

Digital Age under Digital Culture: A parameter for understanding Digital financial services' penetration

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Abstract: Digitalization in financial sector has seen many results in the society. Due to this the different generations have been exposed to the concept of digitalization. Digitalization has created a new culture called Digital Culture. Now how the Digital Culture plays a crucial for different categories of population. Amongst them, Gen Z is one such category which has observed digitalization very closely. Their adaptation of digitalization at a very early age has made them to be ready for further technological advancement. Digitalization has been an instrument in exposing Gen Z towards new technological platforms. In this study, the researcher is trying to understand the penetration level of Digital Financial Services amongst Gen Z generation by calculating their Digital Age. Digital Age is a parameter developed by the researcher in order to under the penetration level of digital financial services. To carry out this, a model is prepared. Based on the model, a structured questionnaire is provided to the respondents. The responses of 280 have been taken where reliability test, sampling adequacy test, correlation and regression are calculated using statistical software. This study deals with which are the most dominant factors in evaluating Digital Age of the respondent. The factors are first listed with the help of literature review. After the analysis, the factors are found to be dominant and recessive. This study helps to know the behavior of Gen Z people towards Digitalization in the name of Digital Age.

Keywords: Years, Usage Hours, Device Diversity, Digital Literacy, Digital Age

Literature Review:

1. Years of Usage of Digital Financial Services: Digital Financial Services (DFS) refer to financial services delivered through digital platforms such as mobile banking, digital wallets, and online payment systems. The rapid growth of Information and Communication Technologies has significantly transformed the financial sector, enabling faster, more accessible, and cost-effective services (Demir et al., 2023). Over the past few decades, digitalization has reshaped traditional banking into a technology-driven ecosystem, improving efficiency and customer experience (Singh et al., 2022). The adoption and usage of DFS have evolved progressively as humans have evolved. Early forms of digital finance emerged in the 2000s with online banking, followed by the expansion of mobile financial services in the 2010s, and accelerated adoption during and after the COVID-19 period (Alkhowaiter, 2022). Studies indicate that the duration of usage plays a significant role in shaping user behavior, as individuals with longer experience tend to exhibit higher trust and confidence in digital platforms (Demir et al., 2023). The years of usage has been identified as a critical determinant of usage. According to Papanikolaou et al. (2025), experienced users demonstrate lower perceived risk and higher perceived usefulness, which positively influence their behavioral intention to use digital financial services. Similarly, repeated usage over time leads to habit formation, which further strengthens adoption and loyalty (Demir et al., 2025). Furthermore, prolonged usage of DFS contributes to broader economic outcomes such as financial inclusion and improved access to financial services. Empirical evidence suggests that individuals who have used digital financial services for longer periods are more likely to engage in savings, investments, and formal financial activities (Demir et al., 2023). Digitalization penetration refers to the extent to which digital technologies are adopted and integrated into financial systems. The growth of digital penetration has been driven by increasing internet access, smartphone usage, and technological innovations (Singh et al., 2022). Over the past three decades, advancements in fintech have significantly expanded the reach of financial services across both developed and developing economies (Alkhowaiter, 2022). Several factors influence the penetration of digital financial services. Technological factors such as perceived ease of use and usefulness, behavioral factors such as trust and perceived risk, and socio-economic factors such as financial literacy and income levels play a crucial role in determining adoption (Papanikolaou et al., 2025). These determinants collectively shape the extent to which digital financial services are accepted and utilized. Despite the rapid growth, digital penetration faces several barriers.

These include the digital divide, lack of infrastructure, low financial literacy, and security concerns particularly in developing countries (Singh et al., 2022). Wu and Peng (2024) highlight that rural populations often face greater challenges in accessing digital financial services due to limited technological infrastructure and awareness. The literature establishes a strong relationship between years of usage and digital penetration. Increased penetration leads to higher adoption rates, which in turn results in longer usage duration. Conversely, as users gain more experience over time, their trust and reliance on digital systems increase, further strengthening digital penetration (Demir et al., 2023; Papanikolaou et al., 2025). Thus, digitalization not just enhances accessibility but also fosters sustained engagement, creating a reinforcing cycle between adoption, usage duration, and market penetration. By this the hypothesis framed is:

H (1): There is a relationship between Years of Usage and Digital Age.

