Design, Development and Usability Evaluation of an AI-Enabled Digital Business Advisory Platform for Small and Medium Enterprises

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ABSTRACT

Small and medium enterprises (SMEs) often encounter difficulties accessing affordable, timely, and personalised business advisory services, particularly in strategic planning, financial management, and risk assessment. This study presents the design, development, and usability evaluation of a generative artificial intelligence (AI)-enabled decision support platform for SMEs in Bangladesh. The platform employs a large language model (LLM)-based approach, integrating structured, category-specific prompt engineering with API-based inference through the Groq API to generate contextualised business recommendations. Business information, including enterprise type, objectives, challenges, priority areas, and development stage, is collected through structured input forms and processed to produce actionable guidance. Developed using an Agile methodology, the platform integrates React.js and Vite for frontend development, Node.js and Express.js for backend processing, and Firebase Firestore for data management. System performance and usability were evaluated through black-box testing, 41 white-box module checks, and task-based user acceptance testing involving ten participants, comprising five SME representatives and five platform administrators. All 41 white-box checks passed, and participants successfully completed their assigned tasks, demonstrating functional reliability within the tested scenarios and preliminary usability. Minor navigation difficulties observed among some administrators highlighted opportunities for interface refinement. Although the accuracy and effectiveness of AI-generated recommendations require further expert validation, the findings demonstrate the technical feasibility of integrating LLM-based advisory capabilities into an accessible, web-based business support environment. This study contributes to research on SME digital transformation, human-centred AI, and intelligent decision support systems by presenting an integrated generative AI advisory approach supported by technical verification and user-centred evaluation in the SME context.

Keywords: Generative Artificial Intelligence; Large Language Models (LLMs); SME Digital Transformation; AI-Based Decision Support Systems; Human-Centred AI

INTRODUCTION

Small and medium enterprises (SMEs) contribute to employment and economic activity, yet many experience barriers to obtaining specialised business advice. A Bangladesh-focused overview identifies finance, capability and business-environment challenges among issues confronting SMEs [1]. Press reporting has likewise highlighted financial pressures on this segment [2]. These sources motivate the investigation of more accessible support mechanisms, although they do not establish that a particular digital intervention will improve business outcomes.

Conventional advisory websites often emphasise service descriptions, static articles and contact forms. Such resources may help businesses locate providers but do not necessarily offer an integrated, self-service workflow for tailoring guidance to specific goals and challenges. Advances in generative AI make it technically possible to formulate business-related recommendations from structured user inputs. Their applicability nevertheless

depends on interface accessibility, system reliability and careful treatment of potentially inaccurate recommendations.

This paper addresses the following research question: Can an integrated web platform offering AI-supported guidance, resources and administrator-controlled content be implemented and used to complete representative SME advisory workflows? The paper documents (i) the design of the integrated platform, (ii) technical verification of its key software modules and (iii) preliminary task-based usability testing involving both prospective SME users and administrators.

Related Work

A. Business support and SME digital access

Existing research and sector reports describe the difficulties SMEs may face in securing affordable strategic, financial and risk-related guidance [1, 2]. Digital channels can reduce the need to visit an advisory office merely to obtain basic information, forms or learning resources. However, availability of information alone should not be conflated with the quality of the advice or the capacity of a business owner to apply it. Technology acceptance research also emphasises perceived usefulness and perceived ease of use as relevant constructs in the adoption of new systems [3]; these constructs are useful for framing future studies, but were not formally measured in this prototype. A 2026 systematic review of 68 studies found that AI adoption among SMEs depends on organisational readiness, trust and alignment with business objectives [12]. Research on how firms actually adopt generative AI shows that initial experimentation does not automatically translate into sustained organisational use [13].

