

Mern Stack Based Fitness Application: A Review

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ABSTRACT– This comprehensive review paper explores the dynamic landscape of fitness applications, with a particular focus on those developed using the MERN (MongoDB, Express.js, React.js, Node.js) stack. The MERN stack has gained prominence as a preferred framework amidst the rapid growth of mobile health technologies, proving itself valuable in the creation of robust and responsive fitness applications. The paper conducts an in-depth examination of the MERN stack's architecture, emphasizing its inherent advantages for crafting innovative and feature-rich fitness solutions.

A critical review of existing literature, surveys, and case studies pertaining to fitness applications utilizing the MERN stack forms a significant aspect of this paper. Key areas of focus include optimizing user experience, establishing performance benchmarks, addressing scalability considerations, and seamlessly integrating real-time features. Through a thorough analysis of the strengths and limitations of the MERN stack, the paper provides a nuanced understanding of its applicability and effectiveness in meeting the distinctive requirements of fitness app development.

Moreover, the review delves into user adoption trends, shedding light on the transformative impact of MERN-based fitness apps on user engagement, motivation, and adherence to fitness regimens. The synthesized findings are intended to distill best practices, offering actionable insights for developers and stakeholders aiming to create compelling and user-centric fitness applications.

KEYWORDS– Fitness App, Gamification, Mern Stack, Home Workout, Social Influence

I. INTRODUCTION

In our ever-evolving technological landscape, there has been a notable surge in the demand for fitness applications, providing individuals with personalized and easily accessible solutions for their health and wellness goals. This review paper focuses on the dynamic realm of fitness applications, specifically those developed using the MERN (MongoDB, Express.js, React.js, Node.js) stack. Recognized for its adaptability and efficiency, the MERN stack has become a fundamental element in shaping contemporary mobile health solutions.

The introduction highlights the pervasive impact of mobile health technologies and the transformative role played by fitness applications in catering to the diverse needs of

health-conscious consumers. It serves as a prelude to a comprehensive exploration of the MERN stack's architecture and its significance in the development of cutting-edge fitness applications.

Outlined in this section are the primary objectives of the review, which include critically examining existing literature, surveys, and case studies related to MERN-based fitness applications. Key areas of focus comprise the optimization of user experience, evaluation of performance metrics, consideration of scalability, and exploration of real-time feature integration. By establishing the foundational importance of both fitness applications and the MERN stack, the introduction provides context for the subsequent detailed analysis.

II. PERVIOUSLY CREATED WORK

A. Web-Service Based Fitness Application to Promote Healthy Lifestyle among the Masses using Gamification (IJSREM)

In the scope of their prior research[5], the team developed a web interface tailored to the needs of desktop and laptop users, complementing their existing mobile application. The seamless connection between both interfaces and a unified backend database through Firebase ensures a cohesive user experience.

The application[5] showcases a thoughtfully structured 'Reward' and 'User Level' system, implementing gamification principles. This system operates on diverse fitness metrics, encompassing heart rate, calorific expenditure, and steps taken across different time intervals (daily, weekly, monthly, and yearly). Users can input data through various activities like walking, running, or cycling, aligning with individual preferences. Data acquisition is facilitated through direct input on smartphones or by utilizing built-in APIs to gather information from wearables.

Within the application, the 'Reward System' serves as an incentive mechanism, allowing users to earn monetary rewards such as gift cards and coupons from online stores and e-commerce websites. Achievement of these rewards is contingent on the completion of designated tasks and challenges, whether routine or event-related. The in-app currency functions as a medium through which users can earn and redeem rewards from a virtual shop.

To enhance user accessibility[5], the application and its web counterpart present fitness tracking data through visually intuitive infographics. This design choice ensures

that users can easily retrieve data for any desired timeline, contributing to a user-friendly and engaging experience.

B. The Effects of 24 Weeks of Non-Face-to-Face Home Exercise on Body Composition, Physical Fitness, Cardiovascular Function, and Blood Profiles in Pre-Metabolic Syndrome Korean Adults [healthcare]

In the wake of the COVID-19 pandemic, there was a notable decrease in physical activity participation. Initial concerns revolved around the increased vulnerability of individuals with obesity and underlying health conditions such as diabetes, high blood pressure, and cerebrovascular disease, raising the risk of severe illness upon contracting the virus. Recent research[3] findings, however, indicated that obesity itself posed a threat to those infected with COVID-19, independent of other health issues.

