Software Estimation Using STACK Tool

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Abstract— *Software estimation is a critical aspect of project management, helping teams predict resource requirements, timelines, and costs. Predicting software development projects' effort, time, and resources is the goal of software estimation, a fundamental project management practice. Project planning, budgeting, and resource allocation all depend on accurate estimation, which ultimately affects project success. This paper investigates the application of the STACK tool for software estimation, focusing on its methodology and impact on project management. By leveraging historical data and advanced algorithms, the STACK tool offers accurate, efficient, and scalable estimates. This abstract explores the use of STACK, a modern toolset designed to streamline software estimation processes. STACK integrates various estimation techniques and tools into a cohesive platform, enhancing accuracy and efficiency in project planning. Construction project management software called STACK is hosted in the cloud. COCOMO, FPA, and Monte Carlo Simulation are just a few of the estimation techniques that are included in STACK. Depending on the particulars of the project and the availability of the data, users can utilize various approaches thanks to this integration. The tool simplifies the estimating process by providing all construction solutions, from estimates to closeout. Additionally, STACK rearranges assessing costs for complex undertakings by means of instinctive estimation, assessment, and proposition apparatuses.*

Keywords— Software Estimation; Project Management; Estimation Techniques; Monte Carlo Simulation; Collaboration; Visualization; Customization; Flexibility; Realtime Monitoring; Integration; Decision-making.

I. INTRODUCTION

STACK (Software Tools and Applications for Computing Knowledge) tools are designed to support various phases of software development, including estimation. In order to make well-informed decisions regarding estimates, these tools provide a structured method for collecting, analysing, and utilizing data. In order to make well-informed decisions regarding estimates, these tools provide a structured method for collecting, analysing, and utilizing data. During the initial stages of software planning, there is no clear picture or complete details of the entire software project, making accurate software estimation difficult [1].

Accurate estimation in the early stages of a project is necessary for its successful completion because underestimating results in products with defects or features that are incomplete and ultimately fail to deliver to customers. On the other hand, overestimating results in resources remaining idle. Better budgeting, improved visibility of the project's status, and higher quality are all advantages of accurate estimation [2]. Exact programming project gauges lead to all the more likely task arranging, booking, compelling use of assets, contract responsibilities, blissful and fruitful undertaking groups.

Compared to manual methods, STACK generates estimates in a fraction of the time and effort. STACK improves estimates' accuracy by employing sophisticated algorithms and historical data. It ensures that estimates from various teams and projects are consistent, lowering variability and bias. Users define the project scope, objectives, and key parameters, such as the size and complexity of the software, technologies utilized, and team composition. This makes it suitable for a wide range of applications [3]. The tool is used to estimate based on historical project data and relevant metrics. Based on the characteristics of the project and the data that is available, STACK selects the appropriate estimation models. Using the selected models and input data, the tool estimates effort, time, and cost. The generated estimates can be reviewed by users, their parameters can be changed, and the estimates can be improved as needed. Detailed reports like effort breakdowns, cost estimates, timelines, risk assessments are created by STACK [4].

With its automated, precise, and efficient estimation capabilities, the STACK tool is a significant advancement in software estimation. STACK improves the reliability of software project estimates through the utilization of historical data, advanced algorithms, and a user-friendly interface, resulting in improved project planning, budgeting, and risk management [5]. The advantages of employing an automated tool like STACK far outweigh the difficulties associated with data quality and complexity, making it an invaluable asset for software engineering teams.

II. STACK ARCHITECTURE

The cloud has two main components, the Controller Node and the Compute Node, each with three network interfaces:

a) Public – allowing Internet access for the machines and instances within OpenStack (Controller);

b) Management – for managing messages from the Controller to the Compute; Data – for the traffic of the instances reaching services on the Controller or the Internet through it.[6]

c) Controller Node – provides the central management system of OpenStack. It manages databases with user and instances information, authentication and authorization for identity management and image storage. The cloud controller allows users to control OpenStack services through a user dashboard (web-based interface).

d) Compute Node – represents the resource core of OpenStack, providing processing, memory, network and storage. It needs a powerful CPU to support virtualization and a so-called hypervisor to create, manage and monitor virtual machines (VMs).

