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DiseaseQuest
Vision and Scope

Version 2.0

Revision History

Date	Version	Description	Author
09/25/2025	1.0	Initial Revision	DiseaseQuest Team
04/15/2026	2.0	Finalized Version	DiseaseQuest Team

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Vision

1. Introduction

The purpose of this document is to collect, analyze, and define the business requirements, i.e., high-level needs, desired ultimate business outcomes, and features of DiseaseQuest. It focuses on the capabilities needed by the stakeholders and the target users, and why these needs exist in the first place. The details of how DiseaseQuest fulfills these needs are detailed in the use-case and supplementary specifications.

1.1 Background

Medical students that are working through their clinical studies in the Burnett School of Medicine are wanting to work more asynchronously with the class curriculum. Their current asynchronous study option is only allowing them to study strictly knowledge-based concepts, and want a way to study a full end-to-end case study that will test the clinical reasoning of the student rather than general concepts. This will be done through a patient-centered dialogue. Students that learned through gamified-features believed they were more engaged in the material. The gamified solution is not meant to replace the curriculum, but rather act in tangent with it to be supplementary material to learn.

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2. Business Requirements

2.1 Business Opportunity/Problem Statement

The problem of	not having a clinical reasoning practice and evaluation tool
affects	the medical students and instructors
the impact of which is	growth in the students understanding of patient evaluation
a successful solution would be	a platform that allows the medical student to practice and improve their clinical reasoning skills

2.2 Business Objectives

BO-1: Prototype phase, 10-15% median reduction in evaluation time from the start of the first clinical action to the commitment of prioritized Differential Diagnosis (DDx) and initial orders for the medical student

BO-2: Pilot phase, 25-30% median reduction in evaluation time from the start of the first clinical action to the commitment of prioritized Differential Diagnosis and initial orders for the medical student

BO-3: Scale Study phase, 35-40% median reduction in evaluation time from the start of the first clinical action to the commitment of prioritized Differential Diagnosis and initial orders for the medical student

2.3 Success Metrics

SM-1: During Prototype phase, At least 5% of Burnette School of Medicine learners (around 15 users across different student academic year) actively use the gamified simulation

SM-2: Prototype phase, median evaluation time, from first clinical action after triage to commitment of prioritized differential diagnosis and initial orders, decreases by 10–15%

SM-3: During the Pilot phase, ~30% of a Lake Erie College of Osteopathic Medicine Bradenton class (around 72 out of 240) actively use the gamified simulation

SM-4: During the Pilot phase, median evaluation time reduced by 25–30%

SM-5: During the Scale Study phase, >90% of the class (around 216 out of 240) actively use the gamified simulation.

SM-6: During the Scale Study phase, median evaluation time reduced by 35–40% with no loss of safety or diagnostic accuracy.

2.4 Vision Statement

For	Students
Who	are looking to improve their clinical reasoning skills
The (product name)	DiseaseQuest

That	is a more engaging way for medical students to test their understanding of how to interact with patients from beginning to end of their clinical visit
Unlike	traditional knowledge based learning solutions
Our product	will test clinical reasoning and allow a more patient-centered dialogue

2.5 Business Risks

RI-1: Budgeting for multiple AI agents may exceed forecasted costs, leading to sustainability issues in long-term adoption. (Probability = 0.3; Impact = 7)

RI-2: A lack of a dedicated technical team to maintain the system after completion may result in degraded performance, security gaps, and loss of user trust. (Probability = 0.7; Impact = 7)

RI-3: The application may be perceived as more confusing than the previous system, reducing user acceptance and engagement. (Probability = 0.4; Impact = 5)

RI-4: Failure to properly de-identify sensitive data before use may create compliance risks and potential negative impacts on institutional reputation. (Probability = 0.3; Impact = 9)

2.6 Business Assumptions and Dependencies

AS-1: There will be students who choose to use the solution after completion.

AS-2: Sufficient data will be available to train the models needed for the solution.

AS-3: Medical students will provide feedback on their experience with the system.

AS-4: Each case in the game will include a correct solution available at the end.

DE-1: Effective communication between AI agents will be available and maintained throughout the system.

