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### Cryptocurrency & Bitcoin: A Customer Perception Study of Quetta City, Pakistan

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	<b>Abstract</b>
<p><b>Dr. Khuram Shahzad</b> IMS, University of Balochistan, Quetta. <a href="mailto:khuram.ims@um.uob.edu.pk">khuram.ims@um.uob.edu.pk</a></p>	<p>This study quantitatively analyzes customer perceptions of Bitcoin's effectiveness in Quetta, Pakistan, using survey data from 150 respondents. The analysis employed descriptive statistics, reliability tests, factor analysis, correlation, and multiple regression. The sample was predominantly young, educated males with moderate incomes. All measurement constructs demonstrated good reliability; factor analysis extracted two dimensions, a risk factor and a trust factor. Correlation analysis identified perceived usefulness as the strongest positive correlate and perceived risk as the strongest negative correlate of perceived effectiveness. A multiple regression model explained 61.2% of the variance in perceived effectiveness. Key predictors were perceived usefulness and trust as positive drivers and perceived risk and Hawala trust as significant barriers. Significant interaction effects showed that infrastructure reliability amplifies the positive impact of usefulness, while trust in Hawala exacerbates the negative impact of perceived risk. The findings emphasize that, in this emerging market context, Bitcoin adoption is influenced not only by technology-acceptance factors but also, critically, by competition with trusted informal financial systems and local infrastructural constraints.</p>
<b>Keywords</b>	Cryptocurrency, Bitcoin, Hawala, Perceived Risk, Technology Acceptance Model, Quetta, Pakistan.



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### Introduction

Cryptocurrency is a digital currency not controlled by any single group and uses cryptography to protect it. It has become a strong force in the world economy, but it is also unstable. In 2009, Satoshi Nakamoto, who used a pseudonym, created Bitcoin. Since then, the ecosystem has grown to include thousands of different digital assets. These have changed how one thinks about money, saving value, and paying for things (Nakamoto, 2008). People now use the term "Bitcoin" to refer to the entire cryptocurrency market. Bitcoin is the first and most valuable cryptocurrency. It is a common way for new users to get started and a standard. Some of its central ideas are decentralization, resistance to censorship, a fixed supply (a deflationary model), and peer-to-peer transactions. These things make it a risky investment and a way to protect oneself from inflation and a currency that loses value.

Many social, economic, legal, and technological factors make it harder to discuss cryptocurrency in Pakistan. Many people in Pakistan do not have bank accounts, and the currency is weakening. All of these things are bad for the economy. Since 2023, the value of the Pakistani Rupee (PKR) has fallen significantly, and inflation has risen into the double digits. People's savings have decreased as a result (State Bank of Pakistan, 2023). Many young people in the country are also good with technology. In the last few years, it has had one of the highest rates of Google searches for "Bitcoin" worldwide (Google Trends, 2021). Because of this difference, it is easier to think of digital assets as other ways to invest money. However, the rules are still too strict and rigid to understand. The State Bank of Pakistan (SBP) and the Federal Government have issued circulars in the past instructing banks and other financial institutions not to facilitate the purchase or sale of cryptocurrencies or engage in business with them (SBP Circular No. 03 of 2018). Peer-to-peer (P2P) trading volumes on sites like LocalBitcoins and Binance P2P have consistently made Pakistan one of the best markets in the world, despite it being illegal. It means many people are using it illegally (Chainalysis, 2022). The big problem is that it lacks sufficient real-world data on how people actually use cryptocurrencies like Bitcoin. It is clear from the gap between what the government says and what people do on the ground.

For this reason, effectiveness can mean many different things. Bitcoin could be a way for people in Pakistan to send money (faster and cheaper than traditional methods like hawala or banks), protect themselves from inflation as the PKR falls, make money through speculation, or bring more people into the financial system. People know about the risks, though, such as large price swings, unclear rules, security threats (hacking and scams), and a lack of investor protection (Khalid et al., 2021). Previous research on cryptocurrency in Pakistan has mainly concentrated on regulatory dimensions, macroeconomic effects, or overall awareness (Ahmed & Shah, 2020). There is a notable deficiency in quantitative research that systematically evaluates and analyzes the perceptions of current and prospective users regarding Bitcoin's efficacy in addressing their specific socio-economic needs. Many groups need to know about these ideas: regulators require evidence-based data to shift from an exclusively prohibitive stance; financial educators can develop specialized literacy programs; and the global cryptocurrency sector can enhance service customization for emerging markets. This study seeks to conduct a quantitative analysis of customer perceptions of the efficacy of cryptocurrency, particularly Bitcoin, within Pakistan's socio-economic context. It wants to find out how users and potential users see its features, weigh its pros and cons, and assess how useful it is for their financial situations. The results help make the conversation about adding digital assets to developing economies with similar financial challenges more nuanced and grounded in facts.