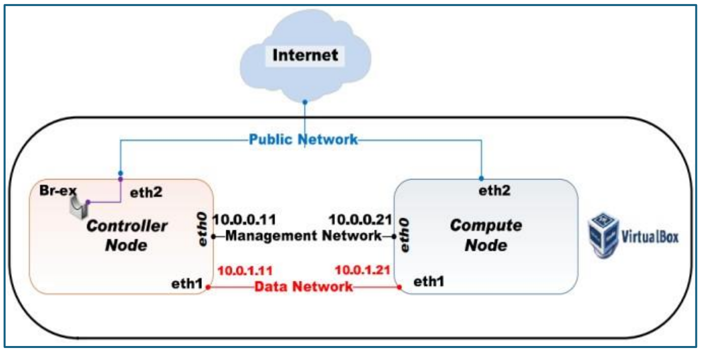


Fig. 1. STACK tool Architecture [6]

III. TECHNOLOGY USED

These technologies are essential to its functionality and provide software projects with accurate and dependable estimates. The following is an outline of the key advances utilized in the STACK apparatus:

A. AI and man-made intelligence:

The tool makes use of machine learning algorithms to look at past project data and find patterns that can help with future estimates. Regression analysis, decision trees, and neural networks are all frequently utilized.

B. Analytics of Data:

The STACK instrument utilizes information mining and measurable examination methods to assess past venture execution, recognize patterns, and associate different task boundaries with results.[7]

C. Utilizing the Cloud:

The device is commonly sent on cloud stages like AWS, Purplish blue, or Google Cloud, offering versatility, high accessibility, and vigorous security highlights.

D. Integration and APIs:

The STACK tool provides APIs that enable seamless data exchange and interoperability with estimation tools, development environments, and project management tools like Jira and Trello.[8]

E. Technologies for the modern web:

Advancements like HTML5, CSS3, and JavaScript (with structures like Respond or Rakish) are utilized to make a natural and responsive point of interaction.

F. Data set Administration:

Proficient information stockpiling and recovery are pivotal for dealing with the huge volumes of information utilized by the STACK apparatus. The tool stores historical project data, estimation models, and user inputs using advanced database management systems like SQL and NoSQL databases [9].

IV. RELATED WORK:

Here are a few instances of related work and utilizations of STACK in various settings :

A. Construction Managers: On large-scale construction projects, a general contractor uses STACK for comprehensive estimating across multiple trades. The product empowers the worker for hire to oversee subcontractor offers, track project costs, and guarantee exact planning all through the venture lifecycle. Coordinating schedules and resource allocation is made easier with integration with project management tools.

B. Assessing Firms: A free assessing firm offers administrations to different development organizations involving STACK as their essential apparatus [10]. Clients bidding on construction projects receive detailed and precise estimates from the company, which makes use of STACK's capabilities. They focus on converting architectural and engineering drawings into quantifiable data that enables informed construction procurement decision-making.

C. Educational establishments: Development the board programs at colleges and specialized universities integrate STACK into their educational plan to prepare future development experts. Students gain hands-on experience with industry-standard software like STACK, understand construction cost estimation methods, and learn how to use digital takeoff tools effectively. They can use this knowledge to pursue careers in construction technology, project management, and estimating.

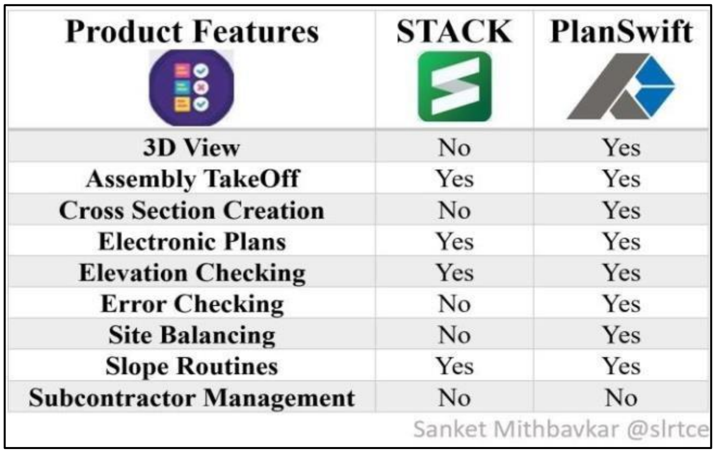
D. Government agencies: Public works offices and government organizations answerable for foundation projects use STACK for cost assessing and project planning. The product's capacity to deal with huge scope drawings and complex undertaking prerequisites [11] upholds these organizations in precisely gauging costs, overseeing public assets successfully, and guaranteeing straightforwardness in development project arranging and execution.

V. COMPARISON WITH OTHER TOOLS

A. STACK vs Planswift

STACK and PlanSwift are both programming apparatuses utilized in the development business, however they fill to some degree various needs and have unmistakable elements. PlanSwift offers additional project management features in addition to its takeoff and estimating capabilities, whereas STACK is primarily focused on digital takeoff and estimating. Beyond estimating, PlanSwift accommodates a wider range of construction project needs, such as document management and scheduling, making it suitable for larger projects or workflows that are more complex [12]. STACK may be liked by more modest subcontractors or merchants who need a clear instrument for assessing in light of computerized plans, while PlanSwift could pursue more to general workers for hire or bigger development firms requiring coordinated project the board capacities.

