

Straub, Lisa et al.

Article — Published Version

When text is not enough: Data-driven personas to explore crypto education affordances through learning platform analysis and survey insights

Electronic Markets

Provided in Cooperation with:

Springer Nature

Suggested Citation: Straub, Lisa et al. (2026) : When text is not enough: Data-driven personas to explore crypto education affordances through learning platform analysis and survey insights, Electronic Markets, ISSN 1422-8890, Springer, Berlin, Heidelberg, Vol. 36, Iss. 1, <https://doi.org/10.1007/s12525-025-00863-y>

This Version is available at:

<https://hdl.handle.net/10419/335633>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>



When text is not enough: Data-driven personas to explore crypto education affordances through learning platform analysis and survey insights

Lisa Straub¹ · Christian Zeiß¹ · Justus Pehl¹ · Maximilian Greiner² · Axel Winkelmann¹ · Ulrike Lechner²

Received: 10 August 2025 / Accepted: 4 December 2025
© The Author(s) 2026

Abstract

Where established financial literacy initiatives fail to keep pace with rapidly evolving digital asset markets, new customer learning environments emerge. In the context of crypto assets and the blockchain ecosystem, platform providers, ranging from trading platforms to specialized educational portals, have taken on a central role in promoting knowledge-building among users. However, most providers lack educational expertise. In line with affordance theory, which focuses on possibilities for action emerging from the interplay between users and technology, it is not enough for platforms to provide merely learning opportunities. To promote broader crypto adoption, educational offerings should align with users' needs. Therefore, this study employs a data-driven persona development approach and analyzes 20 crypto education platforms concerning their implemented learning components. In addition, we apply topic modeling to explore the educational content. These analyses aim to assess the current state of crypto education platforms and to identify the opportunities (affordances) embedded in the design. Based on the insights and an accompanying user survey, we examine which educational offerings are perceived as valuable by different user groups and derive four distinct types of crypto learners: Cautious Strategist, Critical Observer, Curious Gamified Explorer, and Hands-On Practical Experimenter. Our findings reveal a misalignment between current platform design and learner preferences. Across all types, users tend to favor dynamic formats over static, article-based content. Based on affordance theory, we highlight design implications for crypto learning and present data-supported personas to foster more differentiated and user-centered educational strategies.

Keywords Crypto assets · Affordance theory · Platform education · Financial literacy · Data-driven persona · Blockchain ecosystem

JEL Classification I220 · G410 · P360 · G210

Introduction

Crypto should not be cryptic. This is the opening statement on Kraken's learning platform.¹ Despite the emergence of crypto assets in the financial world (Jones et al., 2024), many people still find them difficult to access and opaque (Voskobojnikov et al., 2021; Zeiss et al., 2024). Crypto assets are digital representations of value built on blockchain technology (Gramlich et al., 2023). Although they have gained traction among private investors, their adoption by the gen-

eral public remains limited (Al Mamun et al., 2025; Cousins et al., 2019). This is due not only to security concerns and a lack of trust in emerging technologies (Al Mamun et al., 2025; Voskobojnikov et al., 2021), but also to a substantial lack of knowledge (Zeiß et al., 2024a). Targeted education helps individuals understand financial products and assess risks, while also fostering openness to digital innovations (AlSuwaidi & Mertzanis, 2024; Ante et al., 2023). Crypto platforms already recognize the importance of education for their business, and thus offer their own educational initiatives aimed primarily at online self-learning users. However, platform providers are generally not education experts. While many crypto platforms now offer learning materials, these websites and their content are often generic, do not adapt to diverse user needs, and overwhelm newcomers (Caxton

Responsible Editor: Rainer Alt

Extended author information available on the last page of the article

¹ <https://www.kraken.com/en-de/learn>.

et al., 2022), due to the technical complexity of the content and the limited availability of user-friendly information (Voskoboynikov et al., 2021; Zeiss et al., 2024). This results in a design-reality gap, in which the solutions do not meet the requirements of their target groups (McCarthy et al., 2022). Within the field of Information Systems (IS), particularly in platform (McCarthy et al., 2022; Schmidt et al., 2023), education (Bower, 2008; Xue et al., 2023), and blockchain research (Du et al., 2019; Giamporcaro & Kuk, 2025; Hina et al., 2024), the affordance theory (Gibson, 2014; Norman Donald, 2013) provides a valuable lens for analyzing the relationship between offerings of technological objects and user action (McCarthy et al., 2022; Stoeckli et al., 2020), specifically, how these offerings align with or respond to user needs. It highlights potential discrepancies between the possibilities (affordances) embedded in a system and their real use (actualization) (Du et al., 2019), which depends on how the system is designed and what users are actually able to do with it (Schmidt et al., 2023; Stoeckli et al., 2020). As current educational offerings on crypto platforms misalign with learner needs and usage realities, these challenges underscore the need for more tailored and user-centered learning solutions. To address this gap, it is crucial to understand both the current state of crypto education platforms and the perspectives of their (potential) users. We therefore combine an affordance-theoretical perspective with a data-driven persona development approach, following the multi-stage methodology proposed by Salminen et al. (2020). Our study systematically analyzes $n=20$ crypto education platforms to uncover embedded learning opportunities and integrates findings from an online survey to derive practical design implications for platform providers. The resulting personas offer a structured lens on user diversity and support more targeted educational offerings that can foster adoption and improve the actualization of platform affordances. The research is guided by the following questions:

RQ1: *How are current crypto education platforms structured and designed to support learning in the field of crypto assets?*

RQ2: *What types of educational content do crypto education platforms provide to enhance user competence in the field of crypto assets?*

RQ3: *What user personas can be identified in the context of crypto education platforms, and how well do current platform affordances and offerings align with their learning preferences and needs?*

We contribute to scientific discourse in three ways. First, our work addresses the adoption of crypto assets, emphasizing the critical role of financial crypto literacy initiatives in fostering broad mass adoption (Al Mamun et al., 2025). Second, in light of the highlighted individual and societal relevance (Förster et al., 2026), we extend existing research on crypto and financial literacy (Al Mamun et al., 2025; Jones

et al., 2024) by introducing an affordance-based perspective that underscores how the effectiveness of platform-based learning is contingent upon users' ability to recognize and actualize self-directed learning opportunities. Our analysis places particular emphasis on crypto literacy, defined as a specialized form of financial literacy that encompasses blockchain-related financial competence (Jones et al., 2025; Zeiß, 2025). It builds upon the established understanding of financial literacy as a multidimensional competence comprising not only knowledge and understanding but also the ability and willingness to address financial situations and make responsible decisions (Aprea & Wuttke, 2016). Third, our analysis underscores the growing role of crypto-based intermediary platforms in emerging digital markets (Alt et al., 2024; Zeiß et al., 2024a), especially concerning crypto education, to contribute to platform research by emphasizing the importance of user-centered design in platform-based knowledge exchange.

The paper is structured as follows: The “**Research background**” section provides the contextual foundation for the study. The “**Research design**” section outlines the study design, which builds on Salminen et al. (2020) and includes a learning components analysis and a topic modeling analysis of platforms. The results inform an online user survey and serve as the basis for cluster analysis as well as persona derivation. The “**Results**” section presents the findings, before a thorough examination of the results is conducted in the “**Discussion**” section. The “**Conclusion and further research**” section concludes the paper.

Research background

Platform providers as key actors for crypto literacy

As new financial service providers enter the market with innovative business models to address evolving customer needs (Beinke et al., 2024; Zeiß et al., 2024a), users are increasingly required to recognize and make informed use of the opportunities these offerings create. However, the current state of crypto literacy suggests that many individuals still lack a sufficient understanding of the crypto ecosystem to do so effectively (Litterscheidt & Streich, 2020; Zeiss et al., 2024). This circumstance is attributable to the decentralized nature of blockchain technology (Alt et al., 2024; Gramlich et al., 2023) and its intrinsic objective of disintermediating traditional processes and market participants (Schär, 2021). Organizations that have historically played a central role in financial education, particularly established financial institutions, educators, and regulatory bodies (Kaiser et al., 2022; Menberu, 2024; Stolper & Walter, 2017), are preoccupied with redefining their own roles in light of blockchain-based

technological disruption (Fujiki, 2021) and thus no longer act as the primary drivers of knowledge around new forms of financial offerings. While promoting blockchain-related literacy benefits individuals and society (Lusardi, 2019; Memberu, 2024), traditional institutions remain hesitant to lead the discourse due to their uncertain positioning. However, financial literacy plays a key role in the adoption of cryptocurrencies and crypto assets (Ante et al., 2023; Jariyapan et al., 2022). In this context, the term crypto assets refers to a new and rapidly evolving class of digital assets built on distributed ledger technology (DLT) (Ferreira & Sander, 2021), encompassing a wide spectrum of applications ranging from payment instruments and investment vehicles to digital representations of ownership and value (Zeiss et al., 2024). Cryptocurrencies are a type of crypto asset used for exchanging and storing value in a decentralized way (Rehman et al., 2019; Schär, 2021). Some, like stablecoins, are linked to traditional currencies to maintain their value (Piñeiro-Chousa et al., 2022). Based on that, crypto literacy can be seen as a specific form of financial literacy that extends conventional financial knowledge to decentralized contexts, emphasizing the ability to apply financial skills in crypto and blockchain environments (Jones et al., 2025; Zeiß, 2025), empowering users to make use of digital crypto assets. As emphasized in the study of (Lakshmanan & Krishnan, 2011), the success of platform providers is closely linked to consumers' ability to effectively learn how to use their offerings. This is particularly relevant for the crypto domain due to perceived complexity (Caxton et al., 2022; Cousins et al., 2019). The effort of companies to build customer competence through education is increasingly recognized as a strategic complement to core services (Bell et al., 2017). The evidence that customer education fosters both trust and loyalty (Bell et al., 2017) underscores its strategic relevance for crypto education platforms, where trust remains a key factor in adoption (Rehman et al., 2019; Saeedi & Al-Fattal, 2025; Zeiß et al., 2024a). The literature has paid limited attention to how users perceive and act on the learning opportunities (affordances) embedded in emerging crypto education platforms.

Affordances in online self-learning

Viewing technology through the lens of affordances offers a relational perspective on how individuals engage with and use technological systems (Evans et al., 2017). Rooted in ecological psychology (Camacho & Barrios, 2022; Xue et al., 2023), the concept of affordances (Gibson, 2014; Norman Donald, 2013) has developed into a valuable theoretical perspective in IS research (Schmidt et al., 2023; Stoeckli et al., 2020; Wang et al., 2025). It captures the action possibilities that a technical object offers an individual, depending on the material's properties and the users' skills and goals (Evans

et al., 2017; Schmidt et al., 2023). Affordance actualization is prominently outlined in the literature as a critical aspect, which is understood as the process by which a perceived opportunity is translated into concrete user action (Mesgari et al., 2018; McCarthy et al., 2022). The actualization is shaped by the subjective effort users associate with its enactment (Bernhard et al., 2013) and is closely related to the intentions and perceived purposes of individuals (Mesgari et al., 2018). Since some affordances are acted upon while others are not, Anderson and Robey (2017) argue that actualization requires more than perception and goal alignment, as users may recognize an affordance and pursue a compatible goal, but still choose not to act. In this context, Strong et al. (2014) identify three influencing factors, *individual abilities and preferences*, *system features*, and *characteristics of the work environment*. They state that affordance actualization is best understood as a dynamic process that unfolds over time, shaped by ongoing user interaction and the evolving nature of technological features (Strong et al., 2014). Concerning crypto education platforms and affordances, users need to perceive the platform itself as a space for learning, especially in light of the aforementioned financial literacy shift and the offerings through new intermediaries (Zeiß et al., 2024a) as well as recognize the affordances within the learning environment, embedded in the platform's design. Affordances can emerge and be explored at different levels, such as individual, collective, system, and feature level, depending on the analytical scope applied to both users and IT artifacts (Stoeckli et al., 2020). In a manner analogous to the approach taken by Stoeckli et al. (2020), this study adopts an affordance perspective to jointly examine (1) the educational potential embedded in crypto education platforms and (2) the goals, motivations, and capabilities of diverse learner groups. Prior studies in IS have applied affordance theory to analyze platforms such as Twitch (Church & Thambusamy, 2022) and Facebook (Camacho & Barrios, 2022), as well as platform affordances, like an implemented chatbot (Stoeckli et al., 2020), and have also used it to analyze an online learning system (Xue et al., 2023). The examination of crypto education platforms from the perspective of affordance theory has not yet been addressed in existing research. Looking more closely at affordances is also important from another perspective. In light of the structural shifts in the crypto education landscape, most learning environments are now based on self-directed learning (Morris, 2019; Sawatsky et al., 2017), meaning that interested individuals are required to independently define their learning paths (Morris, 2019; Sawatsky et al., 2017) and rely on their own initiative within flexible, time- and, in self-directed learning environments (Lasfeto, 2020). Therefore, as learners take responsibility for their own learning goals and strategies, shaped by their individual context and motivation (Morris, 2019), the ability to recognize and act upon available affordances is essential to stay com-

mitted. Accordingly, to be effective, the platform offerings of crypto providers need to be tailored to the diverse needs, motivations, and learning preferences of different user groups (Lusardi, 2019; Menberu, 2024). Developing user personas can support this process by serving as a foundation for designing more targeted and meaningful learning content (Mesgari et al., 2018).

Data-driven personas and related work

A persona is a representation of a current user segment (Patkar & Seyff, 2023), typically depicted as an imaginary person (Chang et al., 2008). When applied appropriately, personas guide the design of digital solutions and, in turn, contribute to greater user acceptance and perceived value (Patkar & Seyff, 2023), especially in connection with the affordance-based approach (Mesgari et al., 2018). Due to the availability of data from digital users and algorithmic methods, the use of data-driven personas has gained traction (Salminen et al., 2021). Unlike traditional personas interpreted manually, they are generated using computational techniques such as clustering, machine learning, or large language models (Jung et al., 2025; Salminen et al., 2021). Data-driven personas incorporate the analysis of real user data generated by quantitative or qualitative methods (Salminen et al., 2020; Patkar & Seyff, 2023). For data collection and analysis, research focus on surveys (Wang et al., 2025), telemetry workflow click data (Zhang et al., 2016), system event logs (Li & Xiao, 2022), interviews (Teixeira et al., 2025), clustering (Zhong et al., 2024), literature reviews (Li et al., 2024), focus groups (Teixeira et al., 2025), control task analysis (Palmer et al., 2025), content analysis (Yang et al., 2025) and chi-square analysis (Li & Xiao, 2022). In the literature, data-driven personas can be found in diverse contexts. Developing personas is addressed in multiple studies, from online live streaming platforms (Zhong et al., 2024), user experience research (Zhang et al., 2016), software engineering (Wang et al., 2025), truck safety management (Li et al., 2024), digital twins (Palmer et al., 2025), and even accessible tourism (Teixeira et al., 2025). In the context of learning and education, student personas were used to develop digital learning resources that improve teacher training (Weinhandl et al., 2024) or to investigate learner subgroups in online courses (Li & Xiao, 2022). However, we also find the use and development of personas in the financial technology (FinTech) and crypto ecosystem. Li et al. (2025) examined the detection of cryptocurrency laundering based on personas. Furthermore, Aryono et al. (2019) focused on user interaction design for a FinTech application. Mesgari et al. (2018) combined, as in this study, affordance theory with persona development and showed, by comparison, the strength of affordance-based personas as opposed to purely qualitative

and quantitative deductions. Recognizing the value of personas and affordances for informing platform design and education strategies, this work adopts a composite research design grounded in the aforementioned affordance theory to strengthen crypto education platforms.