B. Digital advisory functions and generative AI

The project reviewed examples of conventional business-consulting websites and found an opportunity to integrate resource access, service information, inquiry submission and interactive advice generation into one workflow. This comparison was exploratory and based on visible website functionality; it was not a systematic or exhaustive market review. Generative-AI interfaces can produce tailored text on demand, but their outputs may be incomplete, unsupported or unsuitable for consequential financial decisions. Therefore, this study distinguishes successful generation and presentation of output from independent validation of its correctness. Recent research identifies knowledge, technological and organisational barriers to generative-AI adoption in resource-constrained SMEs [14]. Privacy-preserving, explainable decision-support research additionally highlights the role of transparency and human oversight in AI-supported SME decisions [15]. The current system therefore addresses an access and workflow problem rather than claiming fully validated autonomous financial advice. In addition, AI-assisted web applications have employed knowledge-based guidance to support users in specialised settings, illustrating the potential of interactive AI support while differing from the present platform's LLM-based generation approach [16].

C. Evaluation gap and contribution

The principal contribution is not a new machine-learning model or a demonstration of improved SME performance. Rather, the work combines three advisory categories—strategy, finance and risk—with resource and inquiry management in an implemented, administratively maintainable platform. It also reports both software-level verification and preliminary observation of task completion by two user roles. This provides an initial evidence base for functionality and workflow usability; it leaves business-decision accuracy, adoption and cost-effectiveness for future investigation.

RESEARCH METHODOLOGY

A. Study design and requirements elicitation

A design-and-development case study was undertaken for a web-based SME advisory prototype. Functional needs were identified from an appraisal of SME support challenges, review of existing advisory websites and

informal discussions with a project-domain representative. The latter informed functionality but was not treated as a representative survey of Bangladeshi SMEs. Requirements were organised for two roles: SME users and platform administrators.

An Agile, iterative process was used to plan, design, develop, test and revise individual modules. The core user workflows were accessing the advisory dashboard, selecting an advice category, entering business details, reading generated output, browsing services, downloading resources and submitting inquiries. Administrative workflows involved managing services, resources, inquiries, site content, notices, form options and credentials. During iterative development, feedback from a domain representative informed the refinement of platform functions and administrative workflows. This practitioner involvement supported requirements alignment but was not a formal expert assessment of the factual accuracy of AI-generated recommendations.

B. Prototype development

The prototype was implemented with a React.js/Vite browser interface, a Node.js/Express.js backend, Firebase Firestore for dynamic records and the Groq API for generating AI-based text responses. The backend validates incoming form data, prepares a category-specific request for the external AI service and returns generated content to the interface. User inputs comprise business type, goals, challenges, priority area and business stage; the original form also included a business-name field. These are contextual prompts rather than verified financial records or audited performance indicators.

C. Evaluation procedures

Three complementary forms of testing were conducted. Black-box testing examined navigation, form handling, input/output behaviour and error messages against expected outcomes. White-box testing comprised 41 module-level checks covering the frontend, advice API, database operations, resource handling, administration, backend endpoints and validation/error handling. User acceptance testing used practical tasks with ten participants: five representatives of SME users and five platform administrators. Sessions were conducted remotely via an online meeting platform because the developer and participants were in different countries.

The usability assessment considered task effectiveness, learnability, ease of navigation and participant feedback through observation and verbal responses. The evaluation records scenario-level outcomes and general qualitative impressions rather than a standardised questionnaire score or participant-by-participant timing dataset. The task-based evaluation considered four usability dimensions: effectiveness, learnability, navigation ease and user satisfaction. Evidence was gathered through observed task completion and verbal feedback.

System Design And Implementation

A. Functional architecture

Figure 1 shows the system is organised into a presentation layer, application-control layer and data layer, with an external AI-service interface. The browser presentation layer displays the SME and administrator views. The backend processes submitted information, performs input checks, mediates database operations and sends advice requests to the AI service. Firestore maintains dynamically editable service, resource, inquiry and content records. This separation follows an MVC-inspired architecture; it is not claimed to implement every convention of a strict MVC framework.