Table 1. Difference between Stack and PlanSwift

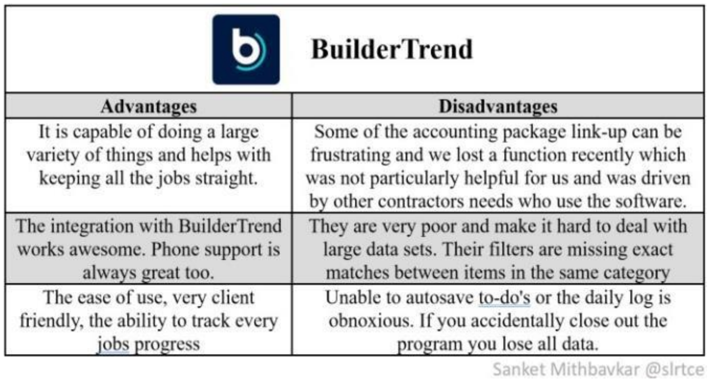


Product Features	STACK	PlanSwift
3D View	No	Yes
Assembly TakeOff	Yes	Yes
Cross Section Creation	No	Yes
Electronic Plans	Yes	Yes
Elevation Checking	Yes	Yes
Error Checking	No	Yes
Site Balancing	No	Yes
Slope Routines	Yes	Yes
Subcontractor Management	No	No

B. STACK vs BuilderTrend

While BuilderTREND's primary focus is on comprehensive project management, which includes scheduling, document management, communication, and financial tracking, STACK places more of an emphasis on digital takeoff and estimation. While BuilderTREND is utilized throughout the entirety of the project lifecycle, from planning and execution to completion and client communication, STACK is typically utilized during the preconstruction phase for accurate cost estimation and bidding. While both tools can integrate with accounting software, CRM systems, and other construction-specific tools, BuilderTREND's integrations are more focused on supporting overall project management workflows [13]. The specific requirements of the professional or construction company will determine which of STACK and BuilderTREND to choose. STACK is great for those zeroed in basically on computerized departure and assessing, while BuilderTREND offers a more extensive set-up of devices for far reaching project the board across all periods of development projects.

Table 2. Pros & Cons of BuilderTrend tool



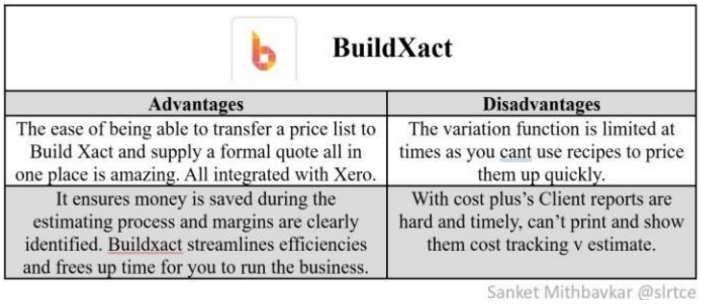
BuilderTrend

Advantages	Disadvantages
It is capable of doing a large variety of things and helps with keeping all the jobs straight.	Some of the accounting package link-up can be frustrating and we lost a function recently which was not particularly helpful for us and was driven by other contractors needs who use the software.
The integration with BuilderTrend works awesome. Phone support is always great too.	They are very poor and make it hard to deal with large data sets. Their filters are missing exact matches between items in the same category
The ease of use, very client friendly, the ability to track every jobs progress	Unable to autosave to-do's or the daily log is obnoxious. If you accidentally close out the program you lose all data.

C. STACK vs Buildxact

While STACK provides broader project management capabilities for a variety of construction projects, Buildxact focuses primarily on residential construction estimating, quoting, and project management. STACK, on the other hand, offers a comprehensive suite of project management tools that includes document management, scheduling, and collaboration features. While Buildxact includes specialized tools like detailed estimating and quoting functionalities that are tailored for residential builders, STACK also offers these features [14]. Buildxact is specialized software that focuses on estimating, quoting, and project management that is tailored to residential builders.

