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CONGRESSO BRASILEIRO DE SOFTWARE

Trilha de Ideias Inovadoras e Resultados Emergentes

TOWARDS BLOCKCHAIN EXPERIENCE (BCDEX):

DIMENSIONS OF DEVELOPER EXPERIENCE IN BLOCKCHAIN-ORIENTED SOFTWARE ENGINEERING

UNIVERSIDADE ESTADUAL DO CEARÁ

UFCA
UNIVERSIDADE FEDERAL DO CARIRI

AUTHORS

Pamella Soares

Graduate Program in Computer Science (PPGCC)
State University of Ceara (UECE)

Allysson Allex de Araújo

Center for Science and Technology (CCT)
Federal University of Cariri (UFCA)

Raphael Saraiva

Graduate Program in Computer Science (PPGCC)
State University of Ceara (UECE)

Jerffeson Souza

Graduate Program in Computer Science (PPGCC)
State University of Ceara (UECE)

AGENDA

01 INTRODUCTION

02 METHODOLOGICAL PROCEDURES

03 EXPLORING THE DIMENSIONS OF BLOCKCHAIN DEVELOPER EXPERIENCE

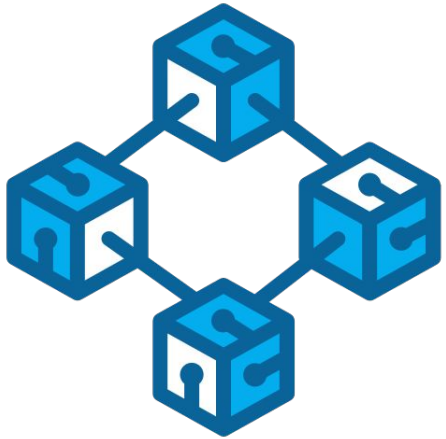
04 NEW DIRECTIONS

05 CONCLUSIONS

01 INTRODUCTION

BLOCKCHAIN

Blockchain is a **distributed data storage** structure safeguarded by **cryptography** and governed by a **consensus mechanism**, providing benefits such as **auditability**, **integrity**, **security**, and **transparency** (Bashir, 2017).

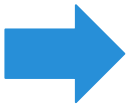


The evolution of blockchain technology has driven innovative businesses beyond the financial context with cryptocurrencies through **Smart Contracts** (SCs) and **Decentralized Applications** (dapps).

Imran Bashir. 2017. Mastering blockchain. Packt Publishing Ltd, Birmingham, United Kingdom. 540 pages.

CHALLENGES IN BLOCKCHAIN DEVELOPMENT

The engineering of blockchain-based software can become **complex** and **prone to critical errors** due to the need to address challenging factors, such as **distributed network infrastructure**, security, etc (Song et. al, 2022).

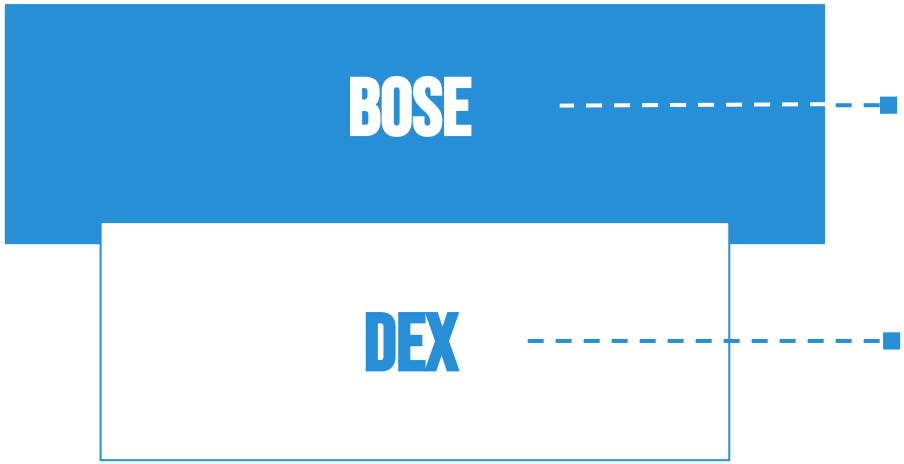


The blockchain domain demands **new software practices** that deal with **immutable**, **decentralized**, and **distributed databases** and **peer-to-peer** networks, which differs from general software development (Kassab et. al, 2021).