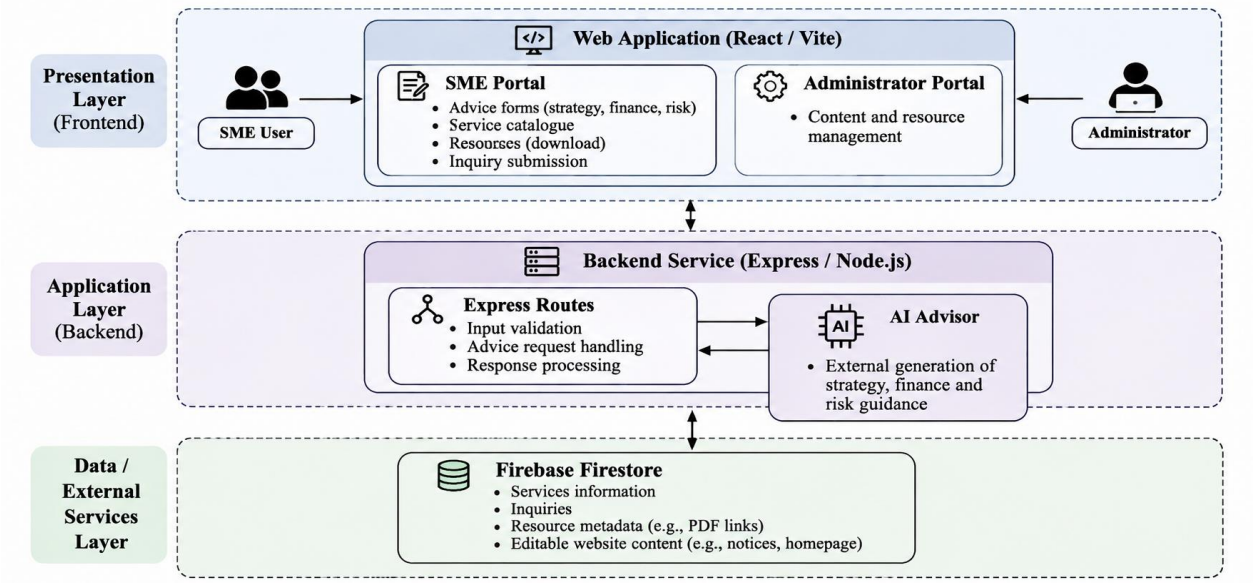


Figure 1. System architecture of the AI-enabled SME advisory platform.

B. Advice-generation workflow

A user selects one of three advice categories: strategic, financial or risk-related guidance. The system collects the supplied business context, validates required fields, formats a category-specific prompt, submits it through a server-side API route and displays the returned text in an output panel. The implementation demonstrates a functional AI-assisted workflow as shown in Figure 2. It does not incorporate a validated business knowledge base, professional oversight of each response or a documented mechanism to verify factual claims in the generated advice.