Prior research (see Table 1) in the context of persona development primarily concerns general e-learning (Li & Xiao, 2022; Weinhandl et al., 2024) or FinTech and crypto domain (Aryono et al., 2019; Li et al., 2025). To the best of our knowledge, no other studies have developed personas for crypto learners. In contrast, extant research on financial and crypto literacy emphasizes behavioral outcomes and the need for personalized design (Jones et al., 2025; Litterscheidt & Streich, 2020; Menberu, 2024; Zeiß, 2025). However, these studies have not analyzed educational crypto platforms or examined user-centered education offerings in the crypto context. Regarding affordance theory, Mesgari et al. (2018) indicate that, in the context of affordances, persona development is established, and Xue et al. (2023) provide affordances in online learning platforms, but neither uses the crypto domain with learner persona. Nevertheless, the concept of affordances is widely used in blockchain research (Du et al., 2019; Hina et al., 2024). This present study addresses this gap by integrating data-driven persona development with affordance theory and financial literacy perspectives to advance a more differentiated understanding of learner types in crypto education.

Research design

As mentioned before, this study follows a multi-phase approach based on the steps proposed by Salminen et al. (2020) (see Fig. 1, Steps 1–4), aiming to develop data-driven personas that consider affordances and to answer the research questions (RQ1–3). Accordingly, the study commenced with a preliminary phase that included a literature review and platform selection. As groundwork for developing the required personas, the platforms need first to be examined in terms of learning components and content to understand the current state. In doing so, a learning components analysis was performed to explore platforms (RQ1) guided by the framework of Aparicio et al. (2016). This was followed by a content analysis using BERTopic modeling (RQ2), proposed by Grootendorst (2022b). Subsequently, during the data collection step of the data-driven persona development process, an online survey was conducted, including the groundwork from identified learning components and content structures. The survey responses were subsequently analyzed for segmentation and grouping using cluster analysis. We extended the clusters using chi-square scores and ultimately differentiated them to derive persona profiles (RQ3). The research steps are outlined in detail below.

Table 1 Summary of related works

Cited as	Paper title	Theoretical framework	Study design	Main findings	Contribution
Aryono et al. (2019)	User interaction design for financial technology mobile application using user-centered design	–	User-centered design approach	High-fidelity prototype for financial technology mobile application with new budget control feature	Applicability of user-centered persona design in FinTech
Du et al. (2019)	Affordances, experimentation, and actualization of FinTech: a blockchain implementation study	Affordance theory, theory of consumption values	Case study	The three identified affordances transparency, decentralization, and immutability were key innovation enablers in organization	Organizations seeking to adopt FinTech or blockchain technologies should cultivate experimentation spaces, foster adaptive governance, and balance short-term efficiency with long-term innovation
Hina et al. (2024)	Blockchain for sustainable consumption: an affordance and consumer value-based view	Affordance theory, theory of consumption values	Empirical study	Blockchain affordances for sustainable consumption practices, e.g., enhanced traceability of products, enabling consumer trust, circular-economy business models	Drawing on the affordance lens, this study proposes distinct blockchain affordances and empirically validates their impact on consumers' sustainable purchase intention
Jones et al. (2025)	Measuring crypto literacy	–	Empirical study	The average respondent scored 5.89 out of 10, indicating moderate to low levels of crypto literacy even among crypto holders. 40% of participants scored 5 or below, suggesting a significant knowledge gap in understanding fundamental concepts	The study introduces the first standardized and validated instrument to measure crypto literacy, closing a major methodological gap in the literature
Li et al. (2025)	Group-based detection of cryptocurrency laundering using multi-persona analysis	–	Multi-persona grouping algorithm	Multi-persona group-based approach outperforms traditional individual-level anomaly detection in uncovering laundering groups: by modeling how multiple personas of the same actor coordinate, the method detects laundering behavior	Advances the AML detection literature by explicitly modeling both multi-persona behavior and group-based coordination in crypto networks, bridging an identified gap in which most work focuses on single-account anomalies
Li and Xiao (2022)	Persona profiling: a multi-dimensional model to study learner subgroups in Massive Open Online Courses	-	Persona profiling	Four learner subgroups who actively participated in the course	New directions for designing tailored course formats and delivery modes that are not currently acknowledged regarding MOOCs
Litterscheidt and Streich (2020)	Financial education and digital asset management: what is in the black box	Modern portfolio theory	Experiment	Financial education improved portfolio diversification, decreased self-reported risk aversion, but increased revealed (behavioral) risk aversion	Financial education complements digital advice, enhancing trust in algorithms, decision quality, and investment outcomes
Menberu (2024)	Technology-mediated financial education in developing countries: a systematic literature review	-	Systematic literature review	Technology-mediated financial education enhances literacy and inclusion through accessibility and scalability but is constrained by digital divides and localization	Offers a synthesis of tech-based financial education in developing countries, highlighting opportunities, barriers, and policy implications for inclusive learning

Table 1 continued

Cited as	Paper title	Theoretical framework	Study design	Main findings	Contribution
Mesgari et al. (2018)	Creating rich and representative personas by discovering affordances	Affordance theory	Affordance-based persona creation	Moodle user personas and mixed qualitative-quantitative approach to create user personas based on the patterns of the affordances	Introduces a novel process for developing personas that is empirically grounded in affordance theory and data-driven clustering, improving more heuristic persona methods
Weinhandl et al. (2024)	Using student personas when developing digital mathematics learning resources to improve teacher training	Technological, pedagogical and content knowledge (TPACK)	Persona development	Student personas for teacher training of pre-service mathematics teachers	Personas can offer pre-service teachers support when developing digital learning resources
Xue et al. (2023)	Examining the affordances of an online learning platform: a usefulness theoretical perspective	Affordance theory	Quantitative and qualitative data were analyzed for affordances	Strong educational and technological affordances emerged (such as representation of materials, resource-sharing, interaction, administration), but social affordances (e.g., sense of community, collaboration) were relatively weak	The study advances affordance theory by applying a usefulness lens (usability + utility) in an online learning context, presents a mixed-methods investigation of platform affordances during pandemic online teaching
Zeiß (2025)	Failing to see the obvious? - How financial crypto literacy shapes the future of FinTech platforms in the disruptive blockchain era		Structured literature review	Financial institutions and their advisors play a crucial role in disseminating crypto literacy, platform designers and FinTech vendors should integrate educational approaches into their services to support adoption and mitigate risks	The paper contributes by highlighting the gap between existing financial literacy research and the emergent demands of crypto and blockchain-based FinTech platforms

Preliminary

Structured literature review To provide an initial overview of the existing research, we conducted a structured literature review following the approach outlined in vom Brocke et al. (2009). We searched for relevant literature in the context of financial literacy, education, and self-learning in combination with crypto platforms. In doing so, we utilized established IS literature databases (such as EBSCO) and identified $n=31$ relevant publications. We summarized the insights previously published by our research team (Zeiß, 2025). The results confirmed that financial literacy constitutes a critical success factor for the adoption of FinTech. However, only a limited number of studies specifically addressed crypto-related educational offerings. We found no research that systematically examines the learning components and content of crypto education platforms in depth, nor any that includes user evaluations of such platforms.

Platform selection To uncover previous affordances and review the current state of crypto education, we identified relevant crypto platforms for our research. The team con-

ducted a scientific literature search (e.g., Beinke et al., 2024). We expanded the resulting list through a Google search due to the domain's specificity and limited academic coverage. Subsequently, to ensure the inclusion of dominant market players, we added relevant platforms based on trading volume data from publicly available sources such as CoinMarketCap. To refine the sample, we applied selection criteria prioritizing accessible content, including free access and English-language support, sufficient online visibility, and permission for web scraping. Platforms that did not meet these criteria were excluded, resulting in a final sample of $n=20$ platforms for further analysis (see Fig. 2).

Additionally, due to our platform selection, we identified two types of platforms to address the prevailing educational need concerning blockchain-based financial learning offerings: (1) *crypto exchange platforms* ($n=15$), specifically designed for processing transactions and crypto asset trading, with embedded learning offerings and (2) *knowledge platforms* ($n=5$) that focus exclusively on learning about blockchain-related contexts. The screening already indicated that a considerable number of well-known crypto platforms have developed extensive educational ecosystems

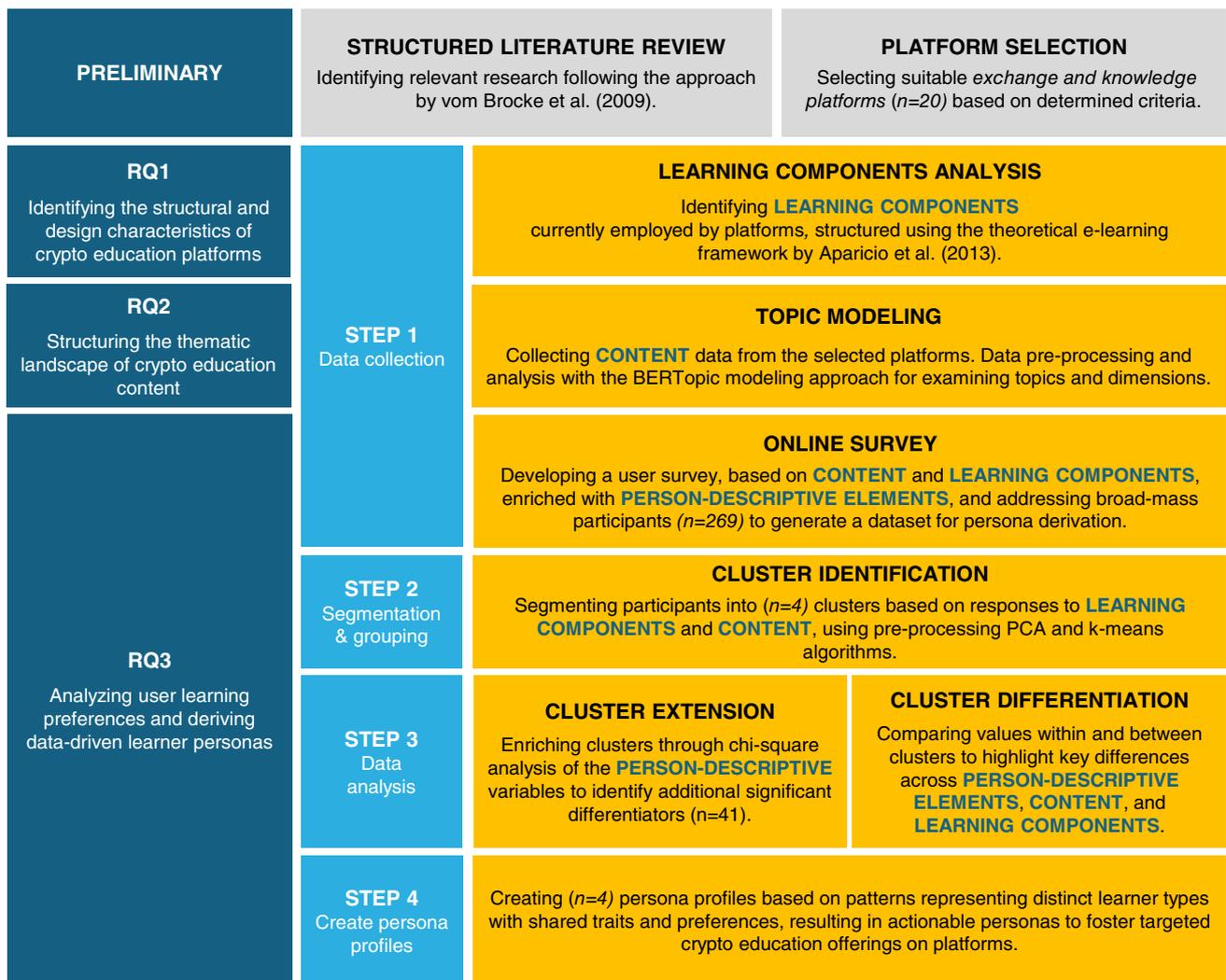


Fig. 1 Extended research design based on Salminen et al. (2020)

EXCHANGE PLATFORMS WITH EMBEDDED LEARNING AREA ($n=15$)					
1	Binance	https://academy.binance.com/en	9	Crypto.com	https://crypto.com/en/university
2	BingX	https://bingx.com/en/guide	10	eToro	https://www.etoro.com/academy/
3	BISON	https://bisonapp.com/academy/en	11	Kraken	https://www.kraken.com/en-de/learn
4	Bitget	https://www.bitget.com/academy	12	OKX	https://www.okx.com/en-eu/learn
5	Bitpanda	https://www.bitpanda.com/academy/en/	13	OpenSea	https://opensea.io/learn
6	Bybit	https://learn.bybit.com/en	14	Phemex	https://phemex.com/academy
7	CEX.IO	https://university.cex.io/	15	Swyftx	https://learn.swyftx.com/courses/
8	Coinbase	https://www.coinbase.com/en-de/learn			

KNOWLEDGE PLATFORMS ESPECIALLY FOR CRYPTO LEARNING ($n=5$)					
1	Babypips	https://www.babypips.com/crypto	4	Cointelegraph	https://www.cointelegraph.com/explained
2	BitDegree	https://www.bitdegree.org/missions	5	LearnCrypto	https://learncrypto.com/
3	CoinMarketCap	https://coinmarketcap.com/			

Fig. 2 Identified crypto education platforms

in response to the prevailing knowledge gap and the necessary shift toward providers of financial crypto education.

Identifying the structural and design characteristics of crypto education platforms (RQ1)

To answer RQ1, the research team conducted a structured analysis of the selected platforms in April 2025, similar to Ouadoud et al. (2016). This analysis is also part of the data collection step of the overall persona-development process (see Fig. 1). As the literature did not provide established frameworks explicitly tailored to the evaluation of crypto asset learning platforms or to the analysis of affordances, we adopted the well-established e-learning framework by Aparicio et al. (2016) as a conceptual and theoretical foundation. While not all crypto platforms qualify as formal e-learning systems, many share key features such as structured pathways and interactive modules, making the applied framework both relevant and insightful for assessing existing affordances and structures as well as identifying areas for improvement of platforms. To meet our research objective (RQ1), we extended the adopted framework (Aparicio et al., 2016) with additional elements to reflect recent developments and domain-specific characteristics not covered in the original model. As processed by Beinke et al. (2024), we ensured data quality through triangulation across multiple sources. Independent evaluations conducted by different researchers also confirmed the consistency and robustness of the data collection procedure. This resulted in a final set of $n=67$ items used in the corresponding survey section and presented in Appendix F.

Structuring the thematic landscape of crypto education content (RQ2)

Simultaneously, we analyzed the learning content for affordance identification to answer RQ2, which is also part of the data collection step in the overall persona development process (see Fig. 1). Topic modeling is a widely used technique to uncover latent semantic patterns within large collections of unstructured text (Kherwa & Bansal, 2019) and a modular approach, as the algorithmic parts work mostly independently, enabling users to build and customize their own topic models (Grootendorst, 2022a) (see Appendix A for parameter settings). In our study, topic modeling served as a tool to structure the thematic landscape of educational materials. Given the informal, domain-specific, and often context-dependent language found in digital learning environments, traditional topic modeling techniques that rely on word frequency may fail to capture deeper semantic relationships. Recent advances in transformer-based language

models, such as BERT, provide context-sensitive embeddings that better represent the meaning of text segments, even in the presence of jargon, abbreviations, or varying syntactic structures (Egger & Yu, 2022). For this reason, the research team chose a BERT-based topic modeling approach, as it enables the generation of coherent, interpretable topics from heterogeneous content.