Jie Song, Pengyi Zhang, Mohammed Alkubati, Yubin Bao, and Ge Yu. 2022. Research advances on blockchain-as-a-service: Architectures, applications and challenges. Digital Communications and Networks 8, 4 (2022), 466–475.

Mohamad Kassab, Giuseppe Destefanis, Joanna DeFranco, and Prince Pranav. 2021. Blockchain-engineers wanted: an empirical analysis on required skills, education and experience. In 2021 IEEE/ACM 4th International Workshop on Emerging Trends in Software Engineering for Blockchain (WETSEB). IEEE, 49–55.

BLOCKCHAIN-ORIENTED SOFTWARE ENGINEERING (BOSE) AND DEVELOPER EXPERIENCE (DEX)



"all software working with an implementation of a blockchain"
(Porru, 2017)

"experiences related to all types of artifacts and activities that a developer encounters in the software development process"
(Fagerholm, 2012)

Simone Porru, Andrea Pinna, Michele Marchesi, and Roberto Tonelli. 2017. Blockchain-oriented software engineering: challenges and new directions. In 2017 IEEE/ACM 39th International Conference on Software Engineering Companion (ICSE-C). IEEE, 169–171.
Fabian Fagerholm and Jürgen Münch. 2012. Developer experience: Concept and definition. In 2012 international conference on software and system process (ICSSP). IEEE, 73–77.

RESEARCH OBJECTIVE

This position paper aims to **introduce** the novel concept of **Blockchain Developer Experience (BcDEx)** within the context of BOSE. By deepening our understanding of BcDEx, we can address blockchain developers' specific pain points and requirements. Through exploring opportunities in BcDEx, we also aim to uncover new avenues for research and practical applications within BOSE.

CONTRIBUTIONS

1) Introduce the concept of BcDEx and examine the key factors that shape the dimensions of cognition, affect, and conation

2) To highlight new directions and insights centered on BcDEx, emphasizing the importance for both SE academia and practice.

02

METHODOLOGICAL PROCEDURES

METHODOLOGICAL STEPS

Gap Identification

An ad-hoc literature search using the search string: **"developer experience framework" AND "blockchain"** in both white and grey literature.

DEx Framework Orientation

We approached the well-established DEx generic framework proposed by **Fagerholm (2012)** to guide our proposal.

Cognition
Affect
Conation

BcDEx Design

(a) Factors Identification and Analysis.

(b) Factors Validation.