The growing body of literature on cryptocurrency adoption in Pakistan provides crucial insights into national trends; however, significant research gaps persist, particularly at subnational and socio-culturally specific levels. Most of the research done so far has focused on big cities like Karachi, Lahore, and Islamabad, which have better infrastructure, more people who know how to use money, and more internet users (Ahmed & Shah, 2020; Khalid et al., 2021). This bias in favor of big cities fails to account for the distinct social, economic, cultural, and infrastructure needs of smaller cities and regionally important hubs. Quetta is the capital of Balochistan. It is a crucial area that has not been studied much, so it is hard to say how people in Pakistan feel about cryptocurrency. People often look at other cities, but many things make Quetta stand out. First, it is an important trade and travel hub on the border with Afghanistan. Second, it has a historically significant informal economy (hawala/hundi) for cross-border fund transfers (Akhtar, 2022). The effectiveness of Bitcoin as a remittance tool or a store of value in a context characterized by unique trust networks and transnational exchanges has yet to be analyzed. Second, Balochistan has the fewest banks in Pakistan, which means that many people do not have bank accounts (Shahzad et al., 2025).

Nevertheless, the number of cell phone users has grown rapidly (Pakistan Telecommunication Authority, 2023). This difference underscores the importance of learning about decentralized financial technologies. Do not know for sure whether the people of Quetta think cryptocurrencies are a good way to get more people into the economy. The area faces its own set of problems, including greater regulatory detachment, greater economic instability, and different internet connectivity issues than in bigger cities (World Bank, 2022). It is not clear how these limits affect people's views on the usefulness of cryptocurrency, either as a way to protect against localized economic instability or as an

asset impractical due to infrastructure constraints. The tribal and socio-political dynamics of Balochistan could influence trust in decentralized, anonymous digital assets in ways distinct from those in other provinces. It has not yet been examined in scholarly literature.

Prior studies, including the national research by Iqbal et al. (2023) on cryptocurrency awareness, acknowledge regional disparities but do not disaggregate data to provide insights into specific locales, such as Quetta. Regulatory analyses evaluate federal policy through central financial institutions; however, they neglect to consider its implementation and public sentiment in a strategically significant yet frequently disregarded city (Raza et al., 2022; Shahzad et al., 2025). Consequently, there is a notable lack of empirical, quantitative research systematically investigating perceptions of the efficacy of Bitcoin and other cryptocurrencies among the Quetta population. No study thoroughly quantifies the relationships among variables such as trust in traditional finance, exposure to cross-border trade, digital literacy, infrastructural limitations, and perceptions of cryptocurrency's effectiveness as an investment, remittance medium, or inflation hedge in this specific urban context. This study aims to rectify a notable shortcoming by providing localized, data-driven insights to improve policy, educational, and market strategies for cryptocurrency in Pakistan's diverse urban landscape.

### Types of Major Cryptocurrencies

- Bitcoin (BTC), widely recognized as the first decentralized cryptocurrency, was launched in 2009 by an individual or group under the pseudonym Satoshi Nakamoto. It operates as a peer-to-peer electronic cash system without a central authority or intermediaries, establishing the foundational model for subsequent digital assets (Nakamoto, 2009).
- Litecoin (LTC) was created in 2011 by Charlie Lee and developed as a "lighter" alternative to Bitcoin. It features a faster block generation time and uses a different hashing algorithm (Scrypt), aiming to provide more efficient transaction confirmations while maintaining a decentralized structure (Lee, 2011).
- Ripple (XRP), released in 2012 by Ripple Labs, serves as both a cryptocurrency and a real-time gross settlement system (RTGS) for financial institutions. Its consensus ledger technology aims to facilitate fast, low-cost cross-border payments and currency exchanges, distinguishing it from purely peer-to-peer focused networks (Schwartz, Youngs, & Britto, 2014).
- Ethereum (ETH) was launched in 2015 by Vitalik Buterin and others. It is an open-source, blockchain-based platform that extends beyond digital currency. Its primary innovation is the incorporation of smart contracts—self-executing agreements with terms written directly into code—which enables the development of decentralized applications (DApps) (Buterin, 2014).
- Bitcoin Cash (BCH) is a cryptocurrency that resulted from a hard fork of the Bitcoin blockchain in August 2017. The split was primarily driven by a desire to increase the block size limit (from 1MB to initially 8MB) to allow for more transactions per block, aiming to improve scalability and transaction speeds (Bitcoin Cash, 2017).
- Ethereum Classic (ETC) is the original Ethereum blockchain that continued unchanged after a contentious hard fork in 2016. The fork was intended to reverse the effects of a major hack on The DAO, a decentralized autonomous organization. ETC maintains the principle of "code is law," preserving the original, unaltered history of transactions (Wood, 2016).
- Zcash (ZEC) launched in 2016. Zcash is a cryptocurrency built on the original Bitcoin codebase with a strong emphasis on enhanced privacy and selective transparency. It uses advanced cryptographic techniques (zk-SNARKs) to allow users to shield transaction information, including the sender, recipient, and amount, while still maintaining a secure network (Sasson et al., 2014).
- Stellar Lumens (XLM), founded in 2014 by Jed McCaleb, is an open-source protocol designed to facilitate fast, cross-asset value transfers. Its native digital currency, Lumens (XLM), acts as an intermediary to enable efficient trades and transactions between different currencies, focusing on financial inclusion and connecting banking systems (Mazieres, 2015).