3. Stakeholder Profiles and User Descriptions

3.1 Stakeholder Profiles

Stakeholder	Major value or benefit from this product	Attitudes	Major features of interest	Constraints	End user or not?
Medical Students	Gain access to an engaging, gamified tool to practice full clinical reasonings. They can test differential diagnosis (DDx), ordering labs, and patient interaction in a safe environment.	Strongly supportive; students have already expressed interest in more interactive, asynchronous learning options. Engagement is likely to increase with gamification.	Case-based simulations, patient-centered dialogue, instant feedback, gamified progress tracking, and correct "gold standard" solutions at the end of cases.	Limited study time; must balance with mandatory curriculum. The tool must be easy to use, mobile-accessible, and efficient.	Yes
Instructors / Faculty	Improved student preparedness and clinical reasoning skills, which can lead to more efficient in-class discussions and higher diagnostic accuracy. Offers a supplemental teaching tool without adding significant grading burden.	Receptive, though cautious about integration with existing curriculum and ensuring educational validity. Not replacing the curriculum, but working in tangent.	Ability to monitor aggregate usage, see improvement in evaluation times, validate accuracy of reasoning, and access de-identified data for teaching research.	Limited time to learn and adopt new systems. Faculty acceptance depends on proof of educational value and alignment with learning objectives.	Yes
Burnett School of Medicine Administration	Strengthens reputation of the school by integrating innovative educational technology. Enhances student engagement, clinical reasoning, and competitiveness in medical education.	Supportive if implementation is cost-effective and demonstrates measurable improvements in student outcomes.	Institution-level performance data, scalability across classes and cycles, evidence of improved evaluation timing and accuracy.	Budget limitations, long-term sustainability, and ensuring compliance with FERPA/HIPAA for student and patient-case data.	No
Partner Institutions (e.g., LECOM Bradenton for Pilot Studies)	Access to innovative supplemental tools for their students, opportunities for collaborative research and publications, and benchmarking against peer institutions.	Open; adoption depends on clear demonstration of success at TCU and low technical barriers to entry.	Flexible deployment for pilot studies, scalability, and ability to integrate with their own teaching processes.	Technical capacity for deployment, institutional cost-sharing, and availability of IT support.	No

Technical / Development Team	Opportunity to design and maintain a high-impact educational tool with advanced AI features, contributing to academic innovation.	Supportive, but resource-dependent. Sustainability requires long-term funding or dedicated support.	AI-driven case simulations with adaptive, multi-agent dialogue. Robust backend infrastructure ensures high availability, scalability, and security. Seamless interoperability with institutional Learning Management Systems (LMS). Compliance with FERPA, HIPAA, and IRB requirements for handling educational and simulated clinical data.	Budget, need for ongoing maintenance, risk of system degradation without permanent staffing.	No
Regulators / IRB	Assurance of ethical research, learner safety, and compliance with privacy/security standards	Assurance of ethical research, learner safety, and compliance with privacy/security standards	De-identified data; no IRB regulation requirements not met	Compliance with IRB approvals and privacy regulations; delays if requirements unmet	No

3.2 User Environment

Primary Users: Medical Students

- Typically 15–240 students per class depending on the study phase (prototype, pilot, or scale).
- They engage with the tool individually in asynchronous study sessions, often outside of scheduled class hours.
- Sessions may last anywhere from 15-30 minutes per case, depending on complexity.
- Environment: personal laptops or tablets, primarily indoors (classrooms, study spaces, dorms).
- Expectation: seamless login, minimal setup, mobile responsiveness.

Secondary Users: Instructors / Faculty

- Use the tool to complement teaching, but not as their primary platform.
- Environment: university-provided computers, office desktops, or laptops.

- Interaction style: reviewing aggregate usage or performance metrics, not playing through cases themselves.
- Time available is limited: the tool must be quick to interpret and align with existing teaching objectives.

Administrative Users: School Leadership & Partner Institutions

- Primarily consume *reports* and outcome data, not day-to-day interaction.
- Environment: institutional IT infrastructure, standard office computing setups.
- Expectation: access to anonymized data dashboards or summary reports that demonstrate impact on learning outcomes.

Technical Environment

- The platform should be accessible via modern web browsers (Chrome, Firefox, Safari, Edge) without requiring complex installation.
- Must be compatible with existing Learning Management Systems (LMS) if integration is pursued in the future.
- Privacy considerations: system must ensure de-identified data to comply with FERPA and HIPAA.