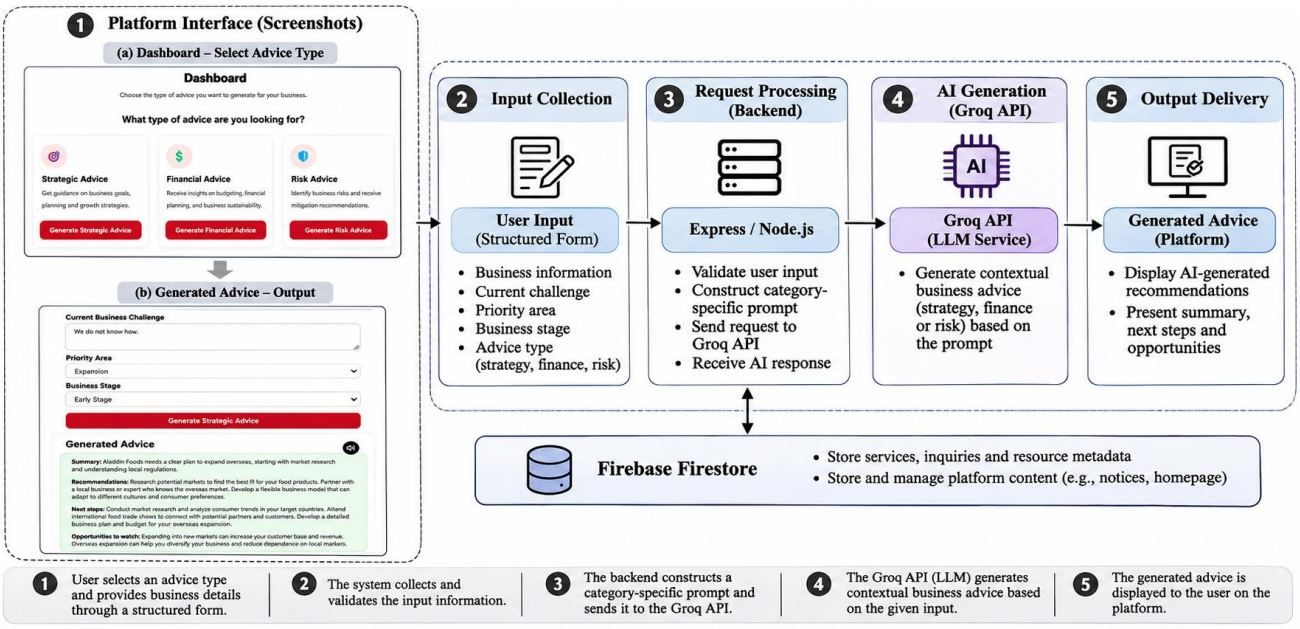


Figure 2. Workflow for AI-supported business advice generation.

C. Non-AI support and administrative management

The platform also offers descriptions of advisory services, downloadable PDF guidance materials and a form for questions or feedback. Administrators can add, change or delete service details, manage resources and inquiries, update platform notices and form choices, and maintain account credentials. These capabilities support a single information-management workflow without requiring a programmer to edit every content item. Requirements

in the study also specify security, responsiveness, compatibility and scalability goals; passing a functional test should not be interpreted as a load-test, penetration-test or verified service-level guarantee.

RESULTS

A. White-box verification

Table 1 presents the module-level verification results. All 41 recorded checks were marked as passed. This supports successful execution of the inspected code paths and integration functions within the test scope, but it does not quantify defect prevalence under production workloads.

Table 1. Results of white-box module verification.

Module	Checks	Reported outcome
Frontend components	6	Passed
Advice-generation API	5	Passed
Firebase Firestore operations	7	Passed
Resource upload and download	5	Passed
Administrative content management	7	Passed
Backend API endpoints	6	Passed
Input validation and error handling	5	Passed
TOTAL	41	41 reported passed

B. Functional and user-acceptance outcomes

Black-box procedures inspected the principal user and administrative workflows, including normal and incomplete form submissions, resource handling and system feedback. Table 2 summarises the observed user acceptance scenarios. Five SME representatives tested user-facing workflows and five administrators tested management functionality. The recorded observations indicate that participants completed their allocated scenarios; some administrators initially hesitated when finding specific management options, then succeeded by inspecting labels and controls.

Table 2. Task-based user acceptance testing outcomes.

User role	Scenario	Reported result
SME representative	Access SME portal and advisory dashboard	Passed
SME representative	Generate strategic advice with valid input	Passed
SME representative	Browse advisory services	Passed
SME representative	Download PDF resource	Passed
SME representative	Submit inquiry	Passed
Administrator	Manage services	Passed

Administrator	Manage resources	Passed
Administrator	Review/manage inquiries	Passed
Administrator	Update platform content	Passed
Both groups	Complete assigned tasks with minimal guidance	Positive feedback; scenario passed

C. Interpretation of usability evidence

Task completion under observation provides evidence of basic effectiveness for these selected scenarios. The reported successful use of forms and navigation is consistent with preliminary learnability, while the noted hesitation among some administrators signals a potential discoverability issue. Verbal feedback was generally favourable, but the record does not give a structured sentiment instrument, task times or severity-coded usability incidents. Results should therefore be described as a small formative evaluation rather than proof of broadly generalisable usability.