Data collection and preparation We gathered textual data into a comprehensive dataset via web scraping, using Python-based tools (BeautifulSoup and Selenium), in compliance with each website's terms of service and robots.txt directives, following practices outlined by Mitchell (2018). Consistent with BERTopic best practices (Grootendorst, 2023), we applied minimal preprocessing and only removed noise artifacts (e.g., HTML tags). In the end, we compiled a dataset containing $n=11,804$ documents (see Appendix A for more details).

Topic extraction The BERTopic algorithm uses three main steps to extract meaningful topics from a large text corpus (Grootendorst, 2022b). First, we *converted documents into embedded representations*, then *reduced the dimensionality of these embeddings* to optimize clustering, and finally *extracted topic representations* from the resulting clusters. The BERTopic model design applied for this study is illustrated in Appendix A.2.

Hierarchical clustering Due to the large number of achieved topics generated by BERTopic ($n=233$) and to identify broader thematic structures, we additionally applied hierarchical agglomerative clustering to the topic embeddings. We used cosine distance to measure inter-topic similarity, a metric well-suited for high-dimensional semantic representations. Clustering was performed using Ward's linkage method (Ward, 1963). This procedure followed the hierarchical topic modeling approach outlined in the official BERTopic documentation,² and enabled both topic reduction and the discovery of higher-level themes across the crypto discourse. This process resulted in a final set of $n=55$ content clusters, relevant for the subsequent survey, which were consolidated into $n=6$ overarching categories for presentation purposes.

Analyzing user learning preferences and deriving data-driven learner personas (RQ3)

To examine user learning needs, derive personas, and match them to affordances (RQ3), we required data from both

² https://maartengr.github.io/BERTopic/getting_started/hierarchicaltopics/hierarchicaltopics.html

potential and current platform users concerning our previous study results.

Online survey

Questionnaire development We conducted a multidimensional questionnaire, as recommended by Salminen et al. (2020), primarily based on a 7-point Likert scale. We divided the main questionnaire into three parts (see Fig. 3). The first section contained the persona-relevant characteristics. For this purpose, we integrated concepts and findings from various research streams, including financial literacy research (e.g., Lusardi & Mitchell, 2014), self-directed learning (e.g., Garrison, 1997), motivated learning strategies (e.g., Pintrich et al., 1991), self-regulated learning (e.g., Pintrich et al., 1993; Zimmerman, 1986), and self-determination theory (e.g., Deci & Ryan, 2000), as well as constructs from investment-related research on risk perception (e.g., Weber et al., 2002) and innovation diffusion (e.g., Rogers et al., 2014). In a multi-step reduction process, we selected relevant questions, removed redundancies, and derived a refined question set ($n=40$) aimed at capturing individual user characteristics, structured around (1) financial and crypto knowledge, (2) learning behavior, and (3) investment behavior. The second part of the questionnaire was built on the $n=67$ learning components, while the third part focused on evaluating the $n=55$ final content clusters identified through topic modeling. The questions in the three parts were designed using a 7-point Likert scale. Upfront to the three main categories, we added a short section on current investment practices $n=21$, which included questions about experience with crypto assets

and the duration of investment activity, which allowed multiple answers. Demographic data were collected through the system, utilizing a survey platform. As delineated by Kung et al. (2018), we also employed several instructed-response items to assess participants’ attention and ensure the internal validity and high quality of their responses. An overview of the questionnaire is available in Appendix E.

Pretest and pilot study The research team conducted a pretest with $n=7$ external researchers to ensure the quality of our questionnaire. Furthermore, a pilot study with $n=34$ participants was performed via the online survey platform Prolific.

Survey execution Subsequently, we operationalized the final questionnaire ($n=183$ questions) and determined participant criteria that would apply to all participants, regardless of their level of knowledge or attributes (non-users as well as current). The main study was conducted in three waves on a single day (05/18/2025) via Prolific, covering different time zones to ensure sample diversity. After excluding 31 responses due to lack of attention, the final sample comprised $n=269$ participants. Detailed demographics are provided in Table 2.

Segmentation and grouping

To derive personas from the collected data and draw conclusions about affordances, we first analyzed and clustered the datasets based on similar response patterns. Following

QUESTIONNAIRE SECTIONS	INDIVIDUAL PROFILE	LEARNING COMPONENTS	CONTENT
BASIS	Literature search for person-descriptive elements	Learning components analysis	Topic modeling
EXPLANATION	This section starts with 7-point Likert questions on (1) financial and crypto knowledge, (2) learning behavior, and (3) investment behavior, grounded in literature such as Self-Directed Learning Theory. The data serves to contextualize participants for clustering and persona development.	This section examines key elements of platforms’ educational offerings as perceived by users, including technological, pedagogical, and organizational aspects. It follows the framework by Aparicio et al. (2016), grouped into the categories (1) People, (2) Technology, and (3) Activity. All items were rated on a 7-point Likert scale.	This section captures user attitudes toward crypto-related learning content, including topics such as staking, gaming, and risks, identified through topic modeling. A total of 55 representative topics grouped into six thematic categories were evaluated using a 7-point Likert scale to reflect the diversity of educational content on various platforms.
EXAMPLE	<i>n = 40 Questions</i> e.g., “I am confident in my ability to make informed decisions about digital financial products.”	<i>n = 67 Questions</i> e.g., “In my opinion, I would like to use a glossary or a wiki on platforms for learning.”	<i>n = 55 Questions</i> e.g., “In my opinion, I do want content on crypto promotions and events on platforms.”

Fig. 3 Structure of survey questionnaire

Table 2 Demographics of the main study

Characteristics	Attributes	Frequency	Percentage
Age	0–20	13	4.89%
	21–30	106	38.71%
	31–40	70	26.32%
	41–50	37	13.91%
	51–60	29	10.90%
	61–70	11	4.14%
	71–80	3	1.13%
Gender	Male	136	50.75%
	Female	133	49.25%
Investment experience with cryptos	None	83	31.20%
	0–1 years	32	12.03%
	1–2 years	75	27.44%
	3–5 years	64	23.68%
	>6 years	15	5.64%
Experience with blockchain-based investments (multiple)	Cryptocurrency (e.g., bitcoin)	165	60.90%
	Crypto asset (e.g., NFT)	80	29.32%
	Tokenized physical asset (e.g., watch)	41	15.04%
	Token in metaverse	14	5.26%
	Other	5	1.88%
	None	77	31.20%
Top five crypto platforms (multiple)	Binance	166	61.71%
	Crypto.com	115	42.75%
	Coinbase	99	36.80%
	Bybit	56	20.68%
	Etoro	35	13.16%

Li and Xiao (2022) and Ditton et al. (2022), we applied a clustering algorithm to responses related to learning components only and context to develop the personas primarily from the affordances, as suggested by Mesgari et al. (2018). To prepare the data, we conducted a principal component analysis (PCA), a well-established method in IS (Guan et al., 2024) and the most meaningful technique for persona creation (Mesgari et al., 2018). This approach is also frequently utilized in conjunction with data clustering (Vazquez, 2021). PCA was implemented to reduce the dimensionality of the data while preserving as much meaningful information as possible. Finally, we performed a cluster analysis of the data using the k-means algorithm to further interpret the resulting clusters for personas, as commonly suggested in the literature (Szozda & Swierczek, 2022). The research team used the elbow method to determine the optimal number of clusters (see Appendix D), examining the two crucial points $k=3$ and $k=4$. We investigated both points of interest by comparing silhouette scores as recommended by Gerlach et al. (2022) and decided on the $k=4$ cluster solution.

Data analysis

Cluster extension Based on that, we examined the impact of additional questionnaire elements, including demographics ($n=5$), current investment practices ($n=21$), and individual profile ($n=40$), on the previously identified clusters. We used chi-square scores to observe significant (threshold: $p < 0.05$) links between variables, as also performed by Li and Xiao (2022). As a result, we enriched our clusters with significant variables necessary for the persona descriptions and the affordance derivations (see Appendix E for the chi-square values).

Cluster differentiation Building on the earlier step, we analyzed all significant variables in more detail. We employed two types of comparisons based on the mean values: *between clusters* (identifying which cluster rated specific features, such as *like buttons*, highest or lowest) and *within clusters* (determining the top five highest and lowest rated elements within a given user cluster).

Create persona profiles

Following Salminen et al. (2020), we concluded our data-driven persona development by interpreting the results. In line with common practice, the resulting personas are presented as profiles (Zhong et al., 2024) and text (Chang et al., 2008) to summarize key attributes and enhance clarity. This supports practical application in platform design and helps translate abstract cluster data into actionable user representations (Patkar & Seyff, 2023), but also enables us to combine platform affordances with user preferences.

Results

To present the results of our multi-stage study and answer the three research questions, we first report the findings from the learning component identification (RQ1), followed by the content insights (RQ2). Finally, we briefly outline the results of the online survey and introduce the personas developed (RQ3), which provide affordance insights concerning different user groups.

Structure of learning components on crypto platforms (RQ1)

The analysis of learning components was conducted to assess how crypto education platforms currently teach crypto-related content (RQ1). In the following sections, we present selected findings organized by the main categories based on Aparicio et al. (2016). An overview of the results is provided in Fig. 4, while Appendix F contains a detailed evaluation table. To prevent direct attribution in light of competitive sensitivities, the analyzed platforms are anonymized and labeled (P1–P20), following established academic conventions similar to those used in interview studies.

In the following, we provide a brief definition and outline our findings regarding the learning components for each element of the underlying framework (e.g., stakeholders).

Systems stakeholders Superordinate elements, including internal and external actors who interact directly or indirectly with the platform, such as students, teachers, educational institutions, or content providers (Aparicio et al., 2016). The terminology used to describe the target group on crypto education platforms is diverse, with a predominant emphasis on users, who are particularly private investors interested in crypto assets. Common terms include *Creator* and *Starters* (e.g., P1), *Individuals*, *Business* and *Developers* (e.g., P7), *Trader*, *Everyone* and *Business* (e.g., P14), as well as *Beginner* (e.g., P10). Most of the content offerings are geared toward basic knowledge, while only a few platforms target experienced users. A significant part of platforms provide their own educational content, while others (P6, P12) also include user-generated material. Several providers integrate third-party content from universities (e.g., P5) or commercial partners (e.g., P15), often as distinct offerings. For the level system, they mainly use terms such as *beginner*, *intermediate*, and *advanced*.

Technologies Support learning by delivering structured content, enabling interactive communication, and fostering collaborative learning experiences (Aparicio et al., 2016).

Content. Crypto education platforms use articles as the predominant medium for knowledge dissemination. Additionally, many providers offer educational videos, while providers such as P12 offer live streams. Digital audio content, such as articles to listen to (e.g., P6, P15) or podcasts (e.g., P12, P19), is scarce. Some platforms (e.g., P6, P7, P10) offer research areas to refer to the latest scientific findings. P6 stands out by providing a customizable newsletter. Several providers integrate links to external content, while others create a closed system. Several platforms have various features, including a tree structure (e.g., P3, P17, P18), next lessons

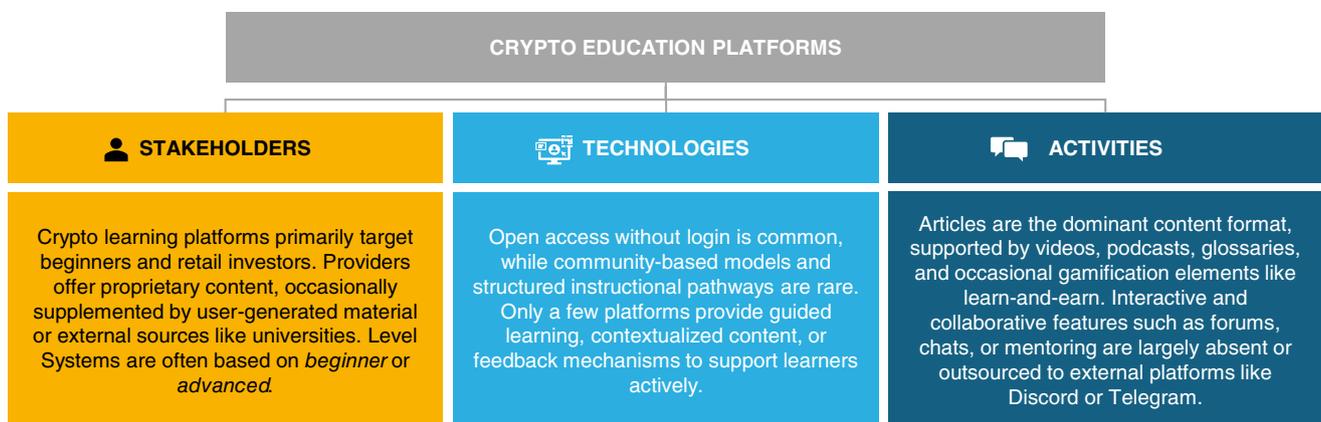


Fig. 4 Overview of the learning components analysis based on Aparicio et al. (2016)

(e.g., P2), suggestions for further articles (e.g., P1), implemented hashtags or topics (e.g., P8, P10), or entire learning paths (e.g., P4). A limited number of providers, including P4, P5, P13, P15, and P17, utilize a course-based model. Only a small number offer profiles geared towards learning and enable tracking of learning history (e.g., P4) or knowledge repositories (e.g., P4, P12) through bookmarks. Less than half use edutainment content and gamification such as quizzes (e.g., P13), ranking lists or leaderboards (e.g., P12), certificates and rewards (e.g., P4), or tests (e.g., P5) to provide learning support. Quizzes are the most common type. Only a few platforms have established a crypto-based reward system with learn-and-earn (e.g., P4, P5, P11, P19, P20) and have built their learning platform on blockchain, although blockchain is often investigated for this purpose in a scientific context (Gräther et al., 2018; Sun et al., 2018).

Communication. Discussion areas are hard to find. P12 allows comments on articles, and P15 hosts a user forum directly on the learning page. Similarly, there are no chats or social network areas on the websites, but some platforms, such as P4, refer to external applications (e.g., Discord and Telegram groups). Notable is the P13 trading community, which stands out in this area. It has been spun off into a separate entity and offers social features. It includes social media features, such as posts, comments, and personal pages for individual traders. However, synchronous communication is available only to a limited extent. Many platforms frequently include a sharing function (WhatsApp, Telegram). P18 is the only platform that integrates an Artificial Intelligence (AI) chatbot. In summary, the pull principle (receiving information) is addressed instead of the push principle (providing information).

Collaboration. Multi-user dialogues, sharing tools, problem and solution areas, and ask-an-expert offerings are not directly accessible in the learning sections of these platforms. Only P12 allows limited user contributions through article posts, while P15 features an active user forum. P11 and P13 support social learning through copy trading functionalities and integrated user feeds. As indicated previously, the Telegram and Discord groups can be listed here as external elements. Furthermore, only a few platforms have integrated elements such as like buttons or star ratings (e.g., P4, P9, P12, P17, P20). In general, the platforms are underdeveloped regarding collaboration.

Activities Pedagogical models that frame learning as a collaborative and flexible process, and instructional strategies that translate these models into concrete teaching practices (Aparicio et al., 2016).

Pedagogical Models. The majority prioritize open learning, offering content accessible without charge or login, but do not provide distributed learning. Few provide specialized content or courses that require a login, such as P4 and P13.

Elements for learning communities, communities of practice, and knowledge-building communities are rare. Only sporadic offerings from P12, P13, and P15 can be referenced, as well as indirectly, external Telegram and Discord groups. However, these offerings only scratch the surface of the subject, indicating a clear potential for further development.