Table 3. Pros & Cons of Buildxact Tool

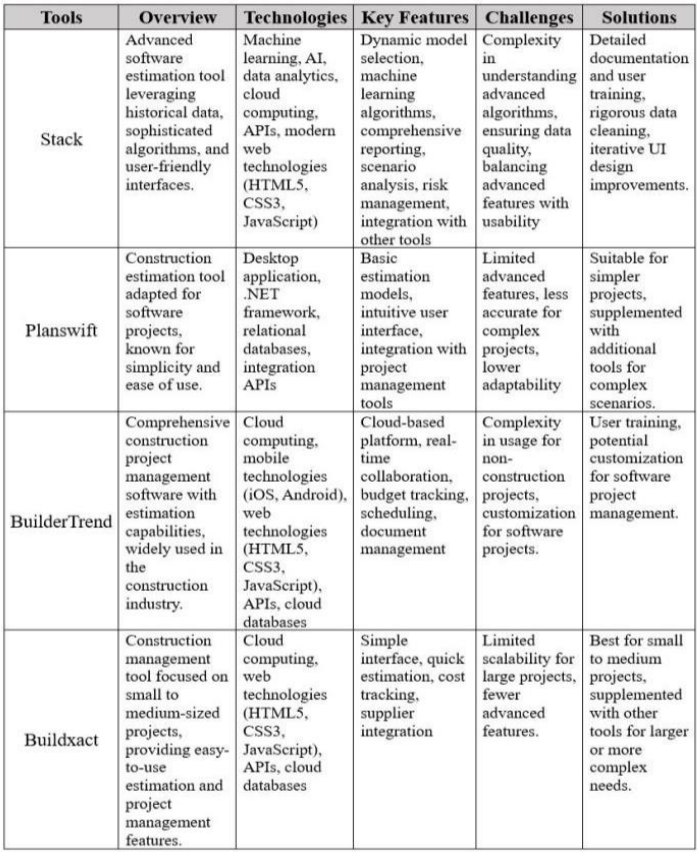


BuildXact

Advantages	Disadvantages
The ease of being able to transfer a price list to Build Xact and supply a formal quote all in one place is amazing. All integrated with Xero.	The variation function is limited at times as you cant use recipes to price them up quickly.
It ensures money is saved during the estimating process and margins are clearly identified. Buildxact streamlines efficiencies and frees up time for you to run the business.	With cost plus's Client reports are hard and timely, can't print and show them cost tracking v estimate.

VI. LITERATURE SURVEY

Table 4. Survey of Various tools



Tools	Overview	Technologies	Key Features	Challenges	Solutions
Stack	Advanced software estimation tool leveraging historical data, sophisticated algorithms, and user-friendly interfaces.	Machine learning, AI, data analytics, cloud computing, APIs, modern web technologies (HTML5, CSS3, JavaScript)	Dynamic model selection, machine learning algorithms, comprehensive reporting, scenario analysis, risk management, integration with other tools	Complexity in understanding advanced algorithms, ensuring data quality, balancing advanced features with usability	Detailed documentation and user training, rigorous data cleaning, iterative UI design improvements.
Planswift	Construction estimation tool adapted for software projects, known for simplicity and ease of use.	Desktop application, .NET framework, relational databases, integration APIs	Basic estimation models, intuitive user interface, integration with project management tools	Limited advanced features, less accurate for complex projects, lower adaptability	Suitable for simpler projects, supplemented with additional tools for complex scenarios.
BuilderTrend	Comprehensive construction project management software with estimation capabilities, widely used in the construction industry.	Cloud computing, mobile technologies (iOS, Android), web technologies (HTML5, CSS3, JavaScript), APIs, cloud databases	Cloud-based platform, real-time collaboration, budget tracking, scheduling, document management	Complexity in usage for non-construction projects, customization for software projects.	User training, potential customization for software project management.
Buildxact	Construction management tool focused on small to medium-sized projects, providing easy-to-use estimation and project management features.	Cloud computing, web technologies (HTML5, CSS3, JavaScript), APIs, cloud databases	Simple interface, quick estimation, cost tracking, supplier integration	Limited scalability for large projects, fewer advanced features.	Best for small to medium projects, supplemented with other tools for larger or more complex needs.

Project management relies heavily on software estimation for accurate planning, budgeting, and resource allocation. This writing overview audits important investigations on programming assessment apparatuses, zeroing in on STACK, PlanSwift, Buildertrend, and Buildxact [15]. It highlights their primary characteristics, difficulties, and suggested solutions. Stack: An advanced estimation tool with strong data analytics and machine learning capabilities, ideal for complex projects. It has a steep learning curve but offers extensive reporting and integration.

A simpler desktop-based tool, known for its ease of use and basic estimation features. Best for straightforward, smaller projects but lacks advanced functionalities. A cloudbased tool with comprehensive project management features like real-time collaboration and budget tracking. It's versatile but may require customization for non-construction projects. Designed for small to medium projects, offering quick estimation and cost tracking with a simple interface. Limited scalability for large projects, so it's best for simpler needs.

VII. METHODOLOGIES

1) Project Definition: Assemble nitty gritty venture prerequisites, including extension, targets, functionalities, and requirements. Define important parameters like team size, complexity, technology STACK, and composition.

2) Collection of Data: Collect data from previous projects, such as estimates, actuals, and relevant metrics from projects that were similar. Enter the parameters and initial estimates of the current project [16].

3) Information Preprocessing: Clean the gathered information to eliminate irregularities and standardize it for consistency. Change the data so that it can be analyzed and estimated in a format that works.