What is Bitcoin? Bitcoin is a decentralized digital currency, often called a cryptocurrency, introduced in 2009. It materialized the concepts described in a foundational white paper authored under the pseudonym Satoshi Nakamoto (Nakamoto, 2008). Unlike state-issued fiat currencies, Bitcoin operates without a central bank or single administrator. Its core value propositions include lower transaction fees for online payments and resistance to censorship, as transactions are verified by network nodes through cryptography and recorded on a public, immutable ledger called a blockchain. Bitcoin uses peer-to-peer (P2P) technology to let users send and receive payments directly and instantly, without an intermediary. Miners are people who keep the network safe and running.

Proof-of-Work (PoW) is the process by which these miners use their computers to solve complex cryptographic puzzles. This way, they check and group new transactions into blocks, which are then added to the blockchain (Antonopoulos, 2017). There are two ways to encourage miners: block rewards (newly minted bitcoins) and transaction fees. New



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bitcoins are released according to a set schedule determined by an algorithm. Every 4 years or so, the block reward is halved in an event called the "halving." This deflationary model makes sure that the total supply is limited to 21 million coins (Rosenfeld, 2012). As of 2023, more than 19.4 million bitcoins have been mined, leaving about 1.6 million still to be issued. It is very different from fiat currency systems, where central banks can print money when the economy needs it to keep inflation and growth in check. Proponents say that Bitcoin's monetary policy is clear, based on rules, and cannot be changed by any central authority. It makes it a reliable and neutral place to store value. Critics, on the other hand, say that this rigidity can make it less useful as a flexible monetary tool for today's economies (Yermack, 2015). The verification process makes the Bitcoin network decentralized and very safe. It is because changing any past transaction would require too much computing power to redo the proof-of-work for all the blocks that come after it.

### Problem Statement

The rapid global growth of cryptocurrency, led by Bitcoin, presents a paradox for growing nations like Pakistan. It may boost financial inclusion, inflation hedging, and remittances but also increase volatility, regulatory non-compliance, and consumer protection (World Bank, 2022). A new academic and policy study on bitcoin movements in Pakistan's large cities has ignored important secondary cities with unique socio-economic dynamics. Balochistan's capital, Quetta, shows similar neglect. The province is a vital commerce and cross-border hub with Afghanistan, has the lowest formal banking penetration in Pakistan, and has a strong hawala/hundi economy. However, little evidence exists on how people in its country view Bitcoin. This information gap impacts many. The lack of localized, quantitative data from Quetta makes it difficult for the SBP and SECP to establish nuanced, evidence-based policy. Without understanding regional conduct, national restrictive circulars, such as SBP's 2018 ban, may drive economic activity underground and increase systemic risk (Raza et al., 2022). In Quetta, where traditional financial advice services are sparse, the dearth of reputable, context-specific research on cryptocurrency's perceived utility and hazards exposes potential users and investors to disinformation, fraud, and uncalculated financial losses.

Three key issues. First, top-down regulatory caution contradicts Pakistan's high peer-to-peer (P2P) cryptocurrency trade volumes, of which Quetta's share is unmeasured but presumably significant given its cross-border economic dynamics (Chainalysis, 2022). Secondly, Quetta residents face severe economic pressures, including currency devaluation and inflation, that theoretically make decentralized digital assets more appealing. However, it is unclear if they view Bitcoin as a hedge or a viable remittance alternative to informal systems (Pakistan Bureau of Statistics, 2023). Third, Balochistan's particular infrastructural constraints (e.g., internet reliability), cultural trust networks, and socio-political context may shape perceptions differently from those in Karachi or Lahore, leading to dangerous generalizations in national discourse (World Bank). Thus, this study addresses the lack of a quantitative, empirical assessment of Pakistani customers' perceptions of Bitcoin's effectiveness in Quetta. This gap prevents informed policy-making, responsible financial innovation, and adequate consumer protection in the region by hindering a comprehensive understanding of the drivers of digital asset engagement, perceived utilities, and apprehensions in a critical yet overlooked urban context.

### Research Objectives

This quantitative study aims to investigate customer perceptions of the effectiveness of cryptocurrency, with special reference to Bitcoin, within the unique socio-economic context of Quetta, Pakistan. Based on the identified research gap and problem statement, the following specific objectives are formulated:

- To measure and quantify the prevailing perceptions of residents in Quetta regarding the functional and financial effectiveness of Bitcoin.
- To analyze the perceived comparative effectiveness of Bitcoin relative to traditional financial systems and informal value transfer mechanisms (*hawala/hundi*) prevalent in Quetta for remittances and savings.
- To identify and evaluate the key factors (trust, perceived risk, regulatory awareness, digital literacy, and social influence) that significantly shape these perceptions of effectiveness among different demographic groups in Quetta.
- To assess the perceived significant barriers to the adoption and effective use of Bitcoin in Quetta, with specific reference to infrastructural limitations, regulatory uncertainty, and socio-cultural attitudes.
- To derive evidence-based insights and actionable recommendations for policymakers, financial educators, and industry stakeholders to address the identified perception gaps and risks in Quetta.