Instructional Strategies. Contextualized instructions, such as step-by-step guides, are available on several platforms and often include guidance on using the exchange's offerings. Some providers (e.g., P4, P5, P10, P13, P14) offer an introductory course for beginners. Outstanding is P4, which uses a targeted approach to guide users through the learning process. P12 enables articles to be summarized using AI. Most provide concise summaries of the article's findings in TLDR format. Cueing content, scaffolding & synthesis, and sequencing processes are not adequately addressed. Less emphasis is placed on actively engaging users. Promoting and supporting authentic learning activities, as well as modeling and explaining, are only touched upon through live streams (e.g., P11, P12), demo areas, and copy trading (e.g., P13).

Landscape of crypto education content (RQ2)

Using BERTopic, we derived a total of $n=233$ distinct topics (see Appendix B4), reflecting the high diversity of the crypto education discourse (RQ2). The model's coherence score of 0.7295 indicated strong internal consistency and interpretability (Röder et al., 2015). Using hierarchical agglomerative clustering, we grouped the topics into $n=55$ content clusters, incorporated into the questionnaire, and divided them into six main categories to enhance clarity (see Fig. 5). In the following, the content clusters and six major categories will be summarized.

Crypto ecosystem trends contains content clusters about new tools in Decentralized Finance (DeFi), tokens, and platforms, as well as market patterns such as meme coins, GameFi developments, and connections to macroeconomic or policy changes, helping to understand the bigger picture behind crypto movements.

Structural foundations and economic forces comprises content clusters related to the underlying structures and drivers of the crypto economy, exploring institutional adoption, regulation, central bank digital currencies (CBDC), tokenization, and the role of Bitcoin and stablecoins in global finance to deepen understanding of how crypto markets evolve.

Emerging narratives and community trends highlight content clusters that concern new and emerging trends in crypto culture and community activity, including developments in

CONTENT ON CRYPTO EDUCATION PLATFORMS	CRYPTO ECOSYSTEM TRENDS	Meme coin market trends & hype cycles; Web3 gaming & GameFi industry momentum; Intersections of crypto with macro & policy trends; New crypto tools and platforms; Emerging crypto sectors: RWA & AI tokens; AI token sector: weekly performance & market trends; Solana ecosystem growth & weekly market trends
	STRUCTURAL FOUNDATIONS AND ECONOMIC FORCES	Crypto market movements: institutions, policies, and trends; Bitcoin’s economic role and macroeconomic narratives; Crypto regulation, CBDCs, and state-level adoption; Tokenization, adoption, and the crypto funding landscape; Stablecoins and on-chain representations of value
	EMERGING NARRATIVES AND COMMUNITY TRENDS	AI narratives & agent-based innovation; Gaming, virtual worlds, & NFT ecosystems; Telegram-driven micro-economies and bot projects; Airdrop Campaigns and participation mechanics; Fan tokens and sports engagement in web3; Ripple ecosystem and legal controversies; Crypto access and fiat onboarding solutions; Crypto market reviews and trading insights; financial literacy and risk in crypto culture; Alternative assets & consumer-focused crypto products; Crypto events, reserve proofs, and regional developments; Legacy altcoins & market movement; Tech frontiers: IoT, quantum, and GPU-driven protocols; Meme coins & cultural token movements; Hardware and ecosystem and wallet infrastructure; Crypto identity, influencers, and legacy figures; Next-gen layer 1 blockchains and developer ecosystems; Bitcoin layer innovations: ordinals, runes, and BRC-20s
	TECHNOLOGICAL BACKGROUND	Ethereum protocol changes and consensus evolution; Blockchain infrastructure, security, and mining mechanics; Token standards and account abstraction; Scalability, interoperability, and multichain protocols; Privacy, transparency, and transaction layer tools; Smart contracts, middleware, and web3 applications; Decentralized governance and DAO infrastructure; BNB ecosystem and wallet infrastructure; Bitcoin forks and network upgrade mechanisms; Decentralized finance: lending, yield, and liquidity; Wallet security and self-custody solutions; Staking Mechanisms and Yield Strategies in Web3
	CRYPTO TRADING, INVESTMENT BEHAVIOUR, AND MARKET EDUCATION	Altcoin sentiment, risk behavior, and community engagement; Crypto derivatives and leveraged trading instruments; Market psychology and valuation cycles in crypto; Trading strategies & alternative execution models; Exchange infrastructure and peer-to-peer protocols; Technical analysis and trend-based strategies; Chart patterns and visual trading techniques; Crypto ETF markets and institutional onramps; Microstructure mechanics: orders, fees, and execution; Crypto financial literacy and portfolio practices
	GAMIFIED CRYPTO CAMPAIGNS	Puzzle challenges with crypto rewards; Mini games with crypto rewards; Play-to-earn games with crypto rewards; Crypto promotions and events

Fig. 5 Structured content clusters

AI, fan tokens, airdrops, Non-Fungible Token (NFT) gaming, and influencer dynamics. The contents show how social movements and innovation beyond technology shape the crypto space.

Technological background covers content cluster about smart contracts, multi-chain protocols, technical fundamentals of Web3 platforms, privacy tools, staking mechanisms, wallets, and governance systems. This content helps users understand how the underlying decentralized infrastructure works.

Crypto trading, investment behavior, and market education addresses a content cluster related to trading strategies, crypto exchange-traded funds (ETFs), sentiment analysis, technical indicators, and tax-related knowledge, promoting informed and responsible investment decisions.

Gamified crypto campaigns covers content cluster related to learning elements around gamified elements on crypto platforms, including challenges, rewards, and interactive features such as puzzles, mini-games, and streak-based promotions.

User preferences and developed crypto learner personas (RQ3)

Before presenting the persona results, including affordance preferences, we first report the user survey’s overall findings.

Survey findings and user preferences and Survey findings

Across the three questionnaire categories (1) individual profile, (2) learning components, and (3) content, responses were consistently positive (see Appendix E). All items on the 7-

point Likert scale were generally affirmed, with none rated irrelevant. This indicates that the affordances created so far are indeed viable, while also revealing potential for improvement and actualization. We used mean values, except for the current investment practices section, where multiple answer types were allowed.

Analysis of the current investment practices answers When asked about blockchain-related investments, the vast majority indicated having invested in cryptocurrencies (165), followed by digital collectibles such as NFTs (80). In terms of investment behavior, most participants reported having invested in stocks (139) and cryptocurrencies such as Bitcoin or Ethereum (167), followed by real estate (76), funds and ETFs (63), and digital goods (56). However, 83 participants stated that they had never invested in blockchain-based assets. Regarding platform familiarity, Binance (166) and Crypto.com (115) emerged as the most well-known platforms.

Analysis of the individual profile answers The results indicate that participants generally tend to lean toward the middle when asked whether crypto- and blockchain-related content is difficult to access (4.02) and whether they engage with digital finance topics for external reasons (e.g., recognition) (4.07). There is a clear tendency for people to invest only if they understand it technically and conceptually (5.81). Participants are cautious with money, avoiding risks and unclear investments (5.70), and tend to learn when it has practical implications for their lives (5.71).

Analysis of the learning components answers Across all the learning components, the average user rating was 5.51. The highest average values were recorded for educational videos and live streams (6.00) and open-learning formats (5.99), demo areas (5.95), and beginner sections (5.95). The lowest average values were observed for paid learning materials (4.58) and like buttons for each article (4.83), keyword search engines (4.90), and web link managers (4.98).

Analysis of the content answer In all content components, the average user rating was 5.45, indicating a relatively consistent perception between topics. Most values were closely clustered, with no item scoring greater than 6. The highest rated content areas were wallet security and self-custody solutions (5.99) as well as privacy, transparency, and transaction-layer tools (5.95), crypto financial literacy and portfolio practices (5.86), and financial literacy and risk in crypto culture (5.82). At the lower end of the scale, two components received values below 5: Telegram-driven micro-economies and bot projects (4.91), and fan tokens and sport engagement in Web3 (4.99). Other comparatively

low-scoring topics included meme coins and cultural token movements (5.02) and meme coin market trends and hype cycles (5.05).

Crypto education personas

The development of data-driven personas from an affordance perspective yielded four distinct groups, derived from Clusters 0–3. We present the personas in descending order of criticality, starting with the most skeptical group. Figure 6 includes all variables that significantly shaped the clusters or were enriched via chi-square analysis. We underscore the most dominant high and low values to indicate particularly distinctive characteristics. *Between-cluster differences* are color-coded in green (high) and red (low) font, while *within-cluster differences* are marked using green and red background shading. All items that deviate from the overall mean by more than one point were also highlighted in bold. **The Critical Observer** (see Fig. 7) represents the most risk-averse persona in the sample and the most skeptical. This user profile is characterized by a highly reserved approach to financial decisions, particularly concerning unclear or high-risk investment opportunities (5.41). Compared to other clusters, the *Critical Observer* shows the lowest levels of self-assessed knowledge about cryptocurrencies (3.39) and the least interest in digital finance topics, including crypto, blockchain (4.09), and broader financial themes (3.86). In terms of learning preferences, the *Critical Observer* favors autonomous self-directed formats. Preferred formats include educational videos & live streams (5.18), demo environments (5.21), and asynchronous formats such as forums (4.96), Q&A and FAQ sections (4.96), especially those following a pull-based logic. Visual clarity and intuitive presentation are the key (5.00). Structured beginner sections (4.96) and open-learning environments (5.20) are appreciated, while interactive formats, such as peer collaboration (3.84), one-on-one mentoring (3.71), or push-based mechanisms such as newsletters (3.32), are of minimal interest. Social sharing features, such as article sharing (3.61) and like buttons (3.89), are considered largely irrelevant. Compared to other personas, the *Critical Observer* places less emphasis on developing a comprehensive, integrative understanding of the broader ecosystem (big picture) (4.59). Thematically, this persona shows selective interest in technical and infrastructural topics such as new crypto tools and platforms (5.25), financial literacy & crypto-related risk cultures (5.05), blockchain infrastructure and security & mining structures (5.16), privacy and transparency mechanisms (5.14), wallet security & self-custody solutions (5.39). In contrast, they actively distance themselves from trend-driven or socially charged content, including meme coins & market hype cycles

		CLUSTER 0 n=55			CLUSTER 1 n=56		CLUSTER 2 n=83		CLUSTER 3 n=75	
		Overall Mean Value	Mean Value Cluster	Deviation Overall Mean Value	Mean Value Cluster	Deviation Overall Mean Value	Mean Value Cluster	Deviation Overall Mean Value	Mean Value Cluster	Deviation Overall Mean Value
INDIVIDUAL PROFILE	Motivated by practical relevance	5.71	5.42	-0.29	4.82	-0.89	5.86	+0.15	6.43	+0.72
	Big picture rather than isolated details	5.54	5.38	-0.15	4.59	-0.95	5.59	+0.06	6.29	+0.76
	Interest/pleasure in financial topics	4.88	3.95	-0.94	3.86	-1.03	5.23	+0.34	5.96	+1.08
	Digital platform learner (new technologies/ financial products)	5.39	4.96	-0.43	4.38	-1.02	5.53	+0.14	6.31	+0.92
	Generally interested in new digital financial topics	5.19	4.60	-0.59	4.09	-1.10	5.41	+0.22	6.19	+1.00
	Willing to invest if the potential benefits outweigh the risk	5.61	5.38	-0.23	4.82	-0.79	5.71	+0.10	6.27	+0.65
	Passively with new topics	5.58	5.62	+0.03	4.79	-0.80	5.55	-0.03	6.19	+0.60
	Crypto knowledge	4.33	3.42	-0.91	3.39	-0.93	4.46	+0.13	5.55	+1.22
	Invests only with technical and conceptual understanding	5.81	5.76	-0.05	5.05	-0.76	5.82	+0.01	6.41	+0.60
	Deal with digital finance when seeing a concrete application	4.95	4.85	-0.09	4.13	-0.82	5.13	+0.18	5.43	+0.48
	Dealing with digital finance for external reasons	4.07	3.33	-0.75	3.46	-0.61	4.41	+0.34	4.71	+0.63
	Blockchain-related content is difficult to access	4.02	4.05	+0.04	4.18	+0.16	4.04	+0.02	3.85	-0.17
	Prefer to try out new tools, digital products, or platforms directly	4.23	3.58	-0.64	4.05	-0.17	4.37	+0.15	4.67	+0.44
	Overwhelmed with complex financial or technological topics	4.52	4.65	+0.14	4.30	-0.21	4.80	+0.28	4.27	-0.25
	Cautious with money and avoids risky or unclear investments	5.70	5.84	+0.14	5.41	-0.29	5.61	-0.08	5.91	+0.21
	LEARNING COMPONENTS	Digital audio (e.g., podcast, listen function)	5.46	5.29	-0.17	4.25	-1.21	5.71	+0.25	6.20
Main content presented as separate articles		5.28	5.33	+0.04	4.57	-0.71	5.25	-0.03	5.81	+0.53
Education videos & live streams		6.00	6.02	+0.01	5.18	-0.83	5.94	-0.06	6.68	+0.68
Visualisation of content (animations, images, illustrations)		5.78	6.04	+0.26	5.00	-0.78	5.61	-0.17	6.36	+0.58
Newsletter, especially with a learning context		4.90	4.49	-0.41	3.32	-1.57	5.22	+0.32	6.01	+1.12
Web link manager for embedding external web sources		4.98	4.55	-0.40	4.14	-0.80	5.07	+0.13	5.88	+0.74
Glossary or wiki		5.26	5.56	+0.30	4.79	-0.48	4.88	-0.38	5.83	+0.56
Discussion area		5.70	5.55	-0.15	4.77	-0.93	5.82	+0.12	6.36	+0.66
Forum		5.64	5.60	-0.04	4.96	-0.68	5.48	-0.16	6.35	+0.71
Ask-an-expert-area (e.g., expert Q&A sessions)		5.84	5.95	+0.11	4.75	-1.09	5.81	-0.03	6.00	+0.76
One-on-one mentoring (e.g., videocall)		5.21	4.67	-0.54	3.71	-1.50	5.78	+0.57	6.09	+0.88
Open learning		5.99	6.38	+0.39	5.20	-0.80	5.76	-0.23	6.56	+0.57
Contextualizing instruction		5.81	6.29	+0.48	4.79	-1.02	5.55	-0.25	6.49	+0.69
Promote collaboration		5.41	5.07	-0.33	3.84	-1.57	5.75	+0.34	6.44	+1.03
Like buttons for each article		4.83	3.98	-0.85	3.89	-0.94	5.06	+0.23	5.91	+1.07
Sharing function in each article		5.15	4.31	-0.84	3.61	-1.54	5.57	+0.42	6.45	+1.30
Q&A/ FAQ		5.91	6.38	+0.47	4.96	-0.95	5.60	-0.31	6.63	+0.71
Demo area		5.95	6.40	+0.45	5.21	-0.73	5.64	-0.31	6.51	+0.56
Level system		5.80	5.91	+0.11	4.82	-0.98	5.67	-0.12	6.59	+0.79
Paid learning materials		4.58	3.53	-1.06	3.46	-1.12	4.89	+0.31	5.85	+1.27
AI integration	5.26	4.51	-0.75	4.04	-1.22	5.49	+0.23	6.47	+1.21	
Learn-and-earn	5.78	5.64	-0.14	4.75	-1.03	5.82	+0.04	6.61	+0.83	
Beginners section on the main learning page	5.95	6.36	+0.42	4.96	-0.98	5.82	-0.13	6.52	+0.57	
CONTENT	Meme coin market trends & hype cycles	5.05	4.49	-0.56	3.89	-1.16	5.29	+0.24	6.05	+1.01
	Web3 gaming & GameFi industry momentum	5.16	4.71	-0.45	4.25	-0.91	5.14	-0.01	6.17	+1.02
	Solana ecosystem growth & weekly market trends	5.29	5.07	-0.21	4.34	-0.95	5.29	0.00	6.15	+0.86
	New crypto tools and platforms	5.82	5.93	+0.11	5.25	-0.57	5.71	-0.11	6.29	+0.47
	Crypto market reviews and trading insights	5.77	5.91	+0.14	4.61	-1.17	5.78	+0.01	6.53	+0.76
	Crypto identity, influencers, and legacy figures	5.06	4.33	-0.73	3.63	-1.43	5.47	+0.41	6.20	+1.14
	Tech frontiers: IoT, quantum, and GPU-driven protocols	5.13	4.64	-0.49	4.05	-1.07	5.36	+0.24	6.03	+0.90
	Next-gen layer 1 blockchains and developer ecosystems	5.20	4.91	-0.30	4.16	-1.04	5.45	+0.24	5.93	+0.73
	Financial literacy and risk in crypto culture	5.82	6.25	+0.43	5.05	-0.77	5.53	-0.29	6.40	+0.58
	Meme coins and cultural token movements	5.02	4.20	-0.82	3.88	-1.14	5.33	+0.31	6.13	+1.11
	Telegram-driven micro-economies and bot projects	4.91	4.00	-0.91	4.02	-0.89	5.05	+0.14	6.09	+1.18
	Airdrop campaigns and participation mechanics	5.15	4.42	-0.73	4.16	-0.99	5.49	+0.35	6.04	+0.89
	Fan tokens and sports engagement in web3	4.99	4.05	-0.93	4.07	-0.91	5.14	+0.16	6.17	+1.19
	Crypto events, reserve proofs, and regional developments	5.30	4.98	-0.32	3.96	-1.34	5.52	+0.21	6.31	+1.00
	Ripple ecosystem and legal controversies	5.20	4.73	-0.48	4.38	-0.83	5.40	+0.19	5.96	+0.76
	Blockchain infrastructure, security, and mining mechanics	5.81	5.96	+0.16	5.16	-0.65	5.61	-0.19	6.39	+0.58
	Privacy, transparency, and transaction layer tools	5.95	6.45	+0.50	5.14	-0.81	5.64	-0.31	6.53	+0.58
	Wallet security and self-custody solutions	5.99	6.36	+0.37	5.39	-0.60	5.75	-0.24	6.43	+0.44
	Crypto financial literacy and portfolio practices	5.86	6.20	+0.34	5.04	-0.83	5.67	-0.19	6.44	+0.58
	Technical analysis and trend-based strategies	5.75	6.02	+0.26	4.68	-1.08	5.65	-0.10	6.48	+0.73
	Chart patterns and visual trading techniques	5.77	6.02	+0.25	4.70	-1.07	5.71	-0.05	6.44	+0.67
	Crypto promotions and events	5.58	5.18	-0.40	4.32	-1.26	5.90	+0.32	6.45	+0.87
Puzzle challenges with crypto rewards	5.69	5.49	-0.20	4.70	-1.00	5.71	+0.02	6.56	+0.87	
Play-to-earn games with crypto rewards	5.70	5.27	-0.43	4.61	-1.09	5.93	+0.23	6.57	+0.87	
Mini games with crypto rewards	5.58	5.38	-0.20	4.52	-1.06	5.71	+0.13	6.37	+0.79	

