A Study on Future Payments System Through Smart Wearable Device

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***Abstract*—This study explores the future of payment systems through smart wearable devices such as smartwatches and fitness bands. It examines their integration with digital payment technologies, factors influencing user adoption, and key challenges related to security and privacy. The study highlights the potential of wearable payments to offer fast, convenient, and cashless transactions, indicating their growing role in the future digital payment ecosystem.**

***Index Terms*—wearable device, payment modes, digital adoption, security and safety.**

I. INTRODUCTION

This report investigates the awareness and adoption of smart wearable payment devices among individuals. The primary objective is to evaluate how familiar people are with these devices and to assess their rate of adoption. The study also aims to uncover gaps in knowledge and explore opportunities to enhance awareness. Additionally, it seeks to identify both the potential benefits and concerns associated with wearable payment technology. After compiling the relevant data, various analysis and visualization methods, such as charts and graphs, were employed to interpret the findings. Hypothesis were formulated to draw meaningful conclusions from the analysis. Ultimately, the results of this research led to conclusions that are directly tied to the awareness and willing to adopt the new technology associated with payment system.

Current Payment System in India has witnessed a significant transformation in its payment infrastructure over the past decade. The introduction of Unified Payments Interface (UPI), QR code payments, Near Field Communication (NFC) enabled cards, and mobile wallets has driven financial inclusion and digital adoption. The Reserve Bank of India (RBI) and the Government of India have played a crucial role in promoting a cashless economy, paying the way for the future of digital transactions.

Among these, wearable payment devices such as rings, watches, wristbands, and mobile stickers are gaining prominence. These innovations are set to redefine the way transactions are conducted, enhancing the overall user experience.

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PROJECTED MARKET GROWTH OF WEARABLES:

The global wearable payments market size was valued at $46.9 billion in 2023, and is projected to reach $393.4 billion by 2033, growing at a CAGR of 23.7% from 2024 to 2033. The wearable payments method is increasingly popular due to its speed, convenience, and enhanced security, eliminating the need for cash or traditional payment methods. (Bias & Onkar, 2024)

- In August 2024, Mastercard partnered with boAt to integrate tap-and-pay capabilities into boAt's smartwatches. This collaboration allows Mastercard cardholders to make secure transactions directly from their wearable devices using Crest Pay, boAt's dedicated payment app. This will enhance user convenience and expands the scope of wearable payment solutions in India. (Bias & Onkar, 2024)

II. LITERATURE REVIEW

- ❖ Maimunatu I, Kabiru IM, Aminu A and Yakubu Y (2024) They have studied and proposed a blockchain-based secure wearable payment system, aiming to address security concerns in wearable technology. Wearable payment systems have significantly impacted global payments,

benefiting the banking and FinTech sectors. Blockchain can enhance the security of these systems. To validate this approach, a prototype incorporating key features like user interface, security measures, and networking protocols should be developed. The system must balance ease of use with strong security, ensuring a smooth user experience in real-world scenarios. This will enable future research to explore improvements and resolve issues, ensuring effective use by financial institutions and customers. (Maimunatu I, 2024)