03

EXPLORING THE DIMENSIONS OF BLOCKCHAIN DEVELOPER EXPERIENCE

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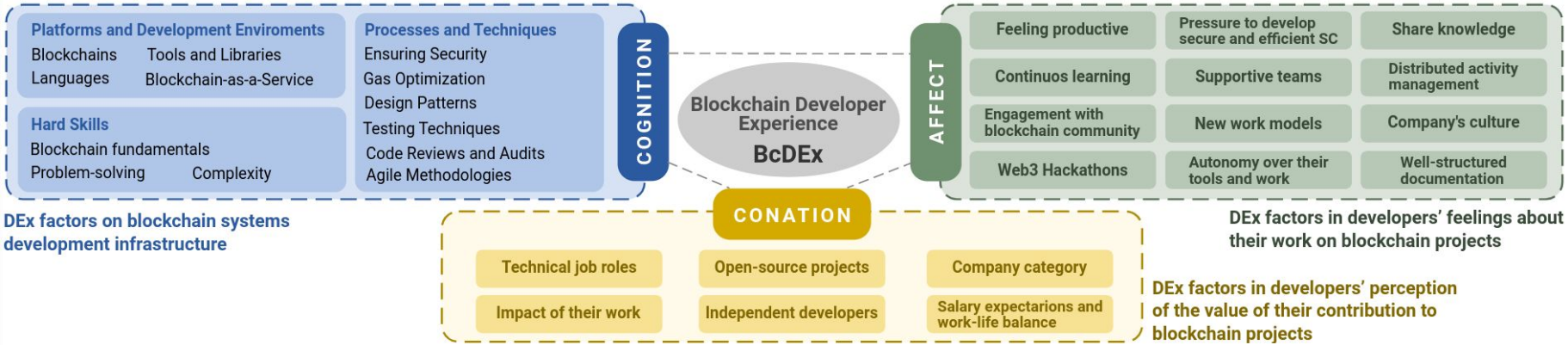
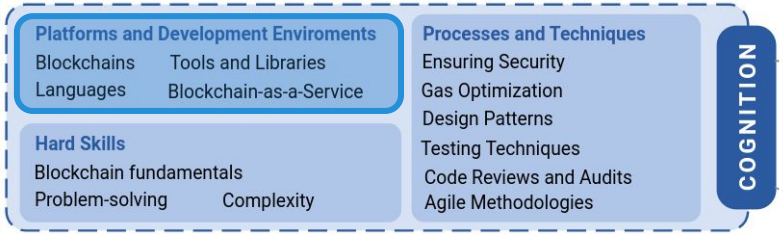


Figure 1: Analysis of DEx dimensions in Blockchain-oriented Software Engineering.

EXPLORING THE DIMENSIONS OF BLOCKCHAIN DEVELOPER EXPERIENCE

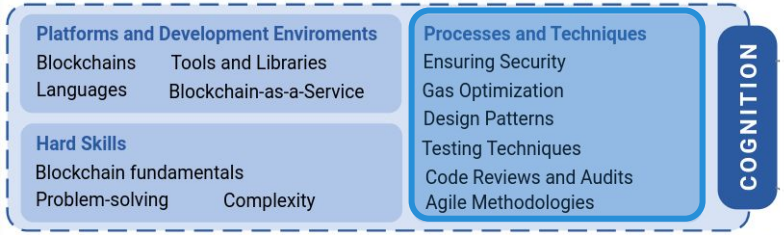


DEx factors on blockchain systems development infrastructure

Web3 development environments and native libraries have been established to facilitate developers' entry into the Web3 ecosystem and simplify the creation of dapps, enhancing development efficiency and ensuring an optimized cost-effectiveness.

There is a substantial **gap** related to more **investigation** into the impacts of these technologies on the developer's and team's overall experience.

EXPLORING THE DIMENSIONS OF BLOCKCHAIN DEVELOPER EXPERIENCE



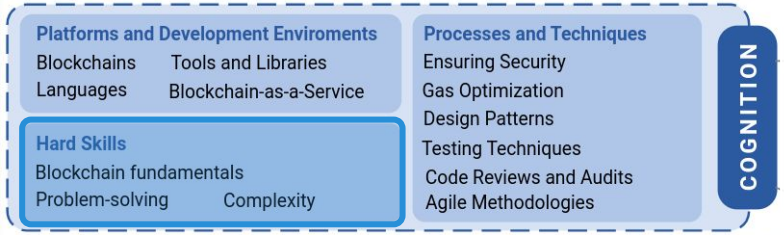
DEx factors on blockchain systems development infrastructure

In addition to existing approaches in SE, different **testing approaches** have been created or adapted in the literature to meet blockchain applications' needs. Elakaş et al. (2024) list Search-Based Testing, Fuzz Testing, Mutation Testing, Model-Based Testing, for example.