Fig. 6 Cluster differentiation

(3.89) as well as cultural token movements (3.88), crypto influencers (3.63), Telegram-based micro-economies (4.02), bot-driven projects and crypto events (3.96).

Quantitatively, this cluster shows the lowest average ratings across nearly all evaluated dimensions, indicating lower engagement, confidence, and perceived relevance of digital finance topics overall. The *Critical Observer*, therefore,

represents the most challenging target group for crypto education platforms.

The *Cautious Strategist* (see Fig. 8) is characterized by a highly analytical and risk-averse (5.38) stance. Unlike the *Critical Observer*, this persona demonstrates a distinct drive to develop a comprehensive understanding of the digital

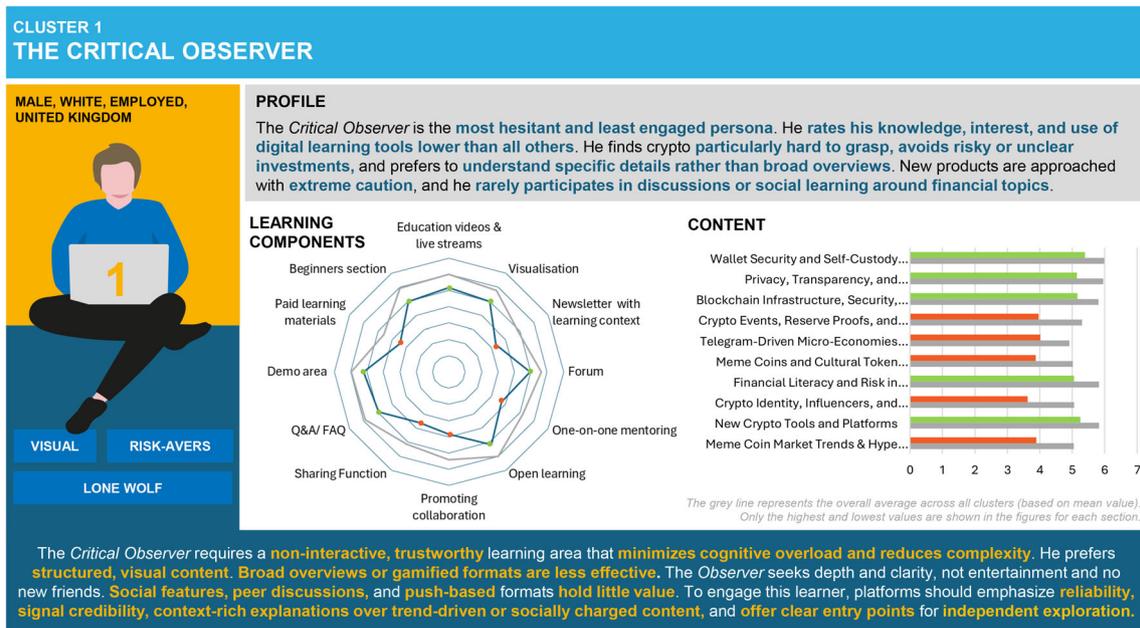


Fig. 7 Persona of the *Critical Observer*

finance landscape and is eager to learn. Although equally hesitant to act prematurely, the *Cautious Strategist* seeks to grasp the larger picture (5.38) and actively search for technological and conceptual understanding (5.76). This persona shows one of the lowest levels of self-assessed financial knowledge (3.95) and confidence in decision-making across the sample (4.20). As a result, they appreciate beginner-friendly formats (6.36), demo areas (6.40), and contextualized instructions

(6.29) that frame abstract content within practical scenarios (5.42). The *Cautious Strategist* prefers to learn before acting (3.58) and is particularly responsive to audio-based formats (5.29) as well as flexible, nonlinear open-learning (6.38) options. In terms of topic preferences, the *Cautious Strategist* clearly distances itself from socially driven or speculative aspects of the crypto ecosystem. Crypto identity narratives, influencers, and legacy figures (4.33), meme

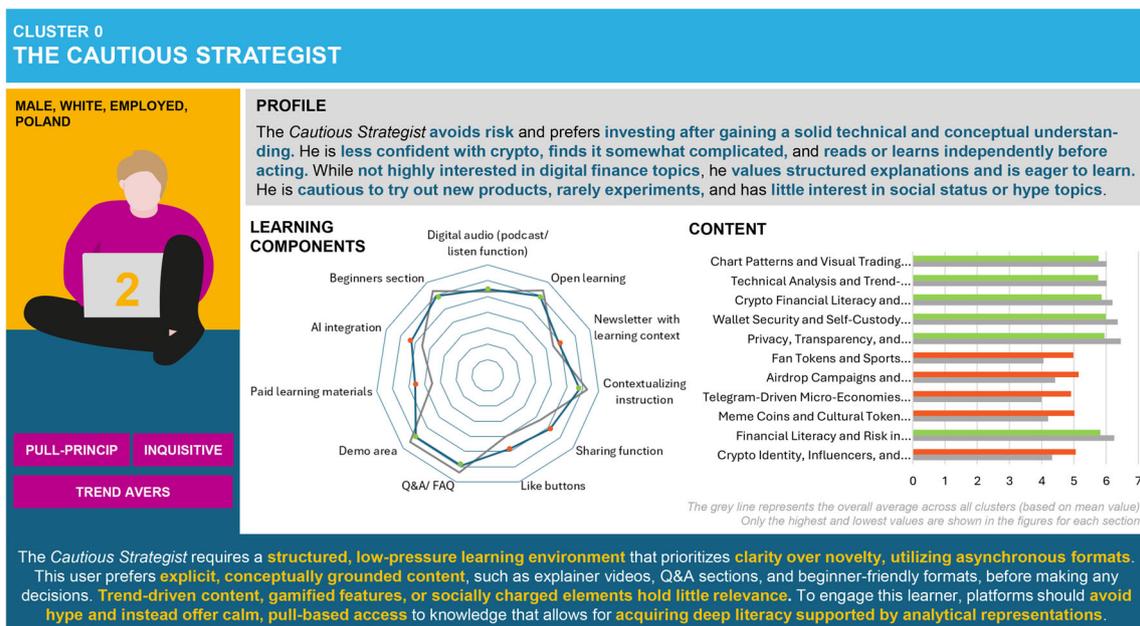


Fig. 8 Persona of the *Cautious Strategist*

coins and cultural token movements (4.20), Telegram-driven microservices and bot projects (4.00), airdrop campaigns, and gamified participation mechanisms (4.02) have little relevance. Similarly, fan tokens and Web3 sports engagement (4.05) are perceived as peripheral and are not part of this persona’s interest profile. Instead, the *Cautious Strategist* shows a strong preference for fundamental and technical domains. These include financial literacy and risk in the context of crypto culture (6.25), privacy and transparency tools, transaction-layer technologies (6.45), wallet security & self-custody solutions (6.36), portfolio strategy (6.20), technical analysis (6.02), and chart patterns and visual trading techniques (6.02). The persona’s learning behavior is guided by a high need for understanding and reliability, and their engagement with FinTech is cautious but purposeful.

Ultimately, the *Cautious Strategist* represents a type of user who values orientation and informed decision-making above novelty or community dynamics. They are critical not only of the technologies themselves but also of the cultural phenomena surrounding them. Their primary motivation is to acquire the knowledge and confidence to navigate digital finance on their terms.

The *Curious Gamified Explorer* (see Fig. 9) is characterized by a moderate level of confidence in crypto (4.46) and curiosity-driven engagement in digital financial topics (5.41). This persona is motivated by the practical implications of financial knowledge (5.86) and prefers to explore new technologies in a structured, engaging way. Although hands-on experimentation is often avoided at the outset

(4.37), the *Curious Gamified Explorer* actively seeks knowledge through preparatory reading and exploration (4.37) in low-risk settings (5.61). Unlike more risk-averse types, this persona rates their own crypto knowledge as moderate (4.46). Central to their learning behavior is the desire to understand the technological and conceptual frameworks (5.82). This big-picture orientation (5.59) distinguishes the *Curious Gamified Explorer* from more narrowly focused or hesitant learner types. When it comes to the preferred learning components, this persona responds positively to educational videos and live streams (5.94), as well as interactive beginner sections (5.82). Learn-and-earn features (5.82) and discussion areas (5.82) are also well-received, while passive formats such as newsletters (5.22), weblink managers (5.07), or like buttons (5.06) are seen as less relevant. The desire for agency and discovery is reflected in a lower interest in purely static or glossary-based content (4.88). Concerning content preferences, the *Curious Gamified Explorer* is especially drawn to gamified and reward-based learning formats. These include mini games with crypto rewards (5.71), crypto promotions and events (5.90), play-to-earn games (5.93), puzzle challenges (5.71), and other elements that blend education with entertainment and interactivity. Conversely, socially or culturally charged topics such as Web3 (5.14), meme coins (5.29), fan tokens (5.14), and Telegram-based micro-economies (5.05) are of limited interest.

Overall, this persona thrives in environments that combine autonomy, structure, and gamified incentives. The *Curious Gamified Explorer* aims to make learning both meaningful and engaging, responding best to platforms that offer tangible

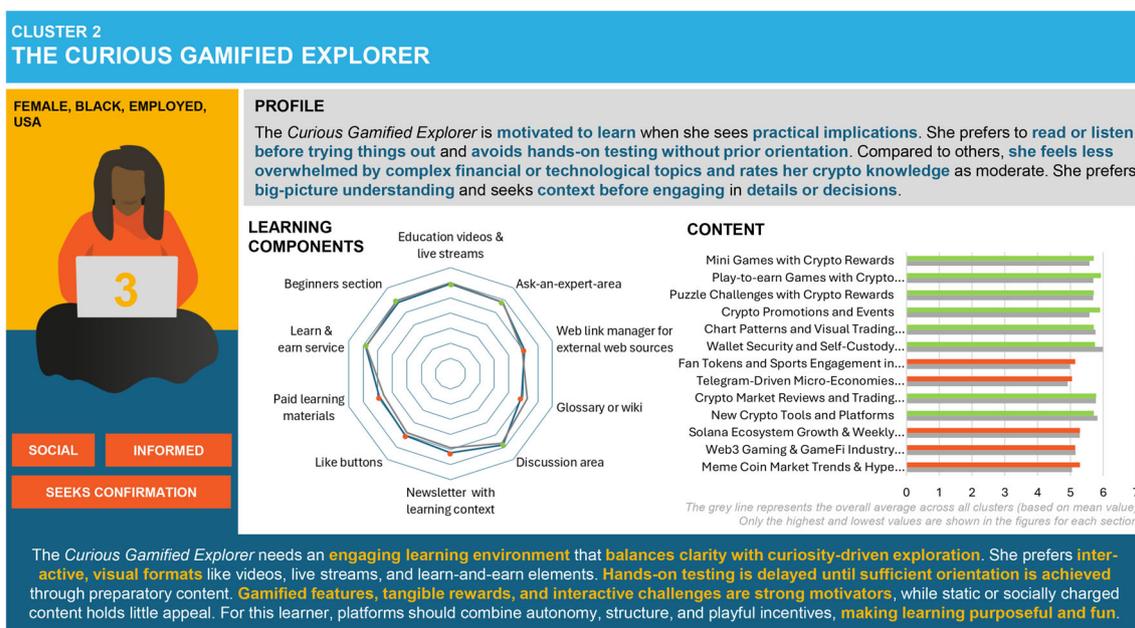


Fig. 9 Persona of the *Curious Gamified Explorer*

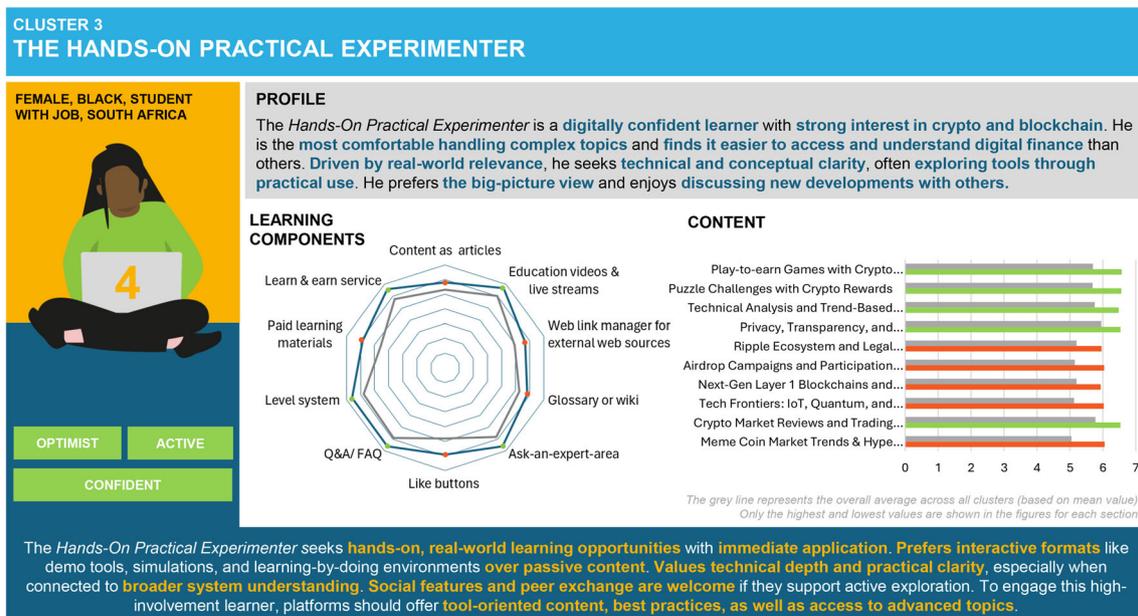


Fig. 10 Persona of the *Hands-On Practical Experimenter*

rewards, interactive content, and a clear sense of progress. Their approach is less about following trends or communities and more about exploring the digital finance space.