Acknowledging the challenges in achieving complete eradication of the virus, there was a consensus on the need for customized exercise programs tailored to individual physical conditions.

With social distancing becoming the norm, numerous social platforms experienced a surge in information aimed at promoting better health through exercise. However, relying solely on generalized information made it challenging to define one's health status[3] on these platforms. To address this, a pilot study introduced a customized healthcare service program utilizing Information and Communications Technology (ICT). Informed by physical examinations, blood profiling, and blood pressure tests, this program facilitated the prompt identification of participants' exercise progress. It provided real-time feedback, aiding participants in understanding their current status and motivating them to enhance their health and physical fitness. This approach aimed to instigate sustained engagement in exercise as a means of improving overall well-being.

It was done to check the effects of 24 Weeks of Non-Face-to-Face Home Exercise on Body Composition, Physical Fitness, Cardiovascular Function, and Blood Profiles.

C. Expanding the Technology Acceptance Model with the Inclusion of Trust, Social Influence, and Health Valuation to Determine the Predictors of German Users' Willingness to Continue using a Fitness App: A Structural Equation Modeling Approach [International Journal of Human-Computer Interaction]

In this paper[2] we see that, fitness or running apps are hugely popular in Germany. Such a trend prompts the question concerning the factors influencing German users' intention to continue using a specific fitness app. To address the research question, the expanded Technology Acceptance Model (with the addition of trust, social influence, and health valuation) was tested with 476 German users of fitness apps. Structural equation modeling results reveal that respondents' intention to continue using a specific fitness app[2] is predicated on three factors, namely perceived ease of use, perceived usefulness, and injunctive social norm. Trust in the app developer and descriptive social norm do not have statistically significant effects on repeat usage intention, but they (alongside perceived ease of use and descriptive social norm) both influence users'[2] perception of a fitness app's usefulness. Furthermore, ease of use and both injunctive and descriptive social norms significantly contribute to users' trust in a fitness app developer.

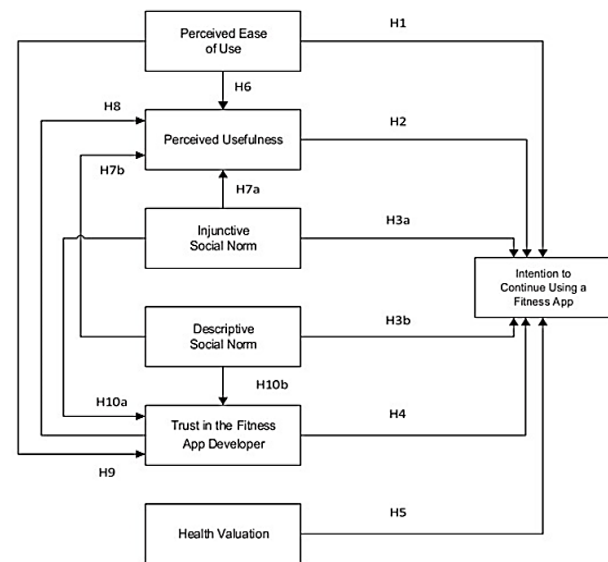


Figure 1: Complete Research Model

D. Predicting future use intention of fitness apps among fitness app users in the United Kingdom: the role of health consciousness [International Journal of Sports Marketing and Sponsorship]

The primary objective of this research paper[1] is to replicate and extend the Unified Theory of Acceptance and Use of Technology (UTAUT2) to elucidate the determinants influencing users' future intention to use fitness apps. This study[1] goes beyond the current theoretical framework by delving into continuance usage and introducing health consciousness as a pivotal driver. This extension not only contributes to a more comprehensive understanding of the factors influencing the sustained use of fitness apps but also holds implications for future research endeavors exploring emerging technologies within the healthcare sector and beyond. The overarching[1] aim is to enhance theoretical insights and practical applications in the context of technology adoption, particularly in the domain of health and wellness.