- Bojjagani S, Seelam NR, Sharma NK, Uyyala R, Akuri SRCM, Maurya AK (2023) They have found that, Wearable devices have significant potential in the financial sector by enhancing services and meeting consumer demands. This paper addresses security concerns in wearable payments through a threat model, utilizing NFC for device pairing, ECC for message encryption, and biometrics for additional authentication. Additionally, the framework reduces communication and computation costs compared to existing solutions. Future work will explore blockchain integration to further streamline processes and eliminate intermediaries, enhancing the efficiency and necessity of wearable technology in finance. (Bojjagani S, 2023)
- Hayat N, Al Mamun A, Salameh AA, Ali MH, Hussain WMHW and Zainol NR (2022) combined they have made efforts to explore the smart wearable payment device adoption intention among Malaysian consumers. Their research examines factors like ease of use, performance expectancy, and social influence. In that the findings indicate that ease of use, lifestyle computability, and trust significantly influence the adoption of smart wearable payment devices. In contrast, social influence and facilitating conditions show limited impact. Additionally, the development of policies and infrastructure is essential to encourage wider acceptance of these devices. (Hayat N, 2022)
- Hidayat-ur-Rehman I, Ahmad A, Akhter F, & Ziaur Rehman M (2022) They have researched and gathered the following information. Smart wearable devices are gaining popularity, and wearable payments are expected to become the standard for mobile transactions. Their study examined consumer adoption of smart wearable payments through the survey of users in Saudi Arabia. The result of that support all hypothesized relationships except for the link between compatibility and perceived ease of use, which was found insignificant. Additionally, personal innovativeness was confirmed as a moderating factor between behavioral intention and actual use. (Hidayat-ur-Rehman, 2022)
- Infineon Technologies AG (2021) The growing use of payment wearables and IoT devices is driving demand for more integrated and personalized devices with multi-functional services. The key to success will be simplifying the process of adding services to these devices. While some high-end wearables offer standalone cellular access, smartphones will remain the primary device for managing wearables. Additionally, non-connected wearables like smart rings and bracelets will see increased use for contactless payments, access, and identification purposes. (Infineon Technologies AG, 2021)

III. RESEACH METHODOLOGY

PROBLEM STATEMENT:

In recent years, the rapid advancement of financial technology has significantly transformed the way individuals conduct their daily transactions. Among these innovations, smart wearable payment devices—such as smartwatches, fitness bands, and rings equipped with NFC (Near Field Communication) technology have emerged as a modern and convenient method for making contactless payments. Despite their growing presence in the global market, the awareness, acceptance, and actual adoption of these devices in regular financial transactions remain relatively limited, especially in developing regions or among specific demographic groups.

- RESEARCH OBJECTIVES:

- To examine the level of awareness among youth regarding smart payment devices like Ring, Wrist band/Watch clasp, Mobile Sticker.
- To evaluate the willingness to adopt and use smart payment device in their daily transactions.
- To examine the perceived benefits.

- To explore the barriers to adoption and reasons for hesitation or resistance toward smart payment devices.

❖ HYPOTHESIS:

1. Null Hypothesis (H0): There is no association between age and usage of smart wearable payment device

Alternative (H1): There is an association between age and usage of smart wearable payment device

2. Null Hypothesis (H0): The factors does not influence willingness to adopt

Alternative (H1): The factors positively influences willingness to adopt

IV. RESEARCH METHODOLOGY

Research methodology refers to the structured approach used by researchers to investigate a specific problem or question. It encompasses the methods, techniques, and tools employed to collect, analyze, and interpret data.

The methodology outlines the steps taken in the research process, from formulating hypotheses to drawing conclusions. It includes decisions on the research design, data collection methods, and how the data will be analyzed and interpreted. The choice of methodology depends on the research objectives and the nature of the problem being studied. By following a clear methodology, researchers ensure that their findings are valid, reliable, and can be replicated by others.

RESEARCH DESIGN

The descriptive research method to analyze individual's awareness and adoption of smart wearable payment devices. The primary reason for selecting this method is that the study aimed to assess and explain the level of awareness among individuals regarding the specific subject of interest. Descriptive research is particularly suitable when the objective is to gather quantitative and qualitative information that outlines the current state of a phenomenon, which in this case is the awareness level among the targeted population.

This design allowed for a systematic approach to collect data from a defined group of respondents and present it in a structured format. It helped in identifying patterns, drawing comparisons, and understanding the various factors influencing awareness levels. Since the focus of the project was not on exploring unknown problems or testing cause-and-effect relationships, but rather on accurately depicting the current scenario, the descriptive method served the purpose effectively. By using this approach, the research could answer key questions such as who is aware, what they are aware of, and how their awareness varies across different segments.