The *Hands-On Practical Experimenter* (see Fig. 10) is a confident digital learner (6.31) who actively engages and demonstrates high self-efficacy in topics related to crypto and blockchain (6.19). Among all personas identified, this user type reports the highest comfort with financial and technological complexity (4.27) and finds it easiest to access and understand blockchain-related content (3.85). Their learning behavior is driven by a strong preference for real-world relevance and practical applicability (6.43), paired with a desire for technical and conceptual clarity (6.41). This persona enjoys staying informed, discussing developments, and connecting technical insights with broader systemic implications. They respond especially well to educational videos & live streams (6.68), and formats that enable direct exchange with experts (6.60), as well as Q&A (6.63). Furthermore, level-based systems for tailored learning (6.59) and learn-and-earn mechanisms (6.61) resonate particularly strongly, as they offer both challenge and immediate reward. In contrast, passive or static formats such as glossaries (5.83), like buttons (5.91), weblink managers (5.68), or long-form articles (5.81) are perceived as less engaging and less relevant to their learning style. In terms of content preferences, the *Hands-On Practical Experimenter* is particularly drawn to applied, interactive, and reward-oriented formats. They are highly motivated by gamified elements such as play-to-earn

games (6.57) and puzzle challenges with crypto rewards (6.56), as well as learn-and-earn features (6.61) that combine knowledge acquisition with tangible benefits. Furthermore, they show strong interest in crypto market reviews and trading insights (6.53), technical analysis, and trend-based strategies (6.48), all of which support their desire for hands-on experimentation.

More advanced and conceptually demanding topics, such as next-generation layer 1 blockchains and developer ecosystems (5.93), legal controversies (5.96), and tech frontiers like Internet-of-Things (IoT), quantum-based protocols, or Graphics-Processing-Unit (GPU)-driven consensus models (6.03), are not entirely ignored, but tend to be of lower immediate priority. The *Hands-On Practical Experimenter* engages in these areas selectively and often concerning concrete use cases or market relevance.

Discussion

Given the ongoing market change, this study expands the literature on financial and crypto literacy by integrating an affordance-based perspective into the analysis of learning platforms. Addressing the design–reality gap (McCarthy et al., 2022), our findings underscore that learning affordances, as well as their recognition and actualization, differ across heterogeneous user groups. Before we turn to the theoretical and practical implications, we briefly discuss additional findings.

Comparison of crypto education platforms with survey results Many crypto education platforms continue to rely heavily on traditional formats such as articles, glossaries, and search engines (e.g., P5, P6). In our survey, these formats were among the least preferred by users (see Appendix F). Although video and live streaming formats were perceived as more effective and are already implemented on many platforms (e.g., P1, P2, P8), they are usually positioned less prominently than articles. Users also place a high value on interactive elements, such as discussion areas and ask-an-expert functions. However, these features are still rarely implemented (e.g., P12, P13, P15). The beginner sections (e.g., P1, P3, P5) also received favorable ratings, but are not yet consistently available. Features related to content interaction and personalization, such as sharing functions and article metadata, are more commonly implemented (e.g., P4, P6, P20) even though they were rated less important. Despite lower user ratings, content related to community trends and meme coins is often prominently featured on the entry pages of learning sections, highlighting more careful educational framing.

Comparison of crypto education platforms with personas The *Critical Observer* shows a distinct preference for discussion forums and demo areas, both of which are only marginally represented across existing platforms (e.g., P12, P16, P15). Similarly, the *Cautious Strategist* places particular value on demo areas and audio-based content. Only four platforms currently offer audio formats (e.g., P6, P12, P15, P19), relying more on external links than on their own content. The *Curious Gamified Explorer* and the *Hands-On Practical Experimenter* stand out for their overall openness toward financial and crypto-related topics. However, their most valued preferences are still rarely incorporated into platform design. The *Curious Gamified Explorer* tends to favor learn-and-earn formats, ask-an-expert functions, and discussion spaces, all of which are still underrepresented (see Appendix F). Their strong interest in social exchange and playful learning is not yet adequately reflected in the current design of crypto education platforms. Similar results apply to the *Hands-On Practical Experimenter*, arguably the most active and strategically relevant persona for platforms. This group assigned one of the lowest ratings to article-based content, which nonetheless remains the dominant format across nearly all platforms. This persona rated paid learning materials among the lowest overall, but the relatively moderate score still suggests potential for value-based monetization models.

Theoretical implications

Our study responds to structural shifts in the financial services landscape, where reduced in-person banking and the

increasing prevalence of self-service or FinTech solutions (Zeiß et al., 2024a, b) have shifted greater responsibility for financial decision-making to individuals (Lusardi, 2019). In this context, financial literacy is highlighted to navigate increasingly complex financial environments and make informed investment decisions for private investors (Compen et al., 2023; Lusardi & Mitchell, 2014; Mireku, 2024; Förster et al., 2026). It is also recognized as a key driver of financial inclusion (Siqueira et al., 2023), as well as for crypto asset adoption (Ante et al., 2023; Jariyapan et al., 2022). Given the growing need for alternative approaches to knowledge dissemination, arising from the current lack of crypto knowledge in traditional financial education (Jones et al., 2024), digital platforms offer a promising means of bridging existing gaps (Lusardi, 2019; van der Heide & Želinský, 2021). By systematically analyzing the content and learning components of existing crypto education platforms, this work establishes an initial conceptual foundation for understanding crypto-related learning contexts. Our work underscores that crypto education platforms have already positioned themselves within the financial education landscape to foster crypto adoption, as also supported by Jones et al. (2025). Further, we identified two predominant types of crypto education platforms, which we examine more closely, that already provide a substantial body of knowledge: crypto exchange platforms and crypto knowledge platforms.

Due to the explained context, our work contributes to the broader discussion on financial education by emphasizing crypto literacy as a specific form of financial literacy that extends traditional financial knowledge with skills related to crypto assets and blockchain-based financial applications, similar to the understanding proposed by Jones et al. (2025) and Zeiß (2025). Building on this perspective, we argue that conceptual work on financial literacy should more explicitly integrate digital and technology-driven elements to remain aligned with emerging financial ecosystems, thereby underscoring the need to expand existing financial education frameworks to include crypto-specific components. Relevant in this context is the notion that competence development in financial education encompasses not only cognitive knowledge, but also non-cognitive elements, such as motivational, emotional, and volitional factors, that allow individuals to translate financial understanding into deliberate practice (Förster et al., 2026; Aprea & Wuttke, 2016). Further, Goyal and Kumar (2020) state that financial knowledge alone is not sufficient, as individuals can only be regarded as financially capable when their skills are reflected in their actual financial behavior. Due to our findings, we see that the analyzed crypto education platforms primarily focus on cognitive knowledge transfer, while design elements that could foster non-cognitive processes, such as demo areas, learn-and-earn, or gamification, are largely neglected, resulting in limited emphasis on the practical application of acquired knowl-

edge. These findings imply that crypto education platforms fall short in addressing non-cognitive dimensions as well as underscore research and practical opportunities (Apra & Wuttke, 2016).

Recent studies also emphasize that a general lack of familiarity with blockchain and its affordances remains a major barrier to the technology's broader understanding and adoption (Giamporcaro & Kuk, 2025). Furthermore, the literature highlights that effective competence transfer requires targeted strategies and tailored content (Lusardi, 2019) that address the diverse needs and preferences of different user groups (Menberu, 2024). Against this backdrop, our study examines the design-reality gap (McCarthy et al., 2022) observed on the crypto education platforms. Drawing on affordance theory (Gibson, 2014; Norman Donald, 2013), we argue that the effectiveness of platform-based learning depends on the interaction between the features provided and users' ability to perceive and actualize them (McCarthy et al., 2022). In doing so, our work also uncovers previously untapped potential on crypto education platforms. Prior research in the field of blockchain affordances discusses the distinction between claimed and actualized affordances in the context of sustainable investment (Giamporcaro & Kuk, 2025), examines organizational implications through a process model of actualization (Du et al., 2019), and explores their consumer-related impact by empirically linking them with sustainable purchase intentions (Hina et al., 2024). To address this discourse, our study extends the current literature by focusing on the affordances of crypto education platforms' learning offerings. Building on Gibson's view that affordances exist independently of an individual's needs or goals (Gibson, 2014), this work supports platforms in identifying which of the available affordances are relevant to different user groups and in focusing existing resources on those affordances most likely to be perceived and actualized. In this regard, Giamporcaro and Kuk (2025) argue that learning affordances differ in relevance between user groups, leading to variations in how they are recognized and utilized. While our study does not directly examine these perceptual differences, our findings support the notion that not all available learning affordances are equally relevant to potential users and therefore not actualized to the same extent. Our findings, parallel to those of Xue et al. (2023), which analyzed online learning platforms through the lens of affordances, show that many platforms still focus on content delivery and cognitive knowledge transfer, while social and interactive features remain underdeveloped. Furthermore, our findings align with Jones et al. (2024), which demonstrated that individuals with higher self-perceived crypto literacy tend to seek additional input from financial professionals to deepen and complement their knowledge, not as a substitute for their knowledge, but as a means of deepening and complementing

it. Personas with greater knowledge and openness to crypto assets demonstrate a stronger inclination to seek advanced learning opportunities and a heightened curiosity for technological innovation, along with investment motivations, as confirmed by our data and the observations of Jones et al. (2024). Given the broader implications of a growing crypto market, such as potential effects on financial stability, as acknowledged by central banks (Balutel et al., 2023), platforms need to ensure educational quality and alignment with societal values.

Practical implications

As our results reveal, crypto education platforms should move beyond one-size-fits-all approaches and evolve toward user-centered, dynamic learning ecosystems. Our findings outline insights for *providers of crypto education platforms*, particularly regarding how learning offerings can be better aligned with user needs. Norman Donald (2013) highlights that platforms should make the system's action possibilities clearly visible to potential users to ensure that they are easily perceived as intended. Our research applies persona-based differentiation, connecting distinct affordance perceptions and actualization patterns to clearly defined learner types in the crypto education domain. The personas developed underscore the diversity of user profiles and emphasize the importance of tailoring learning environments to different levels of experience and motivation (Lusardi, 2019; Menberu, 2024). As discussed in this paper's theoretical section, most platforms still focus on cognitive knowledge transfer, which limits engagement and the practical application of knowledge. To address this, providers should integrate more interactive and adaptive elements that foster non-cognitive learning processes, which is crucial in financial literacy research (Förster et al., 2026). In addition, discussion forums and best practice exchange approaches are mentioned as cornerstones of success for digital platform learning communities in the literature (Huang et al., 2018), but remain underrepresented on current platforms. Xue et al. (2023) also emphasize the importance of social affordances, referring to technological features that enable and encourage user interaction and collaboration. Such affordances support social presence and play a crucial role in creating engaging and interactive learning experiences. Despite their importance, our analysis reveals that only a limited number of the crypto education platforms facilitate community features or open knowledge environments where users can actively benefit from the collective intelligence and experience of the crowd. This is because, according to co-creation research, customer expertise can serve as a strategic asset for shaping platform offerings (Bell et al., 2017), yet this opportunity remains underrepresented. Working on that can yield additional

benefits for providers. Participatory approaches foster user acceptance and enhance business value, while also reducing support costs, spreading best practices, and providing valuable feedback for new product and service development (Huang et al., 2018). In contrast, Willis (2011) argues that it is unrealistic to expect individuals to develop expert-level financial knowledge. Instead, Willis (2011) advocates for relying on professional advisors, a strategy that remains largely absent from today's platform affordances and is more typical of traditional finance offerings (Zeiß et al., 2024a, b). In this regard, platform providers should consider how to meaningfully integrate advisory elements or expert guidance into their learning environments. This also ties in with the theoretical notion highlighted by Jones et al. (2024), which emphasize that even experienced users tend to seek professional advice to complement their own expertise. Overall, platforms should also be cautious in how they present and frame educational content. The literature shows that offerings that build firm-specific expertise strengthen customer loyalty, whereas education that enhances general market knowledge can reduce it (Bell et al., 2017). Consequently, providers need to strike a balance between openness and strategic differentiation to ensure that education initiatives support both user empowerment and platform growth, but especially offer more targeted offerings.

Moreover, given the importance of the topic, our work also addresses practical implications for *traditional financial education stakeholders* by encouraging them to open up and embrace the crypto ecosystem. Lightweight trading platforms, such as Robinhood, are widely adopted by younger users, offer numerous financial literacy services, and could adjust their offerings to crypto (Zeiß, 2025; van der Heide & Želinský, 2021; Kuchciak & Wiktorowicz, 2021). However, even financial institutions with their trustworthy social media accounts, or knowledge exchange platforms play a key role in educating financial competence (Kuchciak & Wiktorowicz, 2021; van der Heide & Želinský, 2021). These players could establish themselves in the crypto market as educators by leveraging their existing structures and adapting their offerings to crypto demand (Zeiß et al., 2024a, b). The literature shows that crypto and financial literacy positively reinforce each other (Jones et al., 2024), suggesting that improvements in one domain can lead to advances in the other. In order to leverage synergies and incorporate crypto knowledge more effectively in traditional educational programs, those responsible for such financial education initiatives should acquire a solid understanding of the subject themselves (Zeiß et al., 2024a, b; Jones et al., 2024), and actively engage with available learning resources, including the offerings of crypto education platforms, to build competences and benefit from expert insights (Jones et al., 2024). Only when financial literacy is holistically addressed can users be optimally prepared for the chances and risks of the financial market. Addition-

ally, our results support traditional knowledge providers with insights to adapt and expand their current offerings (e.g., through uncovered topics and learner types). Beyond this, our findings are of relevance to *policymakers and regulatory bodies*. In line with established practices in traditional banking, policy considerations, such as MiCA, should include clearer responsibility and accountability frameworks for platform providers in delivering comprehensive expertise, as well as the potential introduction of licensing requirements for electronic market platform users (Ferreira & Sandner, 2021; Menberu, 2024). Despite the persistent global lack of financial literacy, even in the face of numerous policy efforts, community-based platforms are considered valuable in this area, as they, similar to schools and workplaces, reach broad and diverse audiences and constitute valuable access points for the dissemination of knowledge (Lusardi, 2019). As crypto assets gain traction in financially less affluent countries and regions with limited access to traditional financial education, dedicated platforms could help strengthen global financial literacy.