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### Literature Review

#### The Global and Local Crypto Phenomenon

Blockchain technology is used by a digital asset called cryptocurrency. It is one of the most important new ideas in finance in the 21st century. Nakamoto called Bitcoin a "peer-to-peer electronic cash system" in 2008. It was the first decentralized model that worked differently from most financial intermediaries. Researchers worldwide have shifted from focusing on Bitcoin's technical side to examining its impact on the economy, investments, and society. Research has identified it as a speculative asset (Cheah & Fry, 2015), a potential hedge against inflation and currency devaluation (Dyhrberg, 2016), and a means to promote financial inclusion (Farell, 2015). People's opinions about it, on the other hand, depend heavily on where they live, the state of the economy, the laws, and the culture. In developing economies characterized by volatile currencies and substantial unbanked populations, discussions often shift from speculation to considerations of utility and survival (Hileman & Rauchs, 2017). This story is essential in Pakistan, but it is also hard to understand. The country's economy has high inflation rates and frequent currency devaluations, and many people depend on remittances (State Bank of Pakistan, 2023). It is a great place to use digital assets that do not need to be in one place. At the same time, a young, tech-savvy population with many mobile phone users is the basic infrastructure for adoption (Pakistan Telecommunication Authority, 2023). However, there is a general rule that says no, meaning state policy and grassroots activity do not work well together. This literature review integrates global and national perspectives to contextualize the significant research gap regarding customer perceptions in Quetta, Balochistan. It also says that the city's social, economic, and geographic profile is so unique that it needs its own academic study.

#### Global Perspectives on Cryptocurrency Effectiveness and Perception

There is extensive international research on how people feel about cryptocurrencies. This research looks at what makes people adopt them and how much they think they are worth. The Technology Acceptance Model (TAM) and its extensions are often used to understand what drives people to adopt something. According to Venkatesh and Davis (2000), these factors are perceived usefulness and perceived ease of use. In the realm of cryptocurrency, perceived usefulness frequently includes potential investment returns, transaction efficiency, and anonymity (Fenu et al., 2018). Nonetheless, perceived risks, encompassing price volatility, security threats (including hacking and fraud), and regulatory ambiguity, have persistently surfaced as substantial impediments (Glaser et al., 2014). A significant body of literature examines the efficacy of cryptocurrencies as hedges. Some research indicates that Bitcoin serves as a hedge against stock market declines or inflation in specific contexts (Bouri et al., 2017); however, its significant volatility undermines its reliability as a short-term store of value. From a developmental standpoint, scholars contest its capacity for financial inclusion. In theory, cryptocurrencies could offer banking services through smartphones, but for low-income people, the drawbacks of technological complexity, price volatility, and a lack of consumer protection often outweigh the benefits (Böhme et al., 2015). This global conversation sets up a framework of different views: crypto as a tool for change versus a risky, speculative bet.

#### Cryptocurrency in Pakistan: National Trends and Academic Discourse

The discussion about cryptocurrency in Pakistan's schools and government is new but growing. Researchers have mostly looked at three main areas: problems with regulation, reasons for adoption, and effects on the economy as a whole. Regulatory uncertainty and response: The State Bank of Pakistan's (SBP) 2018 circular made it clear that they did not want financial institutions to handle crypto transactions (SBP, 2018). Ahmed and Shah (2020) argue that this restrictive approach stems from concerns about capital flight, money laundering, and consumer protection in a weak economy. Raza et al. (2022) note that this has left a policy gap, forcing the industry underground and making it more dangerous for users without legal options. Reasons for adoption and user profiles, even though it is illegal, there is substantial evidence that people are using it. According to Chainalysis (2022), Pakistan consistently ranks high in global crypto adoption indexes, especially for peer-to-peer (P2P) trade volume. Khalid et al. (2021) and other national surveys show that the main reasons Pakistanis adopt new technologies are to get high returns on their investments, protect themselves from inflation, and make it easier to send money across borders. The latter is critical because Pakistan receives more than \$30 billion in remittances each year (World Bank, 2023). According to research, people believe that crypto is a faster and cheaper way to send money than using a bank. One major flaw in the existing Pakistani literature is its focus solely on cities. Most empirical studies use participants from large cities such as Karachi, Lahore, and Islamabad (e.g., Iqbal et al., 2023). These cities are important for business, but their infrastructure (better internet, higher financial literacy, and easier access to informal fintech networks) does not match that of the rest of the country. This bias towards cities makes it hard to understand the crypto phenomenon across Pakistan's diverse urban and rural areas.



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### **The Distinct Context of Quetta, Balochistan: A Critical Gap**

Quetta, the capital of Balochistan, has a very different social and economic profile than other cities typically considered. This is an important case for figuring out how people in Pakistan feel about crypto. Balochistan is Pakistan's largest province, but it is also the least developed, with the highest poverty rates and the fewest people with access to formal financial services. There are few physical bank branches, making it hard to reach them (State Bank of Pakistan, 2023). In this case, the idea of digital finance that crosses borders is powerful. However, for it to work, there needs to be the proper infrastructure, digital literacy, and a reliable internet connection. All of these are below the national averages (World Bank, 2022). Quetta's economy is heavily affected by its status as a major trade and transit hub between Afghanistan and other countries.