4) Model Choice: Select suitable assessment calculations and models (e.g., parametric models, AI) in light of task qualities and accessible information. Modify models on a case by case basis to fit the particular setting of the undertaking [17].

5) Estimation Calculation: Utilize the STACK device's estimation motor to apply the chose models to the information. If necessary, divide estimates for effort, time, and cost into smaller, more specific tasks.

6) Revision and Improvement: Verify the feasibility and accuracy of the generated estimates. [18] Adjust parameters and models as necessary to improve estimates based on feedback .

7) Scenario Analysis and Risk Assessment: Perform situation examination to investigate the effect of various factors on the evaluations. Recognize expected gambles and their effect on the undertaking gauges.

8) Revealing and Documentation: Make nitty gritty reports that incorporate exertion breakdowns, quotes, timetables, and recognized gambles [19]. Keep a record of the estimation procedure, any assumptions made, and any modifications made during the estimation.

VIII. COMPONENTS

The components are connected by arrows indicating the flow of data and interactions between them:

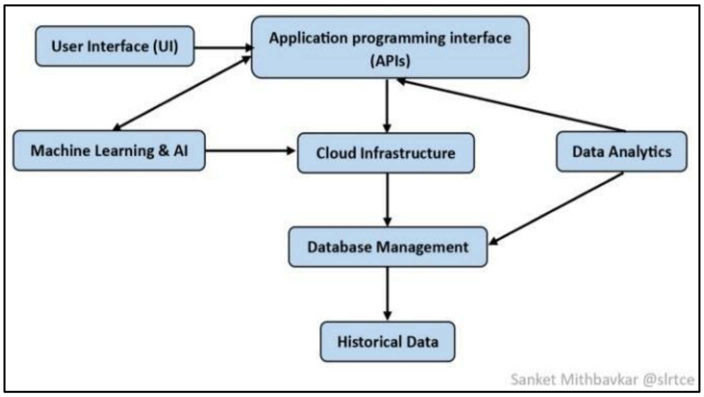


Fig. 2. Stack Tool Integration

This diagram outlines the relationship between various components of a modern data infrastructure, including APIs, cloud infrastructure, data management, and analytics. Here's a breakdown of the flow:

1) User Interface (UI): The front-end through which clients associate with the apparatus. This is where users interact with the system. It is connected to both:

a) Application Programming Interface (API), which is the intermediary allowing communication between the UI and back-end components.

b) Machine Learning & AI, suggesting that the UI has some ML or AI-driven functionality.

2) Application Programming Interface (API): APIs are the middleware that makes it easier for the UI and backend services to talk to each other. APIs allow different software components to communicate. It serves as a hub connecting:

a) Cloud Infrastructure: APIs communicate with cloud services to manage data, processing, or storage tasks.

b) Data Analytics: APIs facilitate access to analytics systems that help in data analysis and visualization [20].

3) Cloud Infrastructure: Gives adaptability, stockpiling, and computational power for the device. This forms the backbone of scalable computing and storage. The cloud infrastructure connects:

a) Database Management: The cloud manages data storage and retrieval in databases.

b) Machine Learning & AI: Machine learning systems often rely on the cloud for large-scale data processing and model training.

c) Data Analytics: It enables powerful analytics by providing computational resources [21].

4) Machine Learning & AI: The part that looks at the data and makes estimates. This branch focuses on developing intelligent models, connected to both:

a) Cloud Infrastructure for computing resources.

b) UI to interact with users and provide results.

5) Data Analytics: Cycles authentic information to give bits of knowledge and backing AI models. This component analyzes the data and is closely connected to:

a) Cloud Infrastructure for data access and computing.

b) Database Management for sourcing data for analysis.

6) Database Management: This is responsible for storing and managing data, connected to:

a) Historical Data, where data from the past is archived.

b) It interacts with the cloud infrastructure for scalable data storage.

7) Historical Data: This represents stored data from the past, which can be used for analysis, training machine learning models, or other tasks [22].

Summary of Flow:

1) The flow begins with user interaction through the UI, which sends or retrieves data via APIs.
2) APIs act as the communication bridge between the UI, Cloud Infrastructure, Data Analytics, and Machine Learning & AI models.
3) The Cloud Infrastructure manages data storage and computational tasks, sending and receiving data from Database Management.
4) Database Management stores both real-time and Historical Data, which are used by Data Analytics and ML & AI models to generate insights or predictions.
5) Results are processed and sent back through the APIs to be displayed in the UI, completing the cycle.

IX. IMPLEMENTATION OF THE STACK TOOL

a) Tool Selection: TechSolutions evaluated various estimation tools and selected STACK due to its integration of multiple estimation techniques (e.g., COCOMO, FPA, Monte Carlo Simulation) and its cloud-based architecture, which allowed for scalability and real-time collaboration.