E. MERN Stack: Technologies Used for Web Development [International Journal for Research in Applied Science & Engineering Technology (IJRASET)]

The objective of this research paper[4] is to explore and articulate the advantages and rationale behind the utilization of the MERN (MongoDB, Express.js, React.js, Node.js) stack as a web development technology. In light of the intricate nature of web development, characterized by a vast array of rules and techniques, the paper aims to underscore the significance of gaining a comprehensive understanding of web technologies. The primary goal is to elucidate why developers should consider the MERN stack in their web development endeavors.

Recognizing that effective web development hinges on proficiency in key languages—JavaScript, CSS, and HTML—the research seeks to provide insights that facilitate a deeper comprehension of web technology. By acknowledging the potential learning curve and the need for time, training, and patience in mastering these

languages, the paper aims to encourage developers to invest in their skill development.



Figure 2: Combining technologies and Investigating how they interact

III. COMPARE AND PROPOSE

A. Web-Service Based Fitness Application to Promote Healthy Lifestyle among the Masses using Gamification (IJSREM)

The outlined objective of developing a web interface, complementing a mobile application, and implementing a gamified 'Reward' and 'User Level' system for fitness tracking holds promise but comes with potential drawbacks and areas for improvement.

One potential drawback is the risk of an overemphasis on gamification, where users may prioritize earning rewards over their actual fitness goals. Striking a balance between gamification and highlighting the intrinsic value of fitness is crucial to prevent unhealthy behaviors and maintain long-term user engagement.

Another concern is the potential privacy issues associated with extensive fitness data collection, particularly from wearables. Users might be reluctant to share sensitive health information due to fears of misuse or unauthorized access. To address this, implementing robust security measures, transparent data usage policies, and clear opt-in/opt-out features for data sharing are necessary.

Dependency on external APIs for data acquisition poses a risk of inconsistencies if these APIs undergo changes or disruptions. To mitigate this, contingency plans for alternative data sources or fallback mechanisms should be established.

The sustainability of offering monetary rewards is another consideration. This approach may not be viable in the long run and could strain the application's financial resources. Diversifying reward options to include non-monetary incentives and regularly assessing the effectiveness and sustainability of the reward system is recommended.

In terms of improvement, enhancing the application's ability to personalize fitness plans based on individual preferences, health conditions, and fitness levels is crucial. Additionally, integrating social features within the application to foster a sense of community can enhance user motivation and accountability.

Ensuring the scientific validity of fitness metrics used is essential. Consulting with health professionals to validate the effectiveness of chosen metrics in promoting overall well-being enhances the credibility of the application.

Implementing a system for collecting and analyzing user feedback regularly is crucial for continuous improvement. This allows the application to adapt to user preferences and address areas that need enhancement.

Finally, providing offline functionality for data input and basic tracking enhances accessibility, allowing users to engage with the application even in areas with poor connectivity.

B. The Effects of 24 Weeks of Non-Face-to-Face Home Exercise on Body Composition, Physical Fitness, Cardiovascular Function, and Blood Profiles in Pre-Metabolic Syndrome Korean Adults[healthcare].

In the context[3] of the COVID-19 pandemic, a decline in physical activity participation was observed, driven by concerns about the heightened vulnerability of individuals with obesity and underlying health conditions to severe illness. Recent research findings underscored the specific threat posed by obesity itself to those infected with COVID-19. Recognizing the challenges of completely eradicating the virus, there was consensus on the need for tailored exercise programs to individual physical conditions.

However, the outlined objective has several drawbacks. Firstly, the reliance on physical examinations, blood profiling, and blood pressure tests may render the program exclusive and less accessible, particularly for those with limited healthcare resources. To address this, alternative methods for health assessments, such as at-home testing kits or telehealth services, should be incorporated to enhance inclusivity and accessibility.

Secondly, concerns related to privacy[6] and data security may arise due to the collection and utilization of personal health data for the program. Strengthening data security measures, ensuring compliance with privacy regulations, and providing clear communication on data handling and protection are crucial. Offering clear consent options and anonymizing data whenever possible can mitigate privacy concerns.

Moreover, the dependence on Information and Communications Technology (ICT) may pose challenges for individuals with limited technological[6] literacy or digital access. Improvements can be made by developing a user-friendly interface, providing educational resources, and offering non-digital participation options to overcome technology barriers.