DISCUSSION

A. Feasibility of integrated self-service guidance

The results show that combining advice generation with information resources, inquiries and administrative maintenance is technically feasible in the evaluated prototype. Across the recorded test checks, core requests and content-management operations functioned as intended, and participants were able to complete representative tasks. This supports the practicality of an integrated digital touchpoint for SME-related guidance in a limited pilot context. The findings do not show that participants acted on the advice or that outcomes such as sales, profitability, credit access or resilience improved.

B. Implications for SME support and digital inclusion

A browser-accessible platform may reduce friction for entrepreneurs who seek an initial explanation of planning concepts, downloadable templates or a route to further assistance. Such a model may complement, rather than replace, professional advisers. Its potential benefits depend on language accessibility, internet access, user literacy, the reliability of content and users' ability to evaluate recommendations. As the study did not compare user costs or outcomes with conventional consulting, claims of affordability and impact remain proposed benefits, not tested findings.

C. Reliability and governance of generative advice

Generative AI introduces risks that conventional service catalogues do not pose, including unsupported facts, oversimplified financial suggestions and inappropriate confidence in personalised-sounding answers. The current evidence verifies the advice-request pathway rather than recommendation validity. Responsible deployment would require clear warnings about the limits of automated advice, minimisation of sensitive business inputs, documented data-handling practices and domain-expert evaluation of output accuracy, usefulness and risk. Security requirements were specified in the project, but no independent security audit was reported. Although conversational assistants such as ChatGPT illustrate the broader potential of large language models for business guidance, the implemented prototype used a Groq API connection rather than the ChatGPT service. This distinction matters because the paper evaluates the implemented software workflow, not the performance of ChatGPT. The integration of generative AI into digital advisory platforms also raises concerns regarding data confidentiality, cybersecurity vulnerabilities, and the protection of sensitive business information. These concerns are consistent with the broader challenges of AI-enhanced cybersecurity discussed by Burhanuddin et al. (2025) [17].

D. Study limitations

The evaluation included only ten participants, separated into two small role groups, and was conducted remotely. The study did not use a control group, random sampling, repeated measures or standardized usability scoring. Participants were representatives of intended user roles and may not reflect rural entrepreneurs, low-connectivity contexts or differing digital skills. The evaluation provides no systematic expert judgement of AI advice quality, no performance benchmark for concurrent loads and no longitudinal evidence of organisational impact. These limitations restrict generalisation and should guide subsequent studies.

CONCLUSION AND FUTURE RESEARCH

This study documented the design and preliminary evaluation of an AI-enabled business advisory platform for SMEs. The system integrates category-based AI-generated guidance with service information, downloadable resources, inquiry submission and administrator-controlled content. In the evaluation, 41 white-box checks were reported as passed and ten participants completed the assigned user-acceptance workflows. These results demonstrate prototype functionality and initial task usability, not validated business-advice accuracy or improved SME outcomes.

Future research should recruit a larger, diverse SME sample and use standardised measures such as task-completion time, error frequency and the System Usability Scale. The study should independently score generated recommendations for factual correctness, relevance, actionable value, safety and consistency across repeated prompts. Comparative evaluations against conventional advisory resources, together with privacy/security review and longer-term business-outcome tracking, would provide stronger evidence of practical value.

Declarations

Ethical considerations: No formal institutional ethics approval was obtained for this prototype usability evaluation. The evaluation involved user tasks and observations without reporting identifiable participant information.

Data availability: No external training or benchmarking dataset was used in this study. The reported findings are based on system test records and task-based usability observations; individual participant-level records are not publicly available.

Conflicts of interest: The authors declare no conflicts of interest.

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