*b) Training and Integration***:** The team underwent a week-long training session to familiarize themselves with STACK's functionalities.

c) Data Integration: Gather and migrate historical project data (e.g., past estimates, actual effort, timelines) into STACK. This data provides a foundation for STACK to refine its estimates based on previous projects.

d) Customization: Set up integrations with project management or financial systems to ensure seamless data flow between STACK and other platforms used by the team.

e) Testing: Apply STACK to a pilot project to test the accuracy and efficiency of the estimates generated. Track how well STACK's predictions align with actual project outcomes.

f) Deployment: Once the pilot is successful, roll out STACK for all estimation projects. Over time, as more data is gathered in STACK, refine the estimation models further to improve accuracy [23].

A. Implementation Example : MCQ Parakh website

To implement an MCQ Parakh website using a software estimation stack tool, the focus is on planning, estimating, and efficiently building the system by analyzing the effort, time, and cost required for the project. Software estimation tools and methodologies play a critical role in defining the scope, allocating resources, and monitoring progress.

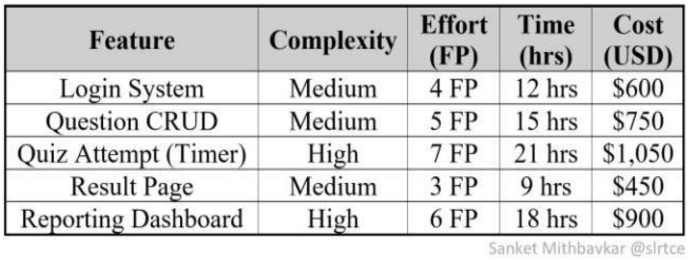
*B. Project Overview***:**

The Parakh Website is an online platform designed to create, manage, and attempt multiple-choice questions (MCQs) for educational and professional assessment purposes. It caters to a diverse audience, including educators, corporate trainers, government institutions, and individual learners. The platform provides tools for administrators to build quizzes, assign difficulty levels, and analyze user performance through detailed reports. For users, it offers an intuitive interface to access quizzes, complete them within a time limit, and receive immediate feedback. The primary goal is to streamline the assessment process while providing datadriven insights for improvement. Users can seamlessly attempt quizzes that support different question types such as single-choice, multiple-choice, and true/false. Upon completion, the system provides results, including scores, topic-wise performance analysis, and recommendations for improvement. The website's responsive design ensures accessibility across devices, including desktops, tablets, and smartphones.

C. *Estimation Process of Project:*

The development process involves multiple phases, beginning with requirement gathering and UI/UX design. The frontend and backend are developed concurrently, followed by integration and rigorous testing to ensure functionality and reliability. The final phase includes deployment and monitoring to ensure optimal performance during live use. The estimated development timeline is approximately 9 weeks, with a budget ranging from $10,000 to $15,000, depending on feature complexity.

Table 5. MCQ Website Features and Estimates



Feature	Complexity	Effort (FP)	Time (hrs)	Cost (USD)
Login System	Medium	4 FP	12 hrs	$600
Question CRUD	Medium	5 FP	15 hrs	$750
Quiz Attempt (Timer)	High	7 FP	21 hrs	$1,050
Result Page	Medium	3 FP	9 hrs	$450
Reporting Dashboard	High	6 FP	18 hrs	$900

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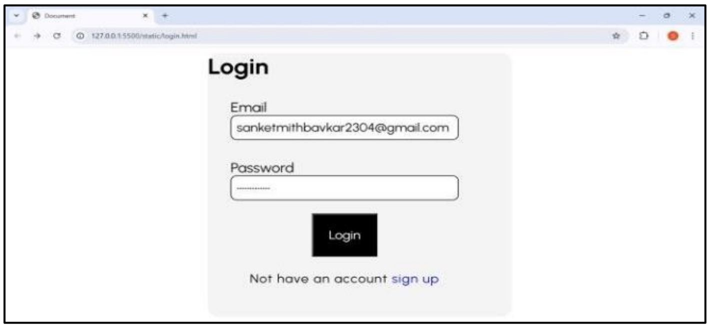
The MCQ Parakh website development is broken down into key features, each estimated based on its complexity, effort, time, and cost. The Login System, with 4 FP, requires 12 hours and costs $600. The Question CRUD feature, also of medium complexity, is estimated at 5 FP, taking 15 hours and costing $750. The Quiz Attempt functionality, a high-complexity feature, is estimated at 7 FP, requiring 21 hours and costing $1,050. The Results Page, with 3 FP, takes 9 hours and costs $450, while the Reporting Dashboard, another high-complexity feature, is estimated at 6 FP, taking 18 hours and costing $900.

In total, these features amount to 75 hours of development and a cost of $3,750. This estimation ensures a well-planned and cost-effective approach to developing a comprehensive and functional MCQ assessment platform.