Additionally, focusing on a 24-week timeframe may limit the understanding of long-term behavior change and sustainable health improvements. Extending the evaluation period and incorporating follow-up assessments would provide a more comprehensive view of the program's impact on participants' long-term health outcomes.

To improve the program, continuous remote health monitoring solutions, personalized digital health plans, and evidence-based behavioural change strategies should be

integrated. Collaboration with healthcare professionals for expert guidance, educational components to empower participants with knowledge, and diverse communication channels for ongoing engagement are essential elements. Longitudinal data analysis can be conducted to understand patterns of behavior change and inform adjustments to the program based on participant feedback and long-term data trends. These improvements collectively contribute to a more inclusive, privacy-conscious, and effective program in promoting sustained health and fitness outcomes. Regular evaluations and adjustments based on participant feedback and long-term data analysis will further enhance the program's success.

C. Expanding the Technology Acceptance Model with the Inclusion of Trust, Social Influence, and Health Valuation to Determine the Predictors of German Users' Willingness to Continue using a Fitness App: A Structural Equation Modeling Approach [International Journal of Human-Computer Interaction]

The study[2] observes the substantial popularity of fitness and running apps in Germany, prompting an inquiry into the determinants influencing German users' inclination to persist in using a specific fitness app. The research question is tackled through the application of an expanded Technology Acceptance Model, introducing variables such as trust, social influence, and health valuation. The investigation involves 476 German fitness app users, and structural equation modeling is employed for analysis.

Nevertheless, several drawbacks can be identified in the study. Firstly, the scope is confined to a specific set of factors, excluding other potentially influential variables. The study could benefit from an expanded set of considerations, encompassing factors like individual motivations, preferences, and specific app features.

Moreover, the study's exclusivity to Germany raises concerns about the generalizability of findings across international contexts. Cultural variations might significantly impact user preferences, necessitating comparative studies across diverse cultural settings to enhance the study's external validity.

The study's sample size, comprising 476 participants, might be considered relatively small, potentially affecting the statistical robustness of the findings. A larger and more diverse sample would enhance the study's reliability and representativeness.

Furthermore, the reliance on quantitative data through structural equation modeling overlooks the potential insights that qualitative research methods could provide. Integrating qualitative approaches, such as interviews or focus groups, would capture nuanced perspectives that quantitative data alone might not reveal.

To improve the study, several recommendations are proposed. First, extending the study's duration for a longitudinal analysis would provide insights into changes in user intentions over time. Second, including user engagement metrics and a comprehensive evaluation of the user experience would offer a more holistic understanding of user behavior. Third, expanding the study to encompass a

cross-cultural analysis would provide valuable insights into the generalizability of findings. Finally, supplementing self-reported data with behavioural metrics and adopting mixed-methods approaches would contribute to a more nuanced and robust exploration of the factors influencing German users' intention to continue using fitness apps. These improvements aim to address the identified drawbacks and enhance the overall quality and applicability of the study's findings.

D. Predicting future use intention of fitness apps among fitness app users in the United Kingdom: the role of health consciousness [International Journal of Sports Marketing and Sponsorship]

The research paper aims to replicate and extend the Unified Theory of Acceptance and Use of Technology (UTAUT2) to elucidate the determinants influencing users' future intention to use fitness apps, with a particular focus on the United Kingdom. While this objective is commendable, there are certain drawbacks that should be considered. Firstly, the emphasis on theoretical replication might limit the exploration of unique or context-specific factors that could impact users' future intentions. It is recommended to strike a balance by incorporating established theoretical frameworks alongside context-specific variables to offer a more nuanced understanding.

Additionally, the study introduces health consciousness as a determinant, but the scope of determinants considered may still be limited. The inclusion of factors like user experience, social influence, and perceived benefits could provide a more comprehensive examination of influences on users' future intention to use fitness apps. Furthermore, the study's focus on the United Kingdom raises concerns about the generalizability of findings to a broader international context. Acknowledging these contextual limitations and encouraging future comparative studies across diverse cultural contexts could enhance the external validity of the research.

The lack of methodological details, including information on sample size, data collection methods, and statistical analyses, is another drawback. Transparent reporting of the research methodology is essential for assessing the study's rigor and facilitating replication by other researchers. By incorporating these improvements, such as exploring additional determinants, considering international comparative analyses, and providing transparent reporting of the methodology, the research paper can enhance its contribution to the understanding of users' future intentions to use fitness apps, contributing to theoretical insights and practical applications in the health and wellness technology adoption domain.