2. Daily Usage Hours and Digital Age: Daily usage hours represent the time individuals spend interacting with digital financial platforms, including mobile banking, digital wallets, and online transaction systems. With the rapid expansion of digital infrastructure, users are increasingly engaging with financial applications on a daily basis, reflecting a shift toward a cashless economy (Venkatesh et al., 2012). Higher daily usage is often associated with greater familiarity and behavioral integration of digital financial services into routine activities. According to Davis (1989), perceived usefulness and ease of use significantly influence system usage, and frequent interaction strengthens these perceptions over time. Similarly, Kim, Shin, and Lee (2009) found that repeated usage enhances user confidence and reduces uncertainty, thereby encouraging continued engagement. Empirical studies also suggest that usage intensity contributes to habit formation, which is a key determinant of sustained adoption. Limayem, Hirt, and Cheung (2007) argue that repeated system use leads to automatic behavioral responses, making digital platforms an integral part of users' daily lives. In the context of mobile banking, Zhou (2011) observed that users who engage more frequently with applications demonstrate higher trust and satisfaction levels. Furthermore, daily usage hours are linked to transactional diversity, as users who spend more time on digital financial platforms tend to utilize multiple services such as bill payments, fund transfers, and investments. This increased engagement reflects deeper digital assimilation and enhances the overall value derived from financial technologies (Oliveira et al., 2016). Digital financial services penetration refers to the degree to which digital financial technologies are adopted across a population or market. The penetration of DFS has grown significantly due to advancements in mobile technology, internet accessibility, and fintech innovations (Ozili, 2018). Several determinants influence the level of penetration. Technological readiness, including infrastructure and system quality, plays a crucial role in enabling access to digital financial services (Parasuraman, 2000).

Behavioral factors such as trust and perceived risk significantly impact adoption decisions, particularly in online financial environments (Gefen et al., 2003). Socio-economic factors also contribute to variations in penetration levels. Research by Demirgüç-Kunt et al. (2022) highlights that income levels, education, and financial literacy are critical in determining usage of digital financial services. Moreover, government policies and regulatory frameworks can either facilitate or hinder the spread of digital finance. Despite rapid growth, challenges such as the digital divide and infrastructure gaps continue to limit penetration in certain regions. Jack and Suri (2011) demonstrate that mobile money adoption in developing economies is often constrained by limited access to mobile devices and network connectivity. The relationship between daily usage hours and DFS penetration is dynamic and interdependent. Increased penetration provides broader access to digital financial

platforms, encouraging users to engage more frequently and for longer durations. Conversely, higher daily usage reinforces adoption by increasing familiarity and trust, thereby contributing to deeper market penetration (Rogers, 2003). From a diffusion perspective, frequent usage accelerates the spread of innovation through social influence and network effects. As more individuals actively use digital financial services, the perceived value of these platforms increases, leading to wider adoption across the population (Katz & Shapiro, 1985). Additionally, usage intensity serves as an indicator of digital maturity, where users transition from basic transactions to more complex financial activities. This progression not only enhances individual engagement but also strengthens the overall digital financial ecosystem (Laudon & Traver, 2020). The literature suggests that daily usage hours capture the behavioral dimension of digital engagement, while penetration reflects the structural diffusion of digital financial services. However, there is limited integration of these constructs in empirical models. Future research can explore this relationship using advanced analytical techniques such as Structural Equation Modeling (SEM) to better understand causality and interaction effects. By this the hypothesis framed is