Unlike other factors previously discussed, some studies have dedicated **efforts to understand** the use of **these approaches** from the perspective of blockchain developers and **testers.**

Anıl Elakaş, Hasan Sözer, Ilgın Şafak, and Kübra Kalkan. 2024. A systematic mapping on software testing for blockchains. Cluster Computing (2024), 1–16.

EXPLORING THE DIMENSIONS OF BLOCKCHAIN DEVELOPER EXPERIENCE



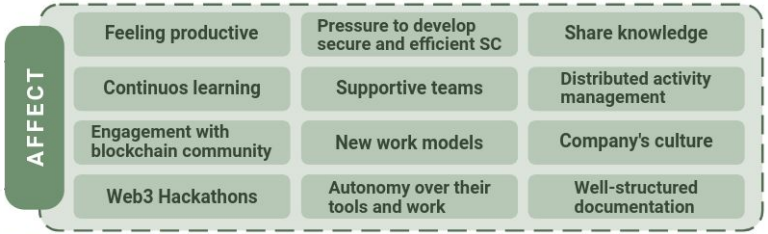
DEx factors on blockchain systems development infrastructure

Designing and developing dapps pose complex challenges that require a **solid understanding of the fundamentals** underpinning blockchain technology.

There is an opportunity to explore the impacts on aspects of DEx and the careers of those who have chosen **to transition from Web2 to Web3.**

EXPLORING THE DIMENSIONS OF BLOCKCHAIN DEVELOPER EXPERIENCE

Feeling productive is one of the relevant aspects to explore related to the feelings about the work of blockchain developers as it can directly impact the developers' satisfaction.



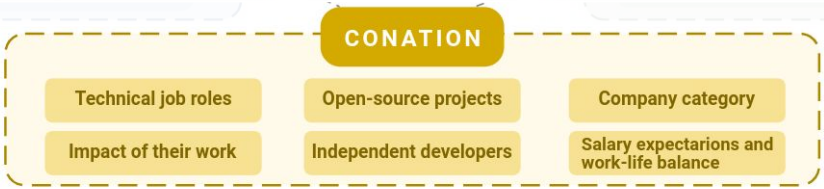
DEx factors in developers' feelings about their work on blockchain projects

These circumstances raise considerations about **subjective aspects** intrinsic to the developer's experience in developing dapps, which have not been explored in the literature to date.

EXPLORING THE DIMENSIONS OF BLOCKCHAIN DEVELOPER EXPERIENCE

Technical job roles influence the effective organization of the team and the value contributed by each member. For example, the SC engineer develops SCs using specific languages and security techniques, while the blockchain architect designs solutions, data security, and cloud infrastructure.