E. MERN Stack: Technologies Used for Web Development [International Journal for Research in Applied Science & Engineering Technology (IJRASET)]

The stated objective of this research paper is to explore and articulate the advantages and rationale behind choosing the MERN (MongoDB, Express.js, React.js, Node.js) stack as a

web development technology. In navigating the complex realm of web development, characterized by a myriad of rules and techniques, the paper[4] aims to underscore the significance of attaining a comprehensive understanding of web technologies. The primary aim is to elucidate why developers should consider the MERN stack in their web development endeavors.

One potential drawback of the current objective lies in its singular focus on extolling the virtues of the MERN stack without offering a comparative analysis with alternative web development stacks. A more comprehensive approach could involve an examination of the strengths and weaknesses of the MERN stack in contrast to other popular web development frameworks. This would provide a more well-rounded perspective for developers seeking the most suitable technology stack for their projects.

Furthermore, the paper could benefit from addressing practical considerations, such as scalability, performance, and maintenance aspects[7] of the MERN stack. Exploring real-world scenarios and case studies where the MERN stack has demonstrated efficacy would add practical insights for developers contemplating its adoption.

Additionally, while emphasizing the importance of proficiency in key languages—JavaScript, CSS, and HTML—the research could delve into specific strategies or resources to aid developers in overcoming the learning curve associated with these languages. Practical tips, recommended learning paths, and examples of successful skill development journeys could enhance the paper's utility for its target audience.

To augment the objective, the research paper could also discuss potential challenges or pitfalls associated with MERN stack development, providing a balanced view for developers. This could encompass issues like security considerations, integration challenges, or any evolving trends that might impact the long-term viability of the MERN stack.

IV. CONCLUSION AND FUTURE SCOPE

Drawing insights from the collective research on fitness applications and the application of the MERN (MongoDB, Express.js, React.js, Node.js) stack in web development, a comprehensive conclusion emerges alongside promising avenues for future exploration in this domain.

• Conclusion

The amalgamation of findings from diverse studies sheds light on the nuanced determinants influencing fitness app adoption. Beyond conventional technological considerations, the interplay of health consciousness, user experience, and social influence underscores the multifaceted nature of user behavior in the fitness app landscape. Moreover, the exploration of technology acceptance models within this context highlights the continued relevance of established theories, such as the Unified Theory of Acceptance and Use of Technology (UTAUT2), especially when considering the evolving dynamics within the health and wellness sector.

The investigation into the advantages of the MERN stack in web development emphasizes the critical importance of selecting an appropriate technology stack. While acknowledging the merits of MERN, developers are encouraged to adopt a holistic view, accounting for factors like user experience, scalability, and real-world challenges inherent in fitness application development.

• Future Scope

Looking ahead, the future[7] of fitness applications holds exciting prospects in several key areas. The integration of behavioural science offers potential avenues for exploring the psychological and behavioural drivers that significantly impact users' adherence to fitness routines. Personalization through the infusion of artificial intelligence (AI) and machine learning algorithms is poised to revolutionize fitness applications by providing tailored workout plans, dietary recommendations, and motivational content based on individual user data.

Recognizing the impact of cultural nuances on health consciousness[7] and technology adoption, a future focus on cross-cultural analyses can provide valuable insights into users' varied perceptions and preferences across regions. Furthermore, the exploration of blockchain technology for heightened data security and privacy in fitness applications addresses the sensitive nature of health-related information.

Emphasizing user-centric design principles in future fitness application development is paramount. Conducting usability studies, gathering real-world user feedback, and refining interfaces based on user experiences contribute to enhanced effectiveness and heightened user satisfaction.

In conclusion, the synthesis of research insights points towards a future characterized by a holistic approach to fitness application development. This includes integrating behavioural science, deploying personalized AI features, cross-cultural adaptation, leveraging blockchain for data security, and maintaining a steadfast commitment to user-centric design principles. By navigating these avenues, developers and researchers stand to make meaningful contributions to the ongoing evolution of fitness applications, ensuring their effectiveness, engagement, and accessibility on a global scale.

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enhancing our understanding of Fitness Application using Mern stack.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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