DATA COLLECTION

In this research project, primary data was used as the main source of information. The reason for choosing primary data is that it allows for the collection of firsthand, original information that is directly relevant to the specific objectives of the study. Since the focus was to understand and evaluate the awareness levels of individuals, it was essential to gather fresh insights from the target audience.

To collect this primary data, the **questionnaire method** was employed. This method was selected because it enables us to obtain structured responses from a larger group of respondents in a cost-effective and time-efficient manner.

SAMPLE AND SAMPLING METHOD

Sample of 100 respondent is taken by non- probability sampling method via convenient collection method.

DATA ANALYSIS TECHIQUE:

Data is collected by google form and chats are interpreted with help of excel. Hypothesis testing is done by using excel tool with 5 % of significant level.

V. FINDINGS

- From the analysis it is found that most of the respondents currently uses UPI and Cash for the payment and also majority of respondents are familiar with the smart wearable payment devices.
- Most of the respondents are aware of smart watch but other devices are not much popular among the respondents and they have first learned about the payment device from the social media.
- Majority of the respondents have not used this device yet but are interested in trying.
- Most of the respondents have said that convenience and ease of use and faster transaction are the factors that encourage them to adopt smart wearable payment device.

- The look and design of this devices are not much matters to 30% of the respondents but 28% of the respondents prefer stylish and well-designed device.
- The major concerns which respondents faces regarding the wearable devices are risk of device loss or theft, security and data privacy risk, and cost of purchasing the device.
- Most of the respondents are natural about the security of this device and among all respondents 51% of them are not sure about switching to wearable devices for daily transactions.
- 50% of the respondents believes that the wearable payment devices could replace the traditional card/digital payments but it will take time to change.
- Wearable devices can be most useful in retail & shopping, public transportation, and in restaurants & cafes.

Hypothesis testing result:

Regression to know relation between factors affecting adoption of smart wear devices.

Null Hypothesis (H0): The factors does not influence willingness to adopt

Alternative (H1): The factors positively influences willingness to adopt

H_0: $\mu_1 = \mu_2$

H_1: $\mu_1 \neq \mu_2$

SUMMARY OUTPUT					
Regression Statistics					
Multiple R	0.2792979741				
R Square	0.07800735836				
Adjusted R Square	0.01852396212				
Standard Error	0.8947331302				
Observations	100				
ANOVA					
	df	*SS*	*MS*	*F*	*Significance F*
Regression	6	6.299094187	1.049849031	1.311413996	0.2598553879
Residual	93	74.45090581	0.8005473743		
Total	99	80.75			

Regression Summary

Multiple R: 0.2793 — This is the correlation between observed and predicted values of the dependent variable. A low value suggests a weak linear relationship.

R Square: 0.078 — About 7.8% of the variance in the dependent variable is explained by the independent variables.

Adjusted R Square: 0.0185 — After adjusting for the number of predictors, only 1.85% of the variance is explained, indicating poor model fit.

Standard Error: 0.895 — This is the standard deviation of the regression's residuals.

Conclusion from test

The regression model is not statistically significant overall ($p = 0.26$), meaning the set of predictors does not reliably predict the dependent variable.

The only significant individual predictor is "Discounts and cashback offers" ($p = 0.015$), which has a positive influence on the outcome.

Other factors like convenience, transaction speed, safety, etc., do not show a statistically significant effect in this model.

The low R^2 and Adjusted R^2 values suggest that this model does not explain much variance, and a better set of predictors or model specification may be needed.

VI. CONCLUSIONS

This study has provided valuable insights into how wearable technology is transforming the way consumers interact with financial services. It is evident that smart wearables - such as smartwatches, wrist bands, and contactless rings - are poised to become a key component in the future of digital payments due to their convenience, speed, and enhanced security features. Through our research, we observed a growing interest and gradual adoption of wearable payment solutions across various demographics. However, several challenges remain, including user awareness, data security concerns, infrastructure readiness, and

device affordability. By addressing these challenges, the adoption rate can be accelerated and made more inclusive.

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