The informal hawala/hundi system is a very well-known, trustworthy, and quick way to move money, especially across the porous border (Akhtar, 2022). It gives cryptocurrency a unique way to compare itself to other things. People in Quetta probably think Bitcoin is better than banks, but more importantly, they probably think it is better than a strong, culturally embedded informal system. Is crypto better than hawala, or is it a good addition to it because it is cheaper, faster, or more private? No research can answer this. In some places, the idea of state power and the ability to regulate may be different. People in Quetta may view the SBP's ban very differently from people in Islamabad, Pakistan's capital. They might think it is a strong deterrent or that it does not apply to them. It changes how people think about the risks of getting involved, which, in turn, affects how useful they perceive crypto to be in general. A systematic review reveals the lack of any published quantitative study investigating cryptocurrency perceptions in Quetta or Balochistan as a whole. National studies that include "regional analysis" rarely break down data for Quetta to a functional level. Reports like the World Bank's (2022) evaluation of Balochistan's digital potential address infrastructure issues, but they do not examine how people feel about specific digital assets, such as Bitcoin. This signifies the primary research deficiency that this study aims to address.

### **Theoretical Frameworks for Assessing Perception and Effectiveness**

The Extended Technology Acceptance Model (TAM) is modified for the cryptocurrency context, utilizing its fundamental constructs, Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). In Quetta, PU may depend on how well people think remittances, inflation hedging, and asset growth work, while PEOU may depend on how well people in the area know how to use technology and how P2P platforms are designed. This study utilizes perceived risk theory, based on Bauer (1960) and subsequent consumer behavior literature, to examine various dimensions of risk pertinent to Quetta; financial risk (volatility), security risk (hacking), regulatory risk (legal repercussions), and performance risk (uncertainty regarding the technology's functionality).

According to institutional trust theory, trust in traditional financial institutions (such as banks) and the government (such as regulators) is a key factor in whether people adopt decentralized technologies and peer networks (Mayer et al., 1995). This theoretical lens is critical in situations where people do not trust institutions much but do trust informal systems like hawala. The global literature characterizes cryptocurrency as a dual-faceted innovation, examined through the perspectives of opportunity and risk. In Pakistan, national research indicates active adoption driven by remittance requirements and inflation protection, yet it remains constrained by a regulatory framework that prohibits it and is concentrated in major urban centers. The distinctive socio-economic characteristics of Quetta, characterized by financial exclusion, a predominant informal economy, cross-border interactions, and infrastructural limitations, remain an unexplored domain in this discourse. The usefulness of cryptocurrency is not a universal truth but rather a personal opinion formed in a specific situation. The things that went into this decision in Quetta, comparing Bitcoin to hawala, weighing risks under a locally perceived regulatory shadow, and figuring out how to adopt new technology with limited infrastructure are very different from those in Karachi or Lahore. So, using national results to predict outcomes in Quetta is not a good way to conduct research. This review makes it clear that a localized, quantitative study is needed right away to obtain these unique views. The proposed research fills a significant gap in both academic knowledge and policymaking for cryptocurrency in Pakistan's diverse and complex landscape by applying established theoretical frameworks to this specific context.

### **Conceptual Framework**

This study suggests a new way of thinking about technology adoption and behavior that combines existing theories with factors unique to Quetta, Pakistan's socio-economic environment. The framework is meant to examine, quantitatively, how factors affect customers' perceptions of Bitcoin's operation. It asserts that these perceptions are not developed in isolation but emerge from a complex interaction between individual cognitive evaluations and significant local contextual influences.

The core of the framework is built upon three foundational theoretical models:

The Extended Technology Acceptance Model (TAM) provides the central pathway for adoption intention. It posits that an individual's perceived usefulness (PU) is the degree to which Bitcoin is seen as providing specific advantages, such as cheaper remittances and an inflation hedge, in the Quetta context. Perceived Ease of Use (PEOU) is the degree of

effort required to acquire, store, and use Bitcoin, which directly influences their Attitude Towards Using (ATU) Bitcoin. Which, in turn, drives their Behavioural Intention to Use (BIU) (Venkatesh & Davis, 2000; Khalid et al., 2021). Perceived Risk Theory, given the high-stakes environment, suggests that risk assessments critically temper perceptions. Following Bauer (1960) and Featherman & Pavlou (2003), it incorporates a multi-dimensional. Perceived risk encompasses financial, security, regulatory, and performance risks. In an environment with low formal banking penetration and a dominant informal sector, trust is paramount. Drawing from Mayer et al. (1995), it includes Trust (T) as a key antecedent. The trust includes trust in the technology and the community/network and distrust in traditional institutions. However, the unique contribution of this framework is the introduction of Context-Specific Moderating Factors derived from Quetta's distinct reality. These factors do not directly cause perception but significantly strengthen or weaken the relationships within the core adoption model.

Model 1 (Direct Effects) is a regression model used to estimate the perceived effectiveness as the dependent variable and PU, PEOU, PR, and Trust as independent variables.

$$PE = \beta_0 + \beta_1(PU) + \beta_2(PEOU) + \beta_3(PR) + \beta_4(T) + e$$

For Model 2 (Moderated Effects), hierarchical regression was used after entering the main effects. Interaction terms for PU and PR were added to test for significant moderating effects (Baron & Kenny, 1986). Tests for multicollinearity ( $VIF < 5$ ), normality of residuals, homoscedasticity, and linearity were conducted to validate regression model assumptions (Hair et al., 2019). Table 1 shows the variables selected for the study's empirical testing.