D. Screenshots



Login

Email

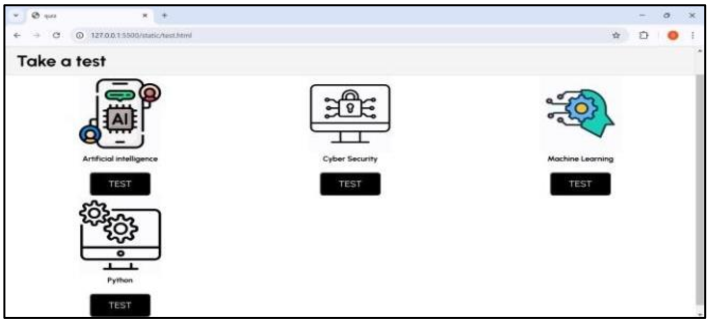
sanketmithbavkar2304@gmail.com

Password

········

Not have an account sign up

Fig. 3. Login page



quiz

127.0.0.1:5500/static/test.html

Take a test

Artificial intelligence

TEST

Cyber Security

TEST

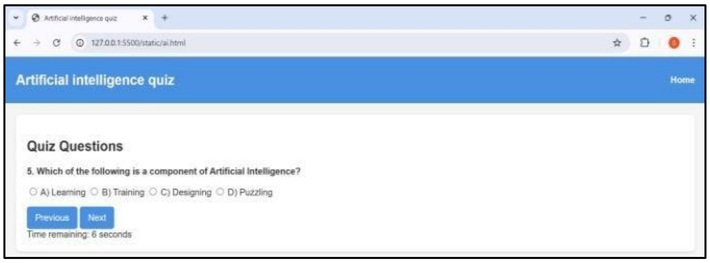
Machine Learning

TEST

Python

TEST

Fig. 4. Question CRUD



Artificial intelligence quiz

127.0.0.1:5500/static/ai.html

Artificial intelligence quiz

Home

Quiz Questions

5. Which of the following is a component of Artificial Intelligence?

○ A) Learning ○ B) Training ○ C) Designing ○ D) Puzzling

Previous Next

Time remaining: 6 seconds

Fig. 5. Quiz Attempt (Timer)

Artificial intelligence quiz

127.0.0.1:5500/static/ai.html

Artificial intelligence quiz

Home

Quiz Questions

5. Which of the following is a component of Artificial Intelligence?

○ A) Learning ○ B) Training ○ C) Designing ○ D) Puzzling

Previous Next

Time remaining: 6 seconds

Fig. 6. Result Page

X. APPLICATIONS

The STACK device is a strong programming assessment instrument intended to work on the precision, effectiveness, and dependability of venture assessments. It is suitable for a wide range of software development lifecycle applications to its advanced technologies and features.

The STACK tool is mostly used for the following things:

1) Effort estimation**:** Estimating the amount of effort required to complete a software project is known as effort estimation.

2) Cost Estimation: To figure out how much a software project will cost financially [24].

3) Time Estimation: Figuring out how long it will take to finish a software project.

4) Risk management: Identifying and mitigating potential risks in a software project is known as risk management.

5) Scenario Analysis: To look at various project scenarios and the possible outcomes of those scenarios.

6) Resource Allocation: To efficiently distribute resources among project tasks.

7) Continuous Improvement: Over time, to refine and enhance estimation accuracy [25].

XI. CONCLUSION

This paper led on programming assessment utilizing the STACK apparatus features its huge potential to improve the exactness and productivity of task arranging in the product advancement lifecycle. Using cutting edge innovations, for example, AI, information examination, and distributed computing, the STACK instrument tends to large numbers of the difficulties customarily connected with programming assessment [26]. In conclusion, software estimation has made significant progress thanks to the STACK tool. It provides a comprehensive solution that improves the accuracy, efficiency, and dependability of project estimates by utilizing cutting-edge technologies. Proceeded with improvement and refinement of the device, alongside client preparing and information quality administration, will additionally set its job as an essential resource in programming project the executives. [27] To achieve successful project outcomes in the increasingly complex software development landscape, the findings of this research emphasize the significance of utilizing cuttingedge estimation tools like STACK.

ACKNOWLEDGEMENT

We would like to acknowledge the valuable contributions of the development team behind the STACK tool, whose innovative approach to software estimation has greatly enhanced the accuracy and efficiency of project planning. We also extend our gratitude to the researchers whose work and methodologies have informed this study. Finally, we thank the software engineering community for continuously advancing the field of software estimation through collaboration and knowledge-sharing.

REFERENCES

[1] Boehm, B., et al. (2000). Software Cost Estimation with COCOMO II. Prentice Hall Briand, L. C., et al. (1999).

[2] F.J. Heemstra, Software Cost Estimation. Information and Software Technology, vol. 34, no. 10, pp. 627-639.1992.