We also conclude that our findings are highly relevant to *users*. Financial and crypto literacy is a critical foundation for navigating the current financial landscape, but the platform offerings vary considerably in quality, scope, and usability. Our persona analysis demonstrates that users differ in how they perceive and actualize learning affordances, making it important to select platforms where they feel confident and supported, while avoiding environments that cause cognitive overload (Caxton et al., 2022). Active engagement with available functionalities, coupled with constructive feedback to platform providers, is vital for driving the continuous development and refinement of learning affordances and should therefore be actively addressed by platforms and users. Customer education not only supports knowledge building, but also improves users' return on investment (Menberu, 2024). Although detailed knowledge of regulatory and technical aspects is not a prerequisite for trading digital assets, investors with a deeper understanding of the underlying technologies can achieve better investment outcomes (Jones et al., 2024), which is valuable for users and providers.

Limitations

As with any scientific study, this work is not without limitations. First, certain constraints arise from the chosen methodological approach and theoretical grounding, particularly with regard to the search string, selected platforms, and the chosen framework, as well as the research method (Salminen et al., 2020). Nevertheless, the systematic procedure ensures transparency and provides a robust snapshot of the current state. Second, the sample size of the survey participants presents a limitation. However, the number was deemed sufficient for the analytical methods chosen, as

related research, such as Li and Xiao (2022), with 155 survey responses, confirms. Since no fully validated, literature-based questionnaire covering all persona-relevant constructs was available, the measurement of these characteristics relies on self-assessed items rather than complete standardized instruments, which limits comparability and may introduce self-report bias. While objective and validated test instruments (e.g., single- or multiple-choice formats) exist in educational research, they were not suitable for our study, as many of them are either too extensive in scope, too specific in focus, or not designed to capture learner characteristics in the way required for our persona-based approach. Nevertheless, the development of this part of the questionnaire was theoretically informed (e.g., by self-determination theory and self-directed learning), and the items were derived from established and validated measurement approaches. A further limitation lies in cluster analysis, which may be sensitive to parameter choices. This was addressed by carefully selecting and validating the clustering parameters. Finally, the development of the final personas may be subject to interpretative bias. To mitigate this, the derivation process was conducted collaboratively within the research team and was supported by quantitative analysis, as recommended by Mesgari et al. (2018), which highlight the value of mixed-methods approaches for the development process. At this point, it should be noted that the study explicitly addresses crypto literacy within the broader framework of financial literacy (Jones et al., 2025; Zeiß, 2025). Consequently, areas such as insurance and personal risk protection, which are also part of financial literacy, are not the focus of this work.

Conclusion and further research

Platform providers in the crypto sector are increasingly taking on the responsibility of supporting interested (potential) users with appropriate information. This study examines the current state of crypto education provided by platforms using an affordance theory lens and a multi-stage research methodology for data-driven persona development. We used a learning components analysis, followed by topic modeling to structure the content, and a quantitative survey to derive four learner personas: the *Cautious Strategist*, the *Critical Observer*, the *Curious Gamified Explorer*, and the *Hands-On Practical Experimenter*.

We see further research opportunities arising from this study in several directions. One promising avenue involves a comparative analysis between traditional financial education offerings and crypto education platforms. In line with Armani Dehghani et al. (2025), which demonstrated that

users and non-users perceive and respond to cryptocurrency affordances differently, it would be worthwhile to explore in more detail how these differences translate to the educational domain, especially whether crypto education platforms predominantly cater to non-users and how their value propositions for active users could be further developed. In particular, our analysis reveals a clear gap between the potential of blockchain to support lifelong learning, as emphasized in previous research (Loukil et al., 2021), and its limited implementation in current crypto education platforms, a gap that deserves a deeper examination. Additionally, we see opportunities for future research to address whether the increasing reliance on private providers is desirable or poses potential challenges. This includes considerations such as potential bias and broader questions of public trust. Another area worth exploring is how the learning structures derived from this study could be integrated into formal financial education systems. Furthermore, Bernhard et al. (2013) introduced a model that underscores the stages of affordance existence, perception, and actualization, in which actualization results in concrete effects. These stages and results are only briefly addressed, leaving room for a more detailed investigation.

Our study provides a foundation for further research on how to align educational design, platform strategy, and user engagement to create sustainable value in the evolving crypto education landscape. This work establishes a connection between the identified platform affordances and the users, providing concrete recommendations for more tailored crypto education offerings. Our study offers insights into the current crypto education and highlights how providers can better tailor their affordances to specific user groups to enhance the learning process. With this, the study contributes to the literature on platforms, financial education, and blockchain by providing transparency in a domain characterized by disruption and ongoing redefinition.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s12525-025-00863-y>.

Acknowledgements This work has been developed in the Project LIONS as part of dtec.bw. dtec.bw funded by the European Commission under NextGenerationEU. The authors are responsible for the content of this publication.

Funding Open Access funding enabled and organized by Projekt DEAL.

Data Availability The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request.

Declarations

Conflict of interest The authors declare no competing interests.

Open Access This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

References

- Al Mamun, M. A., Tanchangya, T., Rahman, M. A., Hasan, M. M., Islam, N., & Yeamin, B. (2025). Measuring the influence of fintech innovation towards consumers' attitude: Moderating role of perceived usefulness. *Sustainable Futures*, 10, Article 100885. <https://doi.org/10.1016/j.sfr.2025.100885>
- AlSuwaidi, R. A., & Mertzanis, C. (2024). Financial literacy and fintech market growth around the world. *International Review of Financial Analysis*, 95(Part B), 103481. <https://doi.org/10.1016/j.irfa.2024.103481>
- Alt, R., Fridgen, G., & Chang, Y. (2024). The future of fintech-towards ubiquitous financial services. *Electronic Markets*, 34, 3. <https://doi.org/10.1007/s12525-023-00687-8>
- Anderson, C., & Robey, D. (2017). Affordance potency: Explaining the actualization of technology affordances. *Information and Organization*, 27(2), 100–115. <https://doi.org/10.1016/j.infoandorg.2017.03.002>
- Ante, L., Wazinski, F.-P., Saggi, A. (2023). Digital real estate in the metaverse: An empirical analysis of retail investor motivations. *Finance Research Letters*, 58(Part A), 104299. <https://doi.org/10.1016/j.frl.2023.104299>
- Aparicio, M., Bação, F., & Oliveira, T. (2016). An e-learning theoretical framework. *Journal of Educational Technology Systems*, 19, 292–307.
- Apra, C., & Wuttke, E. (2016). Financial literacy of adolescents and young adults: Setting the course for a competence-oriented assessment instrument. *International handbook of financial literacy* (pp. 397–414). Berlin, Springer. https://doi.org/10.1007/978-981-10-0360-8_27
- Aryono, S. A., & Harlili, Satya, D. P. (2019). User interaction design for financial technology mobile application using user-centered design. *Proceedings of the International Conference of Advanced Informatics: Concepts, Theory and Applications (ICAICTA 2019)*, 1–6. <https://doi.org/10.1109/ICAICTA.2019.8904187>
- Balutel, D., Engert, W., Henry, C., Huynh, K. P., Rusu, D., & Voia, M. C. (2023). Crypto and financial literacy of cryptoasset owners versus non-owners: The role of gender differences. *Journal of Financial Literacy and Wellbeing*, 1(3), 514–540. <https://doi.org/10.1017/flw.2024.2>
- Beinke, M., Beinke, J. H., Anton, E., & Treuteberg, F. (2024). Breaking the chains of traditional finance: A taxonomy of decentralized finance business models. *Electronic Markets*, 34, 29. <https://doi.org/10.1007/s12525-024-00704-4>
- Bell, S. J., Auh, S., & Eisingerich, A. B. (2017). Unraveling the customer education paradox: When, and how, should firms educate their customers? *Journal of Service Research*, 20(3), 306–321. <https://doi.org/10.1177/1094670517691847>
- Bernhard, E., Recker, J., & Burton-Jones, A. (2013). Understanding the actualization of affordances: A study in the process modeling context. *Proceedings of the 34th international conference on information systems (ICIS 2013)*, 1–11.
- Bower, M. (2008). Affordance analysis-Matching learning tasks with learning technologies. *Educational media international*, 45(1), 3–15. <https://doi.org/10.1080/09523980701847115>
- Camacho, S., & Barrios, A. (2022). Social commerce affordances for female entrepreneurship: The case of Facebook. *Electronic Markets*, 32(3), 1145–1167. <https://doi.org/10.1007/s12525-021-00487-y>
- Caxton, S. V. M., Naveen, K., Karthik, R., & Bama, S. S. (2022). User-centered evaluation and design suggestions for NFT marketplaces. *Proceedings of the international conference on inventive computation technologies (ICICT 2022)*, 1214–1221. <https://doi.org/10.1109/ICICT54344.2022.9850815>
- Chang, Y.-N., Lim, Y.-K., & Stolterman, E. (2008). Personas: From theory to practices. *Proceedings of the 5th Nordic conference on Human-computer interaction: building bridges (NordCHI 2008)*, 439–442. <https://doi.org/10.1145/1463160.1463214>
- Church, E. M., & Thambusamy, R. (2022). Game-swinging on twitch: An affordances perspective. *Electronic Markets*, 32(3), 1677–1689. <https://doi.org/10.1007/s12525-022-00574-8>
- Compen, B., De Witte, K., Declercq, K., & Schelfhout, W. (2023). Improving students' financial literacy by training teachers using an online professional development module. *Education economics*, 31(1), 77–101. <https://doi.org/10.1080/09645292.2022.2035322>
- Cousins, K., Subramanian, H., Esmailzadeh, P. (2019). A value-sensitive design perspective of cryptocurrencies: A research agenda. *Communications of the Association for Information Systems*, 45, 511–547. <https://doi.org/10.17705/1CAIS.04527>
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- Dehghani, M. A., Karavidas, D., Rese, A., & Acikgoz, F. (2025). Bridging the adoption gap for cryptocurrencies: Understanding the affordances that impact approach-avoidance behavior for potential users and continuation usage for actual users. *Information Technology & People*, 38(1), 497–530. <https://doi.org/10.1108/ITP-10-2022-0821>
- Ditton, E., Swinbourne, A., & Myers, T. (2022). Selecting a clustering algorithm: A semi-automated hyperparameter tuning framework for effective persona development. *Array*, 14, Article 100186. <https://doi.org/10.1016/j.array.2022.100186>
- Du, W. D., Pan, S. L., Leidner, D. E., & Ying, W. (2019). Affordances, experimentation and actualization of fintech: A blockchain implementation study. *The Journal of Strategic Information Systems*, 28(1), 50–65.
- Egger, R., & Yu, J. (2022). A topic modeling comparison between lda, nmf, top2vec, and bertopic to demystify twitter posts. *Frontiers in Sociology*, 7, Article 886498. <https://doi.org/10.3389/fsoc.2022.886498>
- Evans, S. K., Pearce, K. E., Vitak, J., & Treem, J. W. (2017). Explicating affordances: A conceptual framework for understanding affordances in communication research. *Journal of computer-mediated communication*, 22(1), 35–52. <https://doi.org/10.1111/jcc4.12180>
- Ferreira, A., & Sandner, P. (2021). Eu search for regulatory answers to crypto assets and their place in the financial markets' infrastructure. *Computer Law & Security Review*, 43, Article 105632. <https://doi.org/10.1016/j.clsr.2021.105632>
- Förster, M., Hommel, M., Apra, C., Fürstenau, B., Happ, R., & Wuttke, E. (2026). The afin network: Advancing financial literacy through systematisation, modelling and assessment-introduction to the springerbrief. In *Conceptualisation and measurement of financial education: A holistic approach and implications for financial education* (pp. 1–10). Cham: Springer Nature Switzerland.