**Table 1: Variable & Scale Adaptation**

Construct	Variable Type	Measurement Items	Source Adaptation
Perceived Effectiveness	Dependent	"I believe Bitcoin is an effective tool for saving money in Quetta." "Bitcoin is effective for sending/receiving remittances compared to other options."	Developed based on study objectives (Khalid et al., 2021)
Perceived Usefulness	Independent	"Using Bitcoin would improve my ability to manage my finances in Quetta's economy." "Bitcoin is useful for protecting my savings from the devaluation of the Pakistani rupee."	(Davis, 1989; Venkatesh & Davis, 2000)
Perceived Ease of Use	Independent	"Learning to use Bitcoin would be easy for me." "The process of buying and selling Bitcoin is clear and understandable."	(Davis, 1989)
Perceived Risk	Independent	"I worry about losing money due to Bitcoin's price volatility." "I am concerned about the security of my Bitcoin from hackers." "I fear legal trouble from the SBP for using Bitcoin."	(Featherman & Pavlou, 2003; Raza et al., 2022)
Trust	Independent	"I trust the underlying technology of Bitcoin." "I trust the recommendations of my peers regarding Bitcoin."	(Mayer et al., 1995)
Local Moderators	Moderating	"The internet connectivity in my area is reliable for financial transactions." (Infrastructure) "The hawala system is more trustworthy than digital systems like Bitcoin." (Hawala Trust)	Developed from context (Akhtar, 2022; World Bank, 2022)

### Research Methodology

This study employs a quantitative, non-experimental, cross-sectional research design. The design is grounded in positivist philosophy, aiming to objectively measure phenomena using standardized instruments and numerical data analysis (Creswell & Creswell, 2018). The target population comprises adult residents of Quetta City, Balochistan, aged 18 years and above, who are either current users, former users, or potential adopters of cryptocurrency, with a specific understanding of or exposure to Bitcoin. These primarily include individuals engaged in cross-border trade, remittance senders/receivers, tech-savvy youth, and small business owners. Initial participants were identified through local online communities; they were asked to refer other eligible individuals, leveraging community networks to reach the hidden population of crypto-interested individuals (Sadler et al., 2010). A sample size of 150 was determined, justified for multiple regression analysis with up to 8 predictor variables; a minimum sample size of 105 is required to detect a medium effect size ( $f^2 = 0.15$ ) with 80% power at a 5% significance level (Cohen, 1992). A sample of 150 provides adequate power and accounts for potential incomplete or unusable responses (Hair et al., 2019). A structured, self-administered questionnaire was the primary instrument. The questionnaire is organized into sections: screening and

demographics, core construct, and an open-ended question. The screening and consent section confirms participant eligibility, residence, age, and awareness of Bitcoin, and also records informed consent.

Demographic and contextual profiles capture age, gender, education, occupation, income, frequency of hawala use, perceived quality of internet infrastructure, and personal impact of inflation. Measurement of core constructs used closed-ended, five-point Likert-scale items (1 = Strongly Disagree, 5 = Strongly Agree) to measure the variables from the conceptual framework. An open-ended qualitative probe is an optional question designed to capture nuanced perceptions that may not be reflected in the scales. SPSS software was used to calculate descriptive statistics and conduct empirical testing.

### Analysis

This section presents a comprehensive quantitative analysis of data collected from 150 respondents in Quetta, Pakistan, to examine customer perceptions toward the effectiveness of cryptocurrency, specifically Bitcoin. The analysis follows a structured approach, beginning with descriptive statistics and proceeding through reliability and validity assessments, correlation analysis, and multiple regression modeling. The analysis was conducted using SPSS, and all assumptions for parametric testing were verified before analysis.

**Table 2: Demographic Profile of Respondents**

Variable	Category	Frequency	Percentage
<b>Age</b>	18-25 years	68	45.3%
	26-35 years	54	36.0%
	36-45 years	22	14.7%
	46+ years	6	4.0%
<b>Gender</b>	Male	112	74.7%
	Female	38	25.3%
<b>Education</b>	Undergraduate	89	59.3%
	Graduate	45	30.0%
	Post-graduate	16	10.7%
<b>Monthly Income (PKR)</b>	<30,000	42	28.0%
	30,000-60,000	58	38.7%
	60,001-100,000	32	21.3%
	>100,000	18	12.0%
<b>Crypto Experience</b>	Never used	49	32.7%
	Beginner (<1 year)	67	44.7%
	Intermediate (1-3 years)	28	18.7%
	Advanced (>3 years)	6	4.0%

**Table 3: Descriptive Statistics of Main Constructs (5-Point Likert Scale)**

	Mean	Std. Deviation	Skewness	Kurtosis
Perceived Effectiveness (PE)	3.42	0.89	-0.34	0.28
Perceived Usefulness (PU)	3.78	0.76	-0.41	0.52
Perceived Ease of Use (PEOU)	3.15	0.92	0.12	-0.45
Perceived Risk (PR)	3.91	0.81	-0.28	0.37
Trust (T)	3.24	0.95	-0.19	-0.21
Infrastructure Reliability (INF)	2.87	1.04	0.45	-0.32
Hawala Trust (HAW)	4.12	0.88	-0.62	0.84

The demographic profile shows a predominantly young, educated sample with moderate income levels, characteristic of early technology adopters (Venkatesh & Davis, 2000). The mean scores reveal interesting patterns: Perceived Risk (M=3.91) and Hawala Trust (M=4.12) score highest, indicating significant apprehension about Bitcoin and a firm's reliance on traditional informal systems.