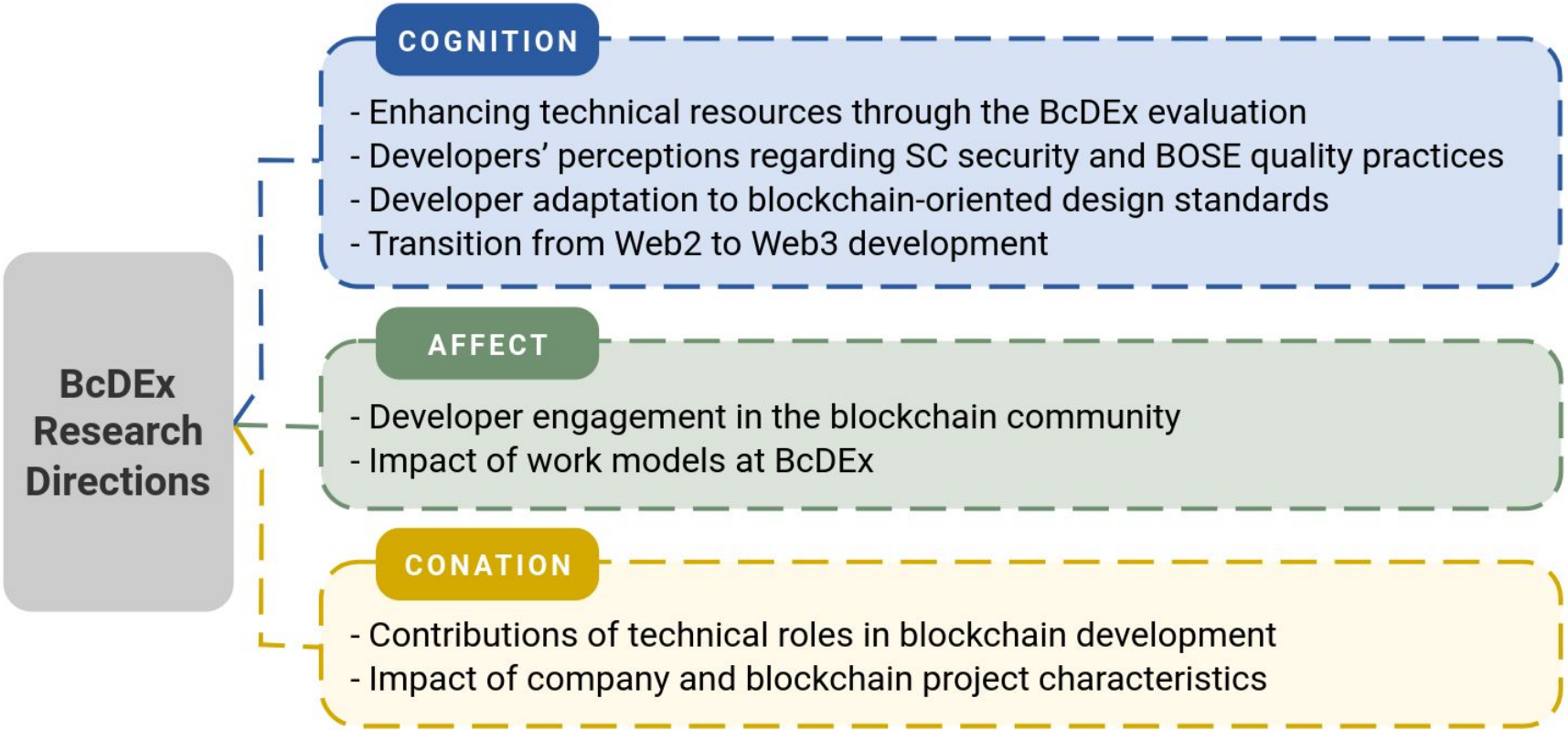
These responsibilities impact in **motivation** and **commitment** of the professionals involved in creating blockchain-based software. In this regard, there is a space to assess the value of these contributions in the development of dapps.



DEx factors in developers' perception of the value of their contribution to blockchain projects

Figure 1: Analysis of DEx dimensions in Blockchain-oriented Software Engineering.

04 NEW DIRECTIONS


BcDEx Research Directions
COGNITION
- Enhancing technical resources through the BcDEx evaluation
- Developers' perceptions regarding SC security and BOSE quality practices
- Developer adaptation to blockchain-oriented design standards
- Transition from Web2 to Web3 development
AFFECT
- Developer engagement in the blockchain community
- Impact of work models at BcDEx
CONATION
- Contributions of technical roles in blockchain development
- Impact of company and blockchain project characteristics

05 CONCLUSIONS

CONCLUSIONS

- Identification of the **complexities and challenges** intrinsic to BOSE, emphasizing their impact on DEx dimensions related to **cognition**, **affect**, and **conation**.
- **New research directions** to provide an initial foundation regarding DEx to support research and industry related to BOSE.
- While factors related to **Conation and Affect are more generic**, they were specifically discussed in the context of the blockchain domain. In addition, we noticed that the factors related to **Cognition are discussed more in the literature**.

FUTURE WORKS

- **Conceptual catalog** considering DEx aspects to guide blockchain developers in developing decentralized applications.