- land. Retrieved from https://doi.org/10.1007/978-3-031-95690-4_1
- Fujiki, H. (2021). Crypto asset ownership, financial literacy, and investment experience. *Applied Economics*, 53(39), 4560–4581. <https://doi.org/10.1080/00036846.2021.1904125>
- Garrison, D. R. (1997). Self-directed learning: Toward a comprehensive model. *Adult education quarterly*, 48(1), 18–33. <https://doi.org/10.1177/074171369704800103>
- Gerlach, J., Hoppe, P., Jagels, S., Licker, L., & Breitrner, M. H. (2022). Decision support for efficient xai services—a morphological analysis, business model archetypes, and a decision tree. *Electronic Markets*, 32(4), 2139–2158. <https://doi.org/10.1007/s12525-022-00603-6>
- Giamporcaro, S., & Kuk, G. (2025). Affordances-in-practice: Unravelling blockchain-for-good in sustainable investment. *Information Technology & People*, 38(5), 2249–2283. <https://doi.org/10.1108/ITP-05-2022-0349>
- Gibson, J. J. (2014). *The theory of affordances:(1979)*. Routledge.
- Goyal, K., & Kumar, S. (2020). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, 45(1), 80–105. <https://doi.org/10.1111/ijcs.12605>
- Gramlich, V., Guggenberger, T., Principato, M., Schellinger, B., & Urbach, N. (2023). A multivocal literature review of decentralized finance: Current knowledge and future research avenues. *Electronic Markets*, 33, 1–37. <https://doi.org/10.1007/s12525-023-00637-4>
- Gräther, W., Kolvenbach, S., Ruland, R., Schütte, J., Torres, C., & Wendland, F. (2018). Blockchain for education: Lifelong learning passport. *Proceedings of the 1st ERCIM Blockchain workshop 2018*, https://doi.org/10.18420/blockchain2018_07
- Grootendorst, M. (2022a). The BERTopic algorithm. <https://maatengr.github.io/BERTopic/algorithm/algorithm.html>. (Accessed: 2025-08-10)
- Grootendorst, M. (2022b). BERTopic: Neural topic modeling with class-based TF-IDF. arXiv, <https://doi.org/10.48550/arXiv.2203.05794>
- Grootendorst, M. (2023). Bertopic - tips and tricks. <https://maatengr.github.io/BERTopic/gettingstarted/tipsandtricks/tipsandtricks.html>. (Accessed: 2025-08-10)
- Guan, C., Ding, D., Ren, J., & Guo, J. (2024). Unveiling the aesthetic “wow factor”: The role of aesthetic incongruity and image quality in NFT art valuation with computer vision. *Electronic Markets*, 34, 38. <https://doi.org/10.1007/s12525-024-00722-2>
- Hina, M., Islam, N., & Dhir, A. (2024). Blockchain for sustainable consumption: An affordance and consumer value-based view. *Internet Research*, 34(7), 215–250.
- Huang, P., Tafti, A., Mithas, S. (2018). Platform sponsor investments and user contributions in knowledge communities. *MIS Quarterly*, 42(1), 213–240. <https://doi.org/10.25300/MISQ/2018/13490>
- Jariyapan, P., Mattayaphutrong, S., Gillani, S. N., & Shafique, O. (2022). Factors influencing the behavioural intention to use cryptocurrency in emerging economies during the COVID-19 pandemic: Based on technology acceptance model 3, perceived risk, and financial literacy. *Frontiers in Psychology*, 12, <https://doi.org/10.3389/fpsyg.2021.814087>
- Jones, M., Luu, T., & Samuel, B. M. (2025). Measuring crypto literacy. *Journal of Consumer Affairs*, 59(4), Article e70029.
- Jones, M., Luu, T. J., & Samuel, B. (2024). The interdependence of financial literacy and crypto literacy. *Economics Letters*, 239, Article 111737. <https://doi.org/10.1016/j.econlet.2024.111737>
- Jung, S.-G., Salminen, J., Aldous, K. K., & Jansen, B. J. (2025). Personacraft: Leveraging language models for datadriven persona development. *International Journal of Human-Computer Studies*, 197, Article 103445. <https://doi.org/10.1016/j.ijhcs.2025.103445>
- Kaiser, T., Lusardi, A., Menkhoff, L., & Urban, C. (2022). Financial education affects financial knowledge and downstream behaviors. *Journal of Financial Economics*, 145(2), 255–272. <https://doi.org/10.1016/j.jfineco.2021.09.022>
- Kherwa, P., & Bansal, P. (2019). Topic modeling: A comprehensive review. *EAI Endorsed Transactions on Scalable Information Systems*, 7(24), Article e2. <https://doi.org/10.4108/eai.13-7-2018.159623>
- Kuchciak, I., & Wiktorowicz, J. (2021). Empowering financial education by banks-Social media as a modern channel. *Journal of Risk and Financial Management*, 14, 118. <https://doi.org/10.3390/jrfm14030118>
- Kung, F. Y., Kwok, N., & Brown, D. J. (2018). Are attention check questions a threat to scale validity? *Applied Psychology*, 67(2), 264–283. <https://doi.org/10.1111/apps.12108>
- Lakshmanan, A., & Krishnan, H. S. (2011). The aha! experience: Insight and discontinuous learning in product usage. *Journal of Marketing*, 75(6), 105–123. <https://doi.org/10.1509/jm.10.0348>
- Lasfeto, D. (2020). The relationship between self-directed learning and students’ social interaction in online learning environment. *Journal of e-learning and Knowledge Society*, 16(2), 34–41. <https://doi.org/10.20368/1971-8829/1135078>
- Li, G., Mi, Y., Zhou, J., Zheng, X., & Wu, W. (2025). Group-based detection of cryptocurrency laundering using multi-persona analysis. *IEEE Transactions on Information Forensics and Security*, 20, 5992–6004. <https://doi.org/10.1109/TIFS.2025.3575954>
- Li, H., Wang, W., Yao, Y., Zhao, X., & Zhang, X. (2024). A review of truck driver persona construction for safety management. *Accident Analysis & Prevention*, 206, Article 107694. <https://doi.org/10.1016/j.aap.2024.107699>
- Li, L., & Xiao, J. (2022). Persona profiling: A multi-dimensional model to study learner subgroups in massive open online courses. *Education and Information Technologies*, 27(4), 5521–5549. <https://doi.org/10.1007/s10639-021-10829-0>
- Litterscheidt, R., & Streich, D. J. (2020). Financial education and digital asset management: What’s in the black box? *Journal of Behavioral and Experimental Economics*, 87, Article, 101573. <https://doi.org/10.1016/j.socec.2020.101573>
- Loukil, F., Abed, M., & Boukadi, K. (2021). Blockchain adoption in education: A systematic literature review. *Education and information technologies*, 26(5), 5779–5797. <https://doi.org/10.1007/s10639-021-10481-8>
- Lusardi, A. (2019). Financial literacy and the need for financial education: Evidence and implications. *Swiss journal of economics and statistics*, 155(1), 1–8. <https://doi.org/10.1186/s41937-019-0027-5>
- Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *American Economic Journal: Journal of Economic Literature*, 52(1), 5–44. <https://doi.org/10.1257/jel.52.1.5>
- McCarthy, S., Rowan, W., Kahma, N., Lynch, L., & Ertiö, T. P. (2022). Open e-learning platforms and the design-reality gap: An affordance theory perspective. *Information Technology & People*, 35(8), 74–98. <https://doi.org/10.1108/ITP-06-2021-0501>
- Menberu, A. W. (2024). Technology-mediated financial education in developing countries: A systematic literature review. *Cogent Business & Management*, 11(1), 2294879. <https://doi.org/10.1080/23311975.2023.2294879>
- Mesgari, M., Okoli, C., & de Guinea, A. O. (2018). Creating rich and representative personas by discovering affordances. *IEEE Transactions on Software Engineering*, 45(10), 967–983. <https://doi.org/10.1109/TSE.2018.2826537>
- Mireku, K. (2024). Determinants of financial literacy among university students: Insight into background and exposure characteristics. *Journal of Business & finance liBrarianship*, 29(3), 203–235. <https://doi.org/10.1080/08963568.2024.2352311>
- Mitchell, R. (2018). *Web scraping with python: Collecting more data from the modern web* (2nd ed.). Sebastopol, CA: O’Reilly Media.

- Morris, T. H. (2019). Self-directed learning: A fundamental competence in a rapidly changing world. *International Review of Education*, 65(4), 633–653. <https://doi.org/10.1007/s11159-019-09793-2>
- Norman Donald, A. (2013). *The design of everyday things*. MIT Press.
- Ouadoud, M., Chkouri, M. Y., Nejari, A., & El Kadiri, K. E. (2016). Studying and comparing the free e-learning platforms. *2016 4th IEEE International Colloquium on Information Science and Technology (CiSt)*, 581–586. <https://doi.org/10.1109/CIST.2016.7804953>
- Palmer, C., Hubbard, E.-M., Grant, R., & Goh, Y. M. (2025). Personas to inform cognitive interaction with a digital twin. *Journal of Industrial Information Integration*, 47, Article 100893. <https://doi.org/10.1016/j.jii.2025.100893>
- Patkar, N., & Seyff, N. (2023). Data-driven persona creation, validation, and evolution. *International Working Conference on Requirements Engineering: Foundation for Software Quality*, 262–271. <https://doi.org/10.1007/978-3-031-29786-118>
- Piñeiro-Chousa, J., Ángeles López-Cabarcos, M., Sevic, A., & González-López, I. (2022). A preliminary assessment of the performance of defi cryptocurrencies in relation to other financial assets, volatility, and user-generated content. *Technological Forecasting and Social Change*, 181, Article 121740. <https://doi.org/10.1016/j.techfore.2022.121740>
- Pintrich, P., Smith, D., Duncan, T., & McKeachie, W. (1991). A manual for the use of the motivated strategies for learning questionnaire (MSLQ). ERIC, 1–80.
- Pintrich, P. R., Smith, D. A., Garcia, T., & McKeachie, W. J. (1993). Reliability and predictive validity of the motivated strategies for learning questionnaire (MSLQ). *Educational and psychological measurement*, 53(3), 801–813. <https://doi.org/10.1177/0013164493053003024>
- Röder, M., Both, A., & Hinneburg, A. (2015). Exploring the space of topic coherence measures. *Proceedings of the Eighth ACM International Conference on Web Search and Data Mining (WSDM)*, 399–408. <https://doi.org/10.1145/2684822.2685324>
- Rehman, M.H.u., Salah, K., Damiani, E., Svetinovic, D. (2019). Trust in blockchain cryptocurrency ecosystem. *IEEE Transactions on Engineering Management*, 67(4), 1196–1212. <https://doi.org/10.1109/TEM.2019.2948861>
- Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). *Diffusion of innovations. An integrated approach to communication theory and research* (pp. 432–448). Routledge.
- Saeedi, A., & Al-Fattal, A. (2025). Examining trust in cryptocurrency investment: Insights from the structural equation modeling. *Technological Forecasting and Social Change*, 210, Article 123882. <https://doi.org/10.1016/j.techfore.2024.123882>
- Salminen, J., Guan, K., Jung, S.-G., Chowdhury, S. A., & Jansen, B. J. (2020). A literature review of quantitative persona creation. *Proceedings of the 2020 CHI conference on human factors in computing systems*, 1–14. <https://doi.org/10.1145/3313831.3376502>
- Salminen, J., Guan, K., Jung, S.-G., & Jansen, B. J. (2021). A survey of 15 years of data-driven persona development. *International Journal of Human-Computer Interaction*, 37(18), 1685–1708. <https://doi.org/10.1080/10447318.2021.1908670>
- Sawatsky, A. P., Ratelle, J. T., Bonnes, S. L., Egginton, J. S., & Beckman, T. J. (2017). A model of self-directed learning in internal medicine residency: A qualitative study using grounded theory. *BMC Medical Education*, 17(1), 31. <https://doi.org/10.1186/s12909-017-0869-4>
- Schär, F. (2021). Decentralized finance: On blockchain-and smart contract-based financial markets. *Federal Reserve Bank of St. Louis Review*, 103, 153–174. <https://doi.org/10.20955/r.103.153-74>
- Schmidt, R., Alt, R., & Zimmermann, A. (2023). Assistant platforms. *Electronic Markets*, 33, 59. <https://doi.org/10.1007/s12525-023-00671-2>
- Siqueira, É.S., Diniz, E.H., Pozzebon, M. (2023). Surveilled inclusion and the pitfalls of social fintech platforms. *Journal of the Association for Information Systems*, 24(5), 1292–1312. <https://doi.org/10.17705/1jais.00815>
- Stoekli, E., Dremel, C., Uebernickel, F., & Brenner, W. (2020). How affordances of chatbots cross the chasm between social and traditional enterprise systems. *Electronic Markets*, 30(2), 369–403. <https://doi.org/10.1007/s12525-019-00359-6>
- Stolper, O. A., & Walter, A. (2017). Financial literacy, financial advice, and financial behavior. *Journal Of Business Economics*, 87(5), 581–643. <https://doi.org/10.1007/s11573-017-0853-9>
- Strong, D.M., Volkoff, O., Johnson, S.A., Pelletier, L.R., Tulu, B., Bar-On, I., Trudel, J., Garber, L. (2014). A theory of organization-EHR affordance actualization. *Journal of the Association for Information Systems*, 15(2), 2. <https://doi.org/10.17705/1jais.00353>
- Sun, H., Wang, X., & Wang, X. (2018). Application of blockchain technology in online education. *International Journal of Emerging Technologies in Learning*, 13(10), 252–259. <https://doi.org/10.3991/ijet.v13i10.9455>
- Szozda, N., & Swierczek, A. (2022). Upstream and downstream dyad governance within the network structures: Creating supply chain governance for the customized products. *Electronic Markets*, 32(2), 873–898. <https://doi.org/10.1007/s12525-022-00533-3>
- Teixeira, P., Teixeira, L., Silva, S., & Eusébio, C. (2025). Technology-based approaches for accessible tourism: Using personas to understand stakeholders characteristics and motivations. *Data and Information Management*, 9, Article 100095. <https://doi.org/10.1016/j.dim.2025.100095>
- van der Heide, A., & Želinský, D. (2021). Level up your money game: An analysis of gamification discourse in financial services. *Journal of Cultural Economy*, 14, 711–731. <https://doi.org/10.1080/17530350.2021.1882537>
- Vazquez, E. E. (2021). Effect of an e-retailer's product category and social media platform selection on perceived quality of e-retail products. *Electronic Markets*, 31(1), 139–157. <https://doi.org/10.1007/s12525-020-00394-8>
- vom Brocke, J., Simons, A., Niehaves, B., Riemer, K., Plattfaut, R., & Cleven, A. (2009). Reconstructing the giant: On the importance of rigour in documenting the literature search process. *ECIS 2009 Proceedings*, 1–12.
- Voskobojnikov, A., Abramova, S., Beznosov, K. K., & Böhme, R. (2021). Non-adoption of crypto-assets: Exploring the role of trust, self-efficacy, and risk. *ECIS 2021 Research Papers*
- Wang, Y., Arora, C., Liu, X., Hoang, T., Malhotra, V., Cheng, B., & Grundy, J. (2025). Who uses personas in requirements engineering: The practitioners' perspective. *Information and Software Technology*, 178, Article 107609. <https://doi.org/10.1016/j.infsof.2024.107609>
- Ward, J. H. (1963). Hierarchical grouping to optimize an objective function. *Journal of the American Statistical Association*, 58, 236–244. <https://doi.org/10.1080/01621459.1963.10500845>
- Weber, E. U., Blais, A.-R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of behavioral decision making*, 15(4), 263–290. <https://doi.org/10.1002/bdm.414>
- Weinhandl, R., Kleinfurchnr, L., Riegler, V., Schobersberger, C., Houghton, T., Lavicza, Z., & Laina, V. (2024). Using student personas when developing digital mathematics learning resources to improve teacher training. *Journal of Digital Learning in Teacher Education*, 40(1), 57–72. <https://doi.org/10.1080/21532974.2023.2291370>
- Willis, L. E. (2011). The financial education fallacy. *American Economic Review*, 101(3), 429–434. <https://doi.org/10.1257/aer.101.3.429>
- Xue, S., Wang, C., & Muhaimaiti, M. (2023). Examining the affordances of an online learning platform: A usefulness theoretical

- perspective. *SAGE Open*, 13(4), 21582440231202820. <https://doi.org/10.1177/21582440231202821>
- Yang, Z., Xu, L., Gao, Y., Zhang, C., & Wang, A. (2025). Tailored personas for self-management in home-based cardiac rehabilitation for patients with coronary heart disease: A qualitative study. *International journal of nursing studies*, 163, Article 105000. <https://doi.org/10.1016/j.ijnurstu.2025.105000>
- Zeiß, C. (2025). Failing to see the obvious? How financial crypto literacy shapes the future of fintech platforms in the disruptive blockchain era. AMCIS 2025 Proceedings. Retrieved from <https://aisel.aisnet.org/amcis2025/sig%5Fdite/sig%5Fdite/12>
- Zeiß, C., Schaschek, M., Straub, L., Tomitza, C., & Winkelmann, A. (2024a). Re-intermediation of the crypto asset ecosystem by banks: An empirical study on acceptance drivers among the populace. *Electronic Markets*, 34, 37. <https://doi.org/10.1007/s12525-024-00720-4>
- Zeiß, C., Straub, L., Hahn, V., Lang, K., Schaschek, M., Tomitza, C., & Winkelmann, A. (2024b). Designing for banking resilience: A defi e-learning solution. *International Conference on Design Science Research in Information Systems and Technology*, 325–338. https://doi.org/10.1007/978-3-031-61175-9_22
- Zeiss, C., Straub, L., Schaschek, M., & Winkelmann, A. (2024). The obscure world of digital assets-design principles for user-centered platforms. *ECIS 2024 Proceedings*
- Zhang, X., Brown, H.-F., Shankar, A. (2016). Data-driven personas: Constructing archetypal users with clickstreams and user telemetry. *Proceedings of the 2016 CHI conference on human factors in computing systems*, 5350–5359. <https://doi.org/10.1145/2858036.2858523>
- Zhong, R., Han, S., & Wang, Z. (2024). Developing personas for live streaming commerce platforms with user survey data. *Universal Access in the Information Society*, 23(4), 1705–1721. <https://doi.org/10.1007/s10209-023-00996-x>
- Zimmerman, B. J. (1986). Becoming a self-regulated learner: Which are the key subprocesses? *Contemporary educational psychology*, 11(4), 307–313. [https://doi.org/10.1016/0361-476X\(86\)90027-5](https://doi.org/10.1016/0361-476X(86)90027-5)

Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Authors and Affiliations

Lisa Straub¹  · Christian Zeiß¹  · Justus Pehl¹ · Maximilian Greiner²  · Axel Winkelmann¹  · Ulrike Lechner² 

✉ Lisa Straub
lisa.straub@uni-wuerzburg.de

Christian Zeiß
christian.zeiss@uni-wuerzburg.de

Justus Pehl
justus.pehl@stud-mail.uni-wuerzburg.de

Maximilian Greiner
maximilian.greiner@unibw.de

Axel Winkelmann
axel.winkelmann@uni-wuerzburg.de

Ulrike Lechner
ulrike.lechner@unibw.de

- ¹ Chair of Management and Information Systems, Julius-Maximilians-Universität Würzburg, Sanderring 2, 97070 Würzburg, Germany
- ² Faculty of Computer Science, Institute for Protection and Dependability, University of the Bundeswehr Munich, Werner-Heisenberg-Weg 39, 85577 Neubiberg, Germany