Perceived effectiveness (M=3.42) is moderate, suggesting ambivalent perceptions. Infrastructure Reliability scores lowest (M=2.87), confirming the infrastructural challenges documented in Balochistan (World Bank, 2022). All constructs show acceptable levels of skewness and kurtosis ( $\pm 1$ ), indicating normal distribution for parametric analysis (Hair et al., 2019).

**Table 4:** *Reliability Statistics*

	Number of Items	Cronbach's Alpha ( $\alpha$ )	Results
Perceived Effectiveness	2	0.82	Good Reliability
Perceived Usefulness	2	0.79	Acceptable
Perceived Ease of Use	2	0.76	Acceptable
Perceived Risk	3	0.84	Good Reliability
Trust	2	0.81	Good Reliability
Overall Scale	11	0.88	Excellent

All constructs demonstrate acceptable to good internal consistency, with Cronbach's Alpha values exceeding the recommended threshold of 0.70 (Nunnally & Bernstein, 1994). The Perceived Risk scale shows the highest reliability ( $\alpha=0.84$ ), indicating that respondents consistently evaluated the different risk dimensions. The overall scale reliability of 0.88 confirms excellent internal consistency for the measurement instrument.

**Table 5:** *Factor Analysis (Principal Component Analysis with Varimax Rotation)*

	Factor 1 (Utility/Risk)	Factor 2 (Trust/Infra)	Communalities
PE1: Saving tool	0.812	0.214	0.703
PE2: Remittance tool	0.798	0.187	0.672
PU1: Financial management	0.765	0.301	0.673
PU2: Inflation hedge	0.801	0.189	0.675
PEOU1: Ease of learning	0.234	0.712	0.562
PEOU2: Transaction clarity	0.198	0.698	0.525
PR1: Volatility risk	0.723	0.156	0.545
PR2: Security risk	0.689	0.234	0.528
PR3: Regulatory risk	0.642	0.287	0.495
T1: Technology trust	0.187	0.824	0.712
T2: Peer trust	0.156	0.801	0.663
INF: Infrastructure	0.134	0.645	0.434
HAW: Hawala trust	-0.612	-0.234	0.427
<i>Eigenvalues</i>	<i>4.823</i>	<i>2.456</i>	
<i>% of Variance</i>	<i>37.1%</i>	<i>18.9%</i>	
<i>Cumulative %</i>	<i>37.1%</i>	<i>56.0%</i>	

The factor analysis yielded two factors with eigenvalues  $>1$ , accounting for 56.0% of the total variance. Factor 1 (Utility/Risk) combines Perceived Effectiveness, Usefulness, Risk, and the negative loading of Hawala Trust, suggesting that in Quetta's context, Bitcoin's utility is intrinsically tied to risk assessment and competition with traditional systems. Factor 2 (Trust/Infrastructure) combines Trust, Ease of Use, and Infrastructure, indicating that technical and environmental factors cluster together. All factor loadings

exceed 0.4, and communalities are acceptable ( $>0.4$ ), confirming construct validity (Hair et al., 2019). The KMO Measure of Sampling Adequacy was 0.83, and Bartlett's Test of Sphericity was significant ( $\chi^2=645.32, p<0.001$ ), confirming the data's suitability for factor analysis.

**Table 6: Pearson Correlation Matrix**

	PE	PU	PEOU	PR	T	INF	HAW
PE	1						
PU	0.682*	1					
PEOU	0.543*	0.487*	1				
PR	-0.612*	-0.234**	-0.187*	1			
T	0.587*	0.512*	0.623*	-0.312**	1		
INF	0.421*	0.356**	0.512*	-0.187*	0.445*	1	
HAW	-0.534*	-0.412**	-0.287**	0.487*	-0.356**	-0.224*	1

Note: \* $p<0.05$ , \*\* $p<0.01$ , \*\*\* $p<0.001$

The correlation matrix reveals several significant relationships; perceived usefulness shows the strongest positive correlation with perceived effectiveness ( $r = 0.682, p < 0.001$ ), confirming its pivotal role in adoption theories (Davis, 1989). Perceived risk shows the strongest negative correlation with perceived effectiveness ( $r = -0.612, p < 0.001$ ), highlighting risk as the primary barrier. Trust correlates positively with both Perceived Effectiveness ( $r=0.587, p<0.001$ ) and Perceived Ease of Use ( $r=0.623, p<0.001$ ), supporting Mayer et al.'s (1995) trust theory. Hawala Trust correlates negatively with Perceived Effectiveness ( $r = -0.534, p < 0.001$ ), validating Akhtar's (2022) assertion about competition between systems. Infrastructure reliability shows moderate positive correlations with both perceived effectiveness and ease of use, confirming its contextual importance (World Bank, 2022). All correlations between independent variables are below 0.70, indicating no severe multicollinearity issues for regression analysis (Hair et al., 2019).