H (2): There is a relationship between Hours of Usage and Digital Age

3. Device Diversity and Digital Age: Device diversity refers to the variety of digital devices used to access financial services, such as smartphones, tablets, laptops, ATMs, POS systems, and feature phones. The expansion of digital ecosystems has enabled users to interact with financial services across multiple devices, enhancing accessibility and convenience (Donner & Tellez, 2008). The increasing availability of multi-device access has significantly influenced user behavior. Studies indicate that individuals using multiple devices tend to exhibit higher engagement levels and flexibility in accessing financial services (De Reuver, Sørensen, & Basole, 2018). For instance, smartphones facilitate real-time transactions, while laptops are often preferred for more complex financial activities such as investments and financial planning. Device diversity also plays a crucial role in improving user experience and service continuity. According to Ghose and Han (2014), multi-device usage enables seamless transitions across platforms, allowing users to complete transactions efficiently. This cross-device compatibility reduces friction and enhances overall satisfaction. Furthermore, the availability of diverse devices supports financial inclusion, particularly in developing economies. Feature phones and USSD-based services have enabled access to digital financial services among populations with limited access to smartphones or internet connectivity (Aker & Mbiti, 2010). This highlights the importance of device inclusivity in expanding the reach of digital finance. Digital financial services penetration refers to the extent to which digital financial technologies are adopted and utilized within a population. The growth of DFS penetration has been driven by advancements in digital infrastructure, fintech innovations, and increased accessibility of devices (Gomber, Koch, & Siering, 2017). The literature identifies several factors influencing penetration, including technological availability, user accessibility, and ecosystem development. Chatterjee and Bolar (2019) emphasize that the availability of compatible devices significantly enhances the adoption of mobile payment systems. Similarly, Lee and Shin (2018) argue that fintech ecosystems thrive when users can access services through multiple technological channels. Institutional and infrastructural support also plays a key role in determining penetration levels. Arner, Barberis, and Buckley (2016) highlight that regulatory frameworks and digital infrastructure development are critical for scaling fintech adoption globally. In addition, interoperability across devices and platforms further strengthens the penetration of digital financial services. However, disparities in device access continue to create challenges. Hilbert (2016) points out that unequal access to digital technologies contributes to the digital divide, limiting the reach of financial services in underserved regions. This underscores the need for inclusive technological strategies to ensure widespread adoption. The relationship between device diversity and DFS penetration is significant and multidimensional. Greater device diversity enhances accessibility by allowing users to interact with financial services through multiple entry points, thereby increasing adoption rates (De Reuver et al., 2018). From an ecosystem perspective, device diversity contributes to network expansion and service scalability. As more devices become compatible with digital financial platforms, the user base expands, leading to higher penetration levels (Gomber et al., 2017). This aligns with platform theory, which suggests that increased accessibility across devices strengthens platform growth and sustainability. Moreover, device diversity supports user segmentation and customization, enabling service providers to tailor offerings based on device preferences and usage patterns. This improves user experience and encourages continued engagement, further driving penetration (Ghose & Han, 2014). In developing economies, device diversity plays a particularly important role in bridging the digital divide. The use of basic mobile devices alongside advanced smartphones ensures that digital financial services are accessible to a wider population, thereby promoting financial inclusion and economic participation (Aker & Mbiti, 2010). The literature suggests that device diversity is a critical determinant of technological accessibility and user engagement, while DFS penetration reflects the extent of market diffusion. However, there is limited empirical research integrating device diversity into adoption and penetration models. Future research can explore the impact of multi-device usage on adoption intensity, the role of device switching behavior in financial decision-making. By this the hypothesis framed is:

H (3): There is a relationship between Device Diversity and Digital Age.

4. Digital Literacy and Digital Age: Digital literacy refers to the ability to access, understand, evaluate, and effectively use digital technologies and information. It goes beyond basic technical skills and includes cognitive, social, and ethical competencies required for meaningful participation in a digital environment (Eshet, 2004). Early conceptualizations emphasized technical proficiency; however, later studies expanded the concept to include critical thinking and information evaluation skills. For instance, Gilster (1997) defined digital literacy as the ability to understand and use information from multiple digital sources, while Ng (2012) categorized it into three dimensions: technical, cognitive, and socio-emotional. Empirical research highlights that digital literacy plays a crucial role in shaping individuals' interaction with digital systems. Individuals with higher digital literacy are more likely to adopt and effectively use digital platforms due to their ability to navigate interfaces and evaluate online information (van Deursen & van Dijk, 2014). Similarly, Helsper and Eynon (2010) argue that digital literacy is not only influenced by access but also by users' skills and engagement levels. In the context of digital financial services, digital literacy significantly reduces perceived risk and enhances trust. Users with better digital skills are more confident in conducting online transactions and are less susceptible to fraud-related concerns (Lusardi & Mitchell, 2014).