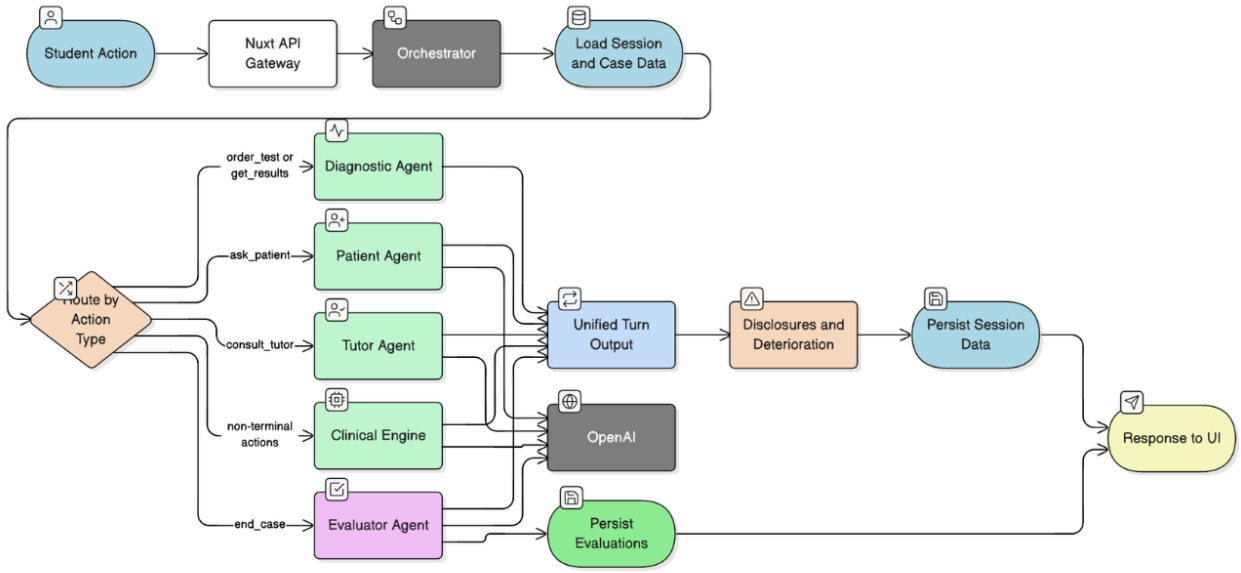
3.3 Alternatives and Competition

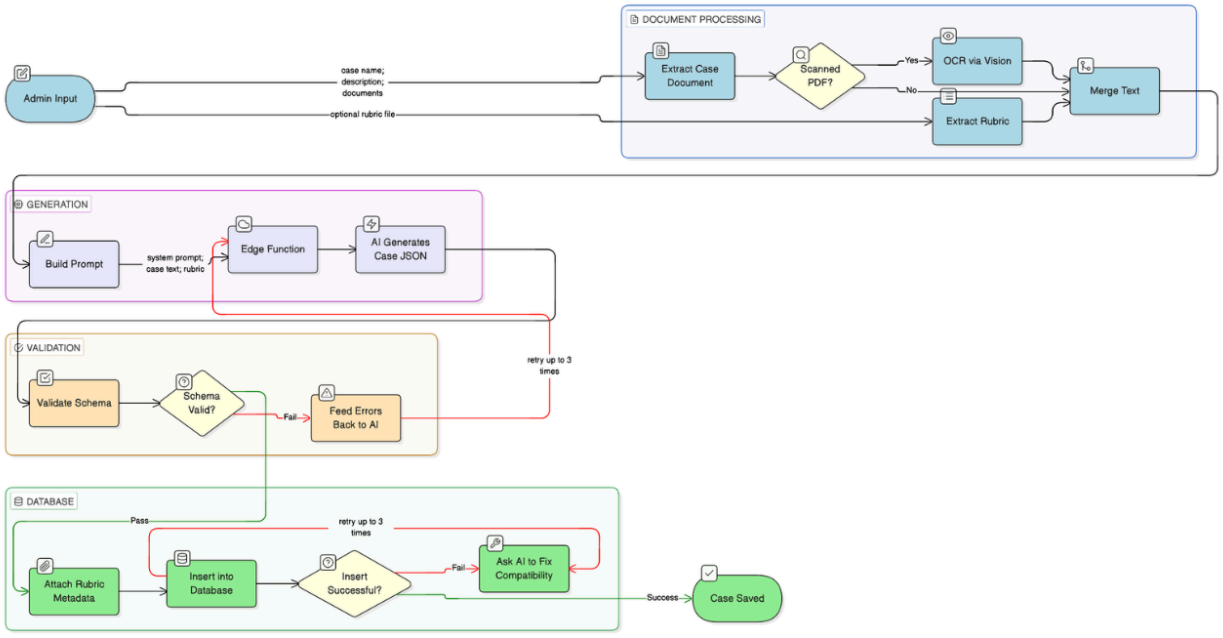
Alternative	Description	Strengths	Weaknesses
MedAgentSim	A multi-agent framework developed specifically to simulate realistic doctor-patient diagnostic interactions for the purpose of evaluating LLMs.	- Simulates the information-gathering process during diagnosis using agentic AI. - Realistic doctor-patient diagnostic interactions	- No provided educational framework for revision, tutoring, or analysis of trends. - Strictly a diagnosis simulation between large language models with no human input.
Kaizen	A gamified platform for teaching and learning.	- Gamification features provide engaging learning experience - Data collection provides insights to both students and instructors	- Cases are strictly knowledge-based and do not test or train a user's reasoning, communication, or timing skills.
Prognosis: Your Diagnosis	A mobile application that presents users with clinical vignettes and challenges them to make diagnostic and management decisions by selecting options from	- Centered on clinical reasoning. - Users are able to see the consequences of their choices - Cases based on real clinical	- User interaction is limited to selecting options in menus rather than interacting through a conversational diagnostic process. - Users are directed toward a

	menus.	observations by experienced physicians - App provides concise but comprehensive discussion of diagnostic reasoning and key learning points after each case	specific diagnosis rather than allowing for an open-ended system.