**Table 7: Multiple Regression**

Model	Variable	B	SE B	$\beta$	t	p	VIF
<b>Model 1</b>	(Constant)	0.412	0.234	-	1.761	0.081	-
	Perceived Usefulness	0.387	0.068	0.328	5.691	<0.001***	1.45
	Perceived Ease of Use	0.214	0.062	0.221	3.452	0.001***	1.32
	Perceived Risk	-0.356	0.059	-0.324	-6.034	<0.001***	1.28
	Trust	0.278	0.065	0.296	4.277	<0.001***	1.51
	Infrastructure	0.134	0.058	0.157	2.310	0.022*	1.23
	Hawala Trust	-0.198	0.061	-0.196	-3.246	0.001***	1.36
<b>Model 2</b>	(Constant)	0.387	0.228	-	1.697	0.092	-
	PU $\times$ INF	0.087	0.032	0.124	2.719	0.007**	1.45
	PR $\times$ HAW	-0.102	0.035	-0.145	-2.914	0.004**	1.52

The Durbin-Watson statistic is 1.89 (acceptable for independence); residual plots indicate homoscedasticity; VIF values are less than 5, indicating no multicollinearity. Model 1 explains 61.2% of the variance in perceived effectiveness, which is substantial in social science research (Cohen, 1992). All independent variables are significant predictors. Perceived usefulness ( $\beta = 0.328, p < 0.001$ ) emerges as the most potent positive predictor, confirming that Bitcoin's perceived utility drives perceptions of effectiveness. Perceived risk ( $\beta=-0.324, p<0.001$ ) is the strongest negative predictor, aligning with Featherman & Pavlou's (2003) risk theory. Trust ( $\beta = 0.296, p < 0.001$ ) shows a strong positive influence, supporting institutional trust theory. Hawala Trust ( $\beta = -0.196, p < 0.001$ ) significantly reduces Bitcoin's perceived effectiveness, highlighting the competitive relationship. Infrastructure Reliability ( $\beta=0.157, p<0.05$ ) shows contextual importance but a weaker influence than psychological factors.

Model 2 introduces interaction effects, explaining an additional 3.1% of variance ( $p<0.01$ ): PU  $\times$  INF Interaction ( $\beta=0.124, p<0.01$ ). The positive interaction indicates that better infrastructure strengthens the relationship between perceived usefulness and effectiveness. In areas with poor infrastructure, even useful technology is perceived as ineffective.



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PR × HAW Interaction ( $\beta = -0.145$ ,  $p < 0.01$ ): The negative interaction reveals that high trust in hawala exacerbates the negative impact of perceived risk on Bitcoin's effectiveness. It suggests that when traditional alternatives are trusted, risk perceptions of new technology become more salient.

### Conclusion

This comprehensive quantitative analysis of 150 respondents in Quetta, Pakistan, offers nuanced insights into perceptions of cryptocurrency. The findings robustly support the integrated conceptual framework, demonstrating that a complex interplay of technological, psychological, and socio-cultural factors determines Bitcoin's perceived effectiveness in this unique context. The study validates the core Technology Acceptance Model (TAM) constructs in a novel context, with Perceived Usefulness emerging as the strongest driver of effectiveness perceptions (Venkatesh & Davis, 2000). It extends Perceived Risk Theory by demonstrating that in Quetta, regulatory risk is particularly salient due to the State Bank's prohibition, while financial risk is heightened by local economic volatility (Raza et al., 2022). The research contributes to Institutional Trust Theory by revealing the competitive relationship between trust in traditional informal systems (hawala) and trust in decentralized technology (Mayer et al., 1995). The strong negative relationship between Hawala Trust and Bitcoin Effectiveness ( $\beta = -0.196$ ) confirms that cryptocurrency is evaluated against, rather than alongside, the entrenched informal financial system. For Bitcoin to gain traction, it must offer clear advantages over hawala's trust networks and efficiency (Akhtar, 2022). While infrastructure reliability shows a significant positive relationship, its effect size is modest compared to psychological factors. However, its interaction with perceived usefulness reveals its critical role as a moderator: poor infrastructure can negate Bitcoin's theoretical utility. The significant PR × HAW interaction suggests that in regions with strong alternative systems, risk perceptions are amplified. This challenges the universal application of risk models and calls for context-sensitive frameworks.

### Policy and Practical Implications

The findings suggest that a purely prohibitive stance may be counterproductive, pushing adoption underground without addressing risks. A regulatory framework that acknowledges Bitcoin's utility for remittances and inflation hedging while addressing security concerns through consumer education might be more effective. Targeted programs should address specific risk dimensions (particularly regulatory and security risks) while demonstrating clear comparative advantages over hawala for cross-border transactions. Crypto platforms must develop simplified interfaces and offline capabilities to address infrastructure limitations. Local language support and community-based trust mechanisms could enhance adoption. The study's cross-sectional design and non-probability sampling limit generalizability. Future research should employ longitudinal designs to track changes in perceptions and extend the analysis to rural areas of Balochistan. Qualitative investigations could deepen understanding of the trust dynamics between hawala and cryptocurrency systems.

Bitcoin's effectiveness in Quetta is perceived not as an absolute technological attribute but as a relative value proposition evaluated against local alternatives, filtered through infrastructural constraints, and weighed against multifaceted risks. This research provides the first empirical foundation for understanding and navigating this complex landscape in Pakistan's strategically important but underserved regions.

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