functional Requirements**:

1. Portability

- Adaptability

- Installability
- Replaceability

2. Reliability

- Maturity
- Availability
- Fault Tolerance
- Recoverability

3. Maintainability

- Modularity
- Reusability
- Analysability
- Modifiability
- Testability

4. Security

- Confidentiality
- Data Integrity
- Non-Repudiation
- Authenticity
- Accountability

5. Manageability

- Types of Manageability Functions
- Manageability Costs
- System Manageability Issues
- Software Manageability Issues

6. Usability

- Effectiveness Metrics
- Efficiency Metrics
- Satisfaction Metrics

7. Performance

- Platform Performance
- Application Performance
- Network Performance

8. Interoperability

9. Elasticity

10. Scalability

Examples

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Some of these **Non-Functional** requirements were alluded to in the White Paper, but not directly specified or defined. Table 1 provides an example of cross-referencing the Non-Functional Requirements to the Benefits, Policy Considerations, Risks and Design requirements identified in the White Paper Analysis done by the Object Management Group .

Table 1: Example of mapping a subset of requirements identified during the White Paper Analysis conducted by the OMG.

Non-Functional Requirement	Benefits, Policy Considerations, Risks and Design requirements
Adaptability	B: B0008, B0016, B0025, B0026, B0029, B0032, B0033, B0035, B0037, B0038, B0039, B0048, P: P0007
Performance	B: B0009, B0011-1, B0011-2, B0017-1, B0017-2, B0024, B0034, B0045, B0047, P: P0026, P0028-6
Availability	B: B0012, B0013 B0053, D: D0016
Confidentiality	B: B0004, B0022-1, B0051
Efficiency Metrics	B: B0001, B0002, B0009, B0011, B0014, B0047, B0051, P: P0023, P0026, P0028-6
B = Benefit Considerations	
P = Policy Considerations	
R = Risk Considerations	
D = Design Considerations	

> **Note:** There should be no tradeoffs between **Non-Functional Requirements** and any existing requirements identified in White Paper as determined by the OMG White Paper Analysis

Discussion of Example

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The first requirement listed under Adaptability is Benefit **B0008**:

B0008	**3**	Provide entrepreneurs a platform on which to create new financial products and services
B = Benefit Considerations		
P = Policy Considerations		
R = Risk Considerations		

D = Design Considerations

In order to realize **B0008**, the CBDC needs to be considered a system that can support both:

- *Software Adaptability - A software component with a well-defined, stable Spplication Programming Interface (API) can be exchanged using another component with minimal effort, as long as that component adheres to the API. For example, SQL describes an API for a database component. As long as the software adheres to the standard SQL API, the Database Management System (DBMS) can be exchanged between, for example, Oracle | Oracle and PostgreSQL, with no to minimal impact.*
- *Architecture Adaptability - Connectors between software components change without having to change the components. This again comes down to having well-defined, stable APIs for the connectors. For example, the Unix File System (UnixFS) is a connector between software components and the physical filesystem. The associated UnixFS library can be exchanged for the InterPlanetary File System (IPFS) UnixFS connector and the software component should have no to minimal impact.*

Obviously, this is just an example, and the Federal Reserve should adopt the information and update the information in the White Paper Analysis and also perform their own assessment a similar to that presented in Table 1. The discussions and justifications for each requirement need to be captured for future reference. For example, **B00008** would have its own discussion area within the CBDC requirements document.

Functional Requirements Design Principles

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Overview

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Some major design principles missing from the White Paper are the specification of https://www.omgwiki.org/dido/doku.php?id=dido:public:ra:xapend:xapend.a_glossary:f:funcreq. The Distributed Immutable Data Objects - Reference Architecture (DIDO-RA) provides a list of Functional Requirements applicable to the CBDC. The following is an outline of the **Functional Requirements**:

1. Platforms

- Hardware Platforms
- Operating System Platforms
- Runtime Platforms
- Network Platforms
- Virtualization Platforms

2. Access Control

Some of these **Functional Requirements** were alluded to in the White Paper, but not directly specified or defined. The Table 2 provides an example of cross-referencing the **Functional Requirements** to the Benefits, Policy Considerations, Risks and Design requirements identified in the White Paper Analysis done by the Object Management Group .

Examples

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<caption>Example of mapping a subset of requirements identified during the White Paper Analysis conducted by the OMG.<caption>

Functional Requirement	Benefits, Policy Considerations, Risks and Design requirements
Hardware Platforms	B: B0007, B0008, B0011, B0014, B0015, B0018, B0022-3, B0024, B0025, B0029, B0030, B0032, B0033, B0037, B0038, B0039, B0040, B0041, B0043, B0044, B0047, B0049, B0053, P: P0007, P0013, P0020, P0026, P0028, R: R0007, R0008, R0010, R0011, D: D0009, D0012, D0015, D0016, D0017
Access Control	B: B0004, B0005, B0007, B0009, B0010, B0011, B0015, B0018, B0022, B0025, B0029, B0033, B0035-2, B0038, B0041, B0044, B0045, B0046, B0049, B0050, P: P0004, P0005, P0007, P0020, P0021, P0023, P0025, P0029, R: R0001, R0003, R0007, R0008, R0011, R0014,
B = Benefit Considerations	
P = Policy Considerations	
R = Risk Considerations	
D = Design Considerations	

Discussion of Example

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The one of the first requirements listed under Platforms is Benefit **B00011**:

	B0011	**7**	Make payments: 1. faster 2. cheaper 3. more convenient 4. more accessible
B = Benefit Considerations			

Requirement **B0011** is a compound requirement, and the selection of a Platform can have an impact on:

- **B00011-1** - Faster

- **B00011-2** - Cheaper
- **B00011-3** - More Convenient
- **B00011-4** - More Accessible

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