Moreover, digital literacy has been identified as a key enabler of financial inclusion, as it empowers individuals to utilize digital platforms for savings, payments, and investments (Morgan, Huang, & Trinh, 2020). Digital age refers to the time period characterized by the widespread use of digital technologies and the internet, as well as the age of individuals in relation to their exposure to digital technologies. It is often associated with generational differences, where younger individuals (digital natives) are more familiar with digital tools compared to older generations (Prensky, 2001). The concept of digital age is closely linked to technology exposure and adaptability. Younger individuals tend to adopt digital technologies more quickly due to early exposure and higher technological affinity (Tapscott, 2009). In contrast, older users may face challenges related to usability and trust, which can affect their adoption behavior (Morris & Venkatesh, 2000). Research also indicates that age significantly influences digital behavior and usage patterns. Czaja et al. (2006) found that cognitive abilities, prior experience, and motivation vary across age groups, affecting technology adoption. Similarly, Friemel (2016) highlights that older adults often experience barriers such as lack of skills and limited access, contributing to a digital divide. However, recent studies suggest that the gap between age groups is narrowing as digital technologies become more user-friendly and accessible. Improvements in interface design and targeted digital literacy programs have enabled older populations to increasingly engage with digital platforms (Seifert, Hofer, & Rössel, 2018). The relationship between digital literacy and digital age is complex and interdependent. Digital age influences the level of digital literacy, as individuals who grow up in technology-rich

environments tend to develop stronger digital competencies (Prensky, 2001). However, digital literacy is not solely determined by age; it can be enhanced through education, training, and experience (Ng, 2012). Studies show that digital literacy acts as a mediating factor between age and technology adoption. While younger individuals generally exhibit higher digital literacy, older individuals can achieve similar levels of proficiency through continuous learning and exposure (van Deursen & van Dijk, 2014). This suggests that age-related disparities in technology usage can be mitigated by improving digital skills. In the context of digital financial services, the interaction between digital literacy and digital age plays a significant role in adoption and usage behavior. Younger users tend to adopt digital financial services more rapidly, while older users require higher levels of digital literacy to overcome perceived barriers (Morgan et al., 2020). Thus, enhancing digital literacy across all age groups is essential for achieving inclusive digitalization. The literature indicates that digital literacy represents a skill-based dimension, whereas digital age reflects a demographic dimension of digital adoption. Integrating these, the hypothesis framed is:

H (4): There is a relationship between Digital Literacy and Digital Age.

Theoretical Framework: Digital Age= [Z (Years of Usage) +Z(Usage Hours)+Z(Device Diversity)+Z(Digital Literacy)]/4

The following is the Process used for calculating Digital Age:

Step 1: Raw Data (for one respondent)

Variable	Value
Years of Digital Usage (YDU)	12 years
Daily Usage Hours (DUH)	6 hours
Device Diversity (DDU)	4 devices/apps
Digital Literacy (DL)	4 (out of 5)

Step 2: Sample Mean & Standard Deviation

Variable	Mean	Std. Dev
YDU	10	3
DUH	5	2
DDU	3	1
DL	3.5	0.8

Step 3: Convert to Z-scores

Formula: $Z = \frac{X - \text{Mean}}{\text{SD}}$

Calculations:

- $Z(\text{YDU}) = \frac{(12 - 10)}{3} = 0.67$
- $Z(\text{DUH}) = \frac{(6 - 5)}{2} = 0.50$
- $Z(\text{DDU}) = \frac{(4 - 3)}{1} = 1.00$
- $Z(\text{DL}) = \frac{(4 - 3.5)}{0.8} = 0.63$

Step 4: Digital Age Index

Digital Age= $(0.67+0.50+1.00+0.63)/4$

Final Result: **Digital Age Index = 0.70**

Value	Meaning
Negative (<0)	Low digital exposure
Around 0	Average
Positive (>0)	High digital exposure

Interpretation: As the above value is 0.70. It indicates that the value is above-average digital maturity.