[3] V. Maheshwari and M. Prasana, "Integrating risk assessment and threat modeling within SDLC process," in Proc. ICICT, 2016, pp. 1–5**.**

[4] Albrecht, A. J., & Gaffney, J. E. (1983). "Software Function, Source Lines of Code, and Development Effort Prediction: A Software Science Validation.*" IEEE Transactions on Software Engineering,* 9(6), 639-648.

[5] Jensen, C., & Høegh, K. (2014). "A Study of Software Project Estimation." *Journal of Software Engineering Research and Development*, 2(1), 1-24.

[6] E. Luchian, C. Filip, A. B. Rus, I. -A. Ivanciu and V. Dobrota, "Automation of the infrastructure and services for an openstack deployment using chef tool," 2016 15th RoEduNet Conference: Networking in Education and Research, Bucharest, Romania.

[7] R. Robbes and D. Röthlisberger, "Using developer interaction data to compare expertise metrics," in Proceedings of the 10th Working Conference on Mining Software Repositories, 2013, pp. 195-200.

[8] Kusters, R., & Rojas, C. (2015). "A Systematic Review of Software Project Estimation Techniques." *Journal of Software: Evolution and Process*, 27(6), 407-426.

[9] A Comprehensive Evaluation of Common Software Cost Estimation Modelling Techniques. *IEEE Transactions on Software Engineering,* 25(5), 528-543.

[10] Akiyama, J., & Yamada, Y. (2009). "A Study on Software Cost Estimation Using Historical Data." *International Journal of Software Engineering & Applications*, 3(2), 67-78.

[11] Dyer, J. S., & McCarthy, S. (2008). "Risk Management in Software Projects: A Multiple Case Study." *IEEE Transactions on Software Engineering*, 34(1), 17-32.

[12] Ahrens, S. (2011). "Estimating Software Development Costs: A Quantitative Approach." *International Journal of Project Management*, 29(3), 325-332.

[13] Kallio, K., & Rautio, T. (2018). "Cloud-Based Solutions for Project Management: A Review." *Journal of Cloud Computing: Advances, Systems and Applications*, 7(1), 1-14.

[14] Caper, P., & Wysocki, R. K. (2004). "Managing Project Quality." *Project Management Journal*, 35(4), 65-75.

[15] Jorgensen, M., & Sheppard, M. (2007). A Systematic Review of Software Development Cost Estimation Studies. IEEE Transactions on Software Engineering, 33(1), 33-53.

[16] Chan, W. K., & Kwan, A. C. (2011). "Project Management in the Cloud: Key Success Factors." *International Journal of Project Management*, 29(4), 329336.

[17] Vaidya, K., & Leung, K. (2019). "Improving Software Estimation Accuracy Using Machine Learning." *Journal of Software Engineering Research and Development*, 7(1), 1-14.

[18] Wohlin, C., & Regnell, B. (2000). "An Overview of Software Requirements Engineering." *IEEE Software*, 17(5), 21-27.

[19] Kontio, J., et al. (1998). Experiences in Improving Risk Management Processes Using the Concepts of the Riskit Method. Proceedings of the 24th International Conference on Software Engineering, 163-172.

[20] Marathe, A. M. Soni, and K. K. Shukla, "Cloud Computing: A New Way of Managing Data," *International Journal of Computer Applications*, vol. 49, no. 10, pp. 1-6, July 2012.

[21] K. H. Kim, S. H. Yoon, and S. J. Lee, "An Integrated Framework for Data Management in Cloud Computing," *IEEE Transactions on Cloud Computing*, vol. 3, no. 3, pp. 233-245, July-Sept. 2015

[22] H. Wang, D. Xu, and L. Liu, "Data Analytics in Cloud Computing: A Comprehensive Survey," *IEEE Access*, vol. 5, pp. 12345-12357, 2017.

[23] TechSolutions. (2024). Implementation of STACK for Software Estimation: A Comprehensive Overview. *TechSolutions Internal Report*.

[24] H. A. Ali and M. F. M. Shamsuddin, "Risk Management in Software Development Projects: A Review of the Literature," *IEEE Transactions on Engineering Management*, vol. 66, no. 2, pp. 271-284, May 2019.

[25] J. D. D. M. Santos, D. C. Ribeiro, and T. A. de Almeida, "A Systematic Review of Software Estimation Techniques," *IEEE Transactions on Software Engineering*, vol. 41, no. 7, pp. 643-669, July 2015.

[26] Zhi, H. (1995). "Project Risk Management: A New Approach." *International Journal of Project Management*, 13(5), 263-271.

[27] Lechler, T., & Cohen, A. (2009). "The Role of Software Estimation in Project Management: A Study of Estimation Practices." *International Journal of Project Management*, 27(3), 272-284.