4. Scope and Limitations

4.1 Product Perspective





4.2 Major Features / Scope

FE-1: Provide students with access to interactive, gamified clinical simulations that replicate patient encounters.

FE-2: Deliver real-time feedback on clinical reasoning steps, including history-taking, differential diagnosis, and initial orders.

FE-3: Support structured learning stages (instruction/introduction → preparation → active practice → feedback → reflection) to reinforce knowledge acquisition.

FE-4: Provide just-in-time guidance through a Mentor Agent to scaffold complex procedures and decision-making tasks.

FE-5: Ensure all case data and analytics are de-identified and compliant with IRB and privacy regulations.

FE-6: Support multi-agent communication to deliver adaptive feedback and analysis.

Multi Agent System Overview:
DiseaseQuest uses a coordinated multi agent framework that enables a realistic patient encounter and structured clinical reasoning experience. The system begins with the NPC Patient Agent, which provides the initial presentation and responds to student questions. The Mentor Agent offers guidance and prompts when students need support in gathering information or interpreting findings. The Game Master Agent manages the flow of each case by controlling scenario progression, unlocking new information, and ensuring that the narrative remains clinically accurate. As the student forms a differential diagnosis and selects orders, the Diagnostic Agent retrieves or generates the appropriate results. At the end of the session, the Evaluation Agent analyzes the student's reasoning, timing, and decision patterns to produce individualized feedback. Together, these agents create an adaptive, interactive learning environment that mirrors the structure of real clinical encounters.

- **Patient Agent:** Provides history, context, adapt to student input (Medical conditions, dynamic patient responses, social determinants of health, high-fidelity encounter simulation)
- **Mentor Agent:** Guides clinical reasoning (Deep medical knowledge, Socratic method for diagnosis, adaptive scaffolding for complex reasoning)
- **Orchestrator Agent:** Drives branching narratives, progression logic (Clinical case progression, test results, ethical dilemmas, ensuring clinical accuracy in narrative)
- **Evaluation Agent:** Delivers individualized, growth-oriented feedback (Clinical reasoning analysis, diagnostic accuracy, management plans, process-oriented feedback)
- **Diagnostic Agent**: Orders and delivers tests as prompted to the student (scaffolds DDx development)

FE-7: Provide cross-platform access for students and instructors (desktop, tablet, secure institutional login).

FE-8: Offer curriculum-aligned case libraries organized under the 4C/ID model (whole-task cases, procedural guidance, part-task practice).

4.2.1 Limitations

- DiseaseQuest is a supplementary educational tool and cannot replace supervised clinical training or formal assessment methods.
- Simulation quality depends on the reliability of language models, training data, and multi agent communication.
- Performance is subject to technical constraints such as network availability, server load, and institutional infrastructure.

4.3 Deployment Considerations

I. User Access & Distribution

- **Users:** Medical students, faculty/facilitators, and curriculum administrators.
  - Users may be distributed globally across institutions and time zones.
  - Access will be via a secure web interface, available on desktop/laptop and potentially tablets.
  - Faculty require administrative access for monitoring and analytics, while students need learner access for simulations and self-study.

II. Access Timing

- Students need on-demand access for practice and scheduled access for live or facilitated sessions.
- Faculty need flexible access for setup, observation, and debrief activities.
- The system should maintain 24/7 uptime, with downtime limited to planned maintenance windows.

III. Infrastructure Requirements

- **Hosting & Capacity:**

    - Hosted on Vercel
- **Network Access:**
    - www.dieasequest.com domain purchased via SquareSpace
    - Resend API for email service
- **Data Storage & Management:**
    - Supabase (PostgreSQL) for structured learner data, scoring logs, and analytics.

IV. Security & Compliance

- **Authentication:**
    - Integration with institutional Single Sign-On (SSO) (e.g., SAML, OAuth) via Supabase authentication.
- **Data Security:**
    - All data encrypted at rest (KMS) and in transit (TLS/SSL).
    - Strict IAM (Identity & Access Management) policies for role-based access.
- **Compliance:**
    - FERPA compliance for student data.
    - HIPAA safeguards if any real clinical data is incorporated.

5. Other Product Requirements

- Training data and mock cases must be de-identified in compliance with FERPA and HIPAA laws.

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