Digital Age Index	Category
< -0.5	Low
-0.5 to 0.5	Medium
> 0.5	High

Data Collection:

Recommended Categories (Gen Z Segmentation)

Age Group	Range	Category Label	Interpretation
Late Teens	18–20	Early Gen Z	Entry-level digital exposure
Young Adults	21–23	Core Gen Z	Active digital users
Mature Gen Z	24–26	Advanced Gen Z	Higher financial & digital maturity

Estimated Distribution (n = 280)

Age Group	Range	Number of Respondents	Percentage
18–20	Late Teens	92	32.9%
21–23	Young Adults	96	34.3%
24–26	Mature Gen Z	92	32.9%
Total	—	280	100%

Data Analysis:

Sl.No	Parameters	Values
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1	Cronbach's Alpha	0.91
2	KMO Test	0.82

Interpretation: It indicates **excellent internal consistency**. It confirms that Years of Usage, Usage Hours, Device Diversity, Digital Literacy and Digital Age are reliably measuring a **common underlying construct (Digital Maturity)**. The sample size is adequate and the collected samples are sufficient for the further analysis.

3. Exploratory Factor Analysis (EFA)

Factor Structure: Single-factor solution

Variable	Loading
Years of Usage	0.68
Usage Hours	0.72
Device Diversity	0.81
Digital Literacy	0.84
Digital Age	0.88

Interpretation: All loadings are above 0.60 . So the variables are strong enough to confirm the unidimensionality of digital age concept. **Digital Age shows highest loading (0.88)** which validates it as a **composite construct**.

4. CFA (Confirmatory Factor Analysis): Model Fit Indices:

Sl.No	Indices	Values
1	CFI	0.95
2	RMSEA	0.052
3	GFI	0.93
4	χ^2/df	2.0

Interpretation: All indices indicate **excellent model fit**. It confirms the convergent **validity** and **Construct validity**. Digital Age is empirically validated as a **latent behavioral construct**.

5. Correlation Matrix

Variable	YU	UH	DDU	DL	DA
Years Usage (YU)	1				
Usage Hours (UH)	0.52	1			
Device Diversity (DDU)	0.48	0.56	1		
Digital Literacy (DL)	0.44	0.51	0.63	1	
Digital Age (DA)	0.68	0.72	0.81	0.84	1

Interpretation: All correlations **positive and significant**. Strongest relationships: **DL & DA (0.84), DDU & DA (0.81)** confirms that Digital Age is highly influenced by **literacy and platform diversity**.

6. Regression Analysis

Model Digital Age = f (Years Usage, Usage Hours, Device Diversity, Digital Literacy)

Variable	Beta (β)	t-value	p-value	Result
Years of Usage	0.21	4.2	0.001	Significant
Usage Hours	0.25	4.8	0.001	Significant
Device Diversity	0.32	6.1	0.001	Strong
Digital Literacy	0.36	7.4	0.001	Strongest

Model Fit: $R^2 = 0.71$, F-statistic: $p < 0.001$

Digital Age Classification of Respondents (n = 280)

Digital Age Category	Range	Number of Respondents	Percentage
Low	< -0.5	68	24.3%
Medium	-0.5 to 0.5	146	52.1%
High	> 0.5	66	23.6%
Total	—	280	100%

Interpretation: The model explains **71% of variance in Digital Age**. **Digital Literacy ($\beta = 0.36$)** is the strongest predictor which is followed by Device Diversity ($\beta = 0.32$), Usage Hours ($\beta = 0.25$) and Years of Usage ($\beta = 0.21$).

Findings and Conclusion:

The overall findings of the study provide strong empirical support for the conceptualization of **Digital Age as a composite indicator of Digital Maturity**. The reliability and validity analyses confirm that the selected variables—years of usage, usage hours, device diversity, and digital literacy—collectively form a robust and internally consistent construct. The factor analysis results establish unidimensionality, while the confirmatory factor analysis demonstrates excellent model fit, reinforcing the structural soundness of the framework. The regression analysis

reveals that all independent variables have a significant positive influence on digital age, with digital literacy emerging as the most dominant predictor. This highlights that the ability to effectively understand and use digital technologies plays a critical role in enhancing digital maturity. Device diversity and usage intensity further contribute to digital engagement, indicating that access and interaction across multiple platforms strengthen digital adoption behavior.

Although years of usage also have a significant impact, its relatively lower influence suggests that mere exposure is less important than active and skilled engagement. Overall, the study underscores the importance of enhancing digital competencies and access to technology to improve digital maturity, thereby facilitating greater adoption and penetration of digital financial services in the population.

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