
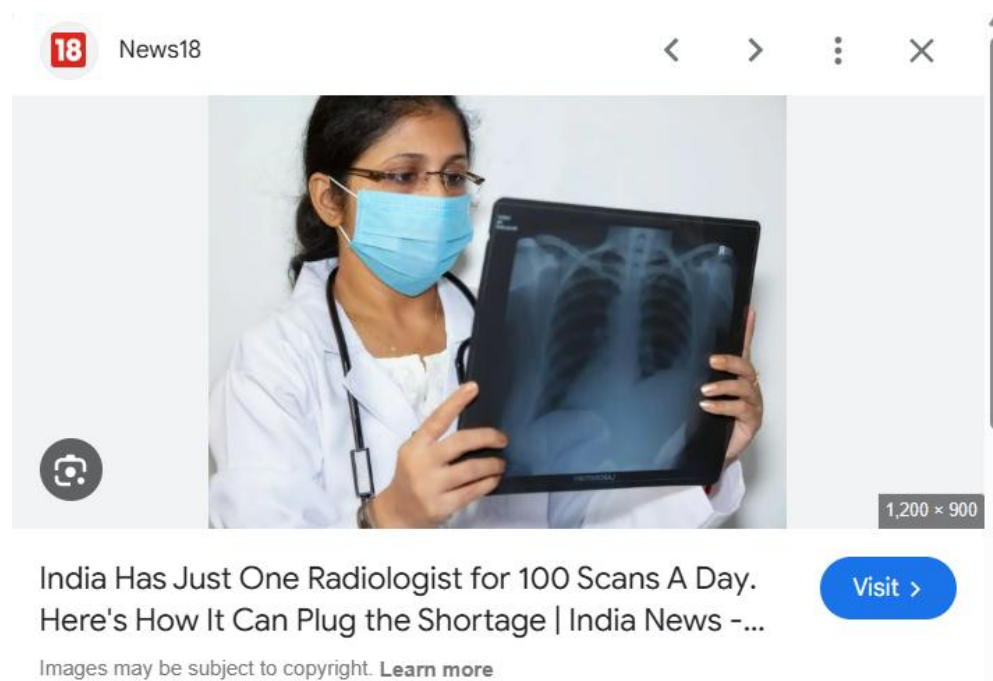
 <b>Marwadi University</b> Marwadi Chandarana Group	NAAC 	<b>Marwadi University</b> <b>Faculty of Engineering and Technology</b> <b>Department of Information and Communication Technology</b>
<b>Subject: Capstone Project (01CT0715)</b>	<b>Ideation and Stakeholder Needs Analysis</b>	
<b>Ideation</b>	<b>Date: 25/09/2025</b>	<b>Enrolment No: 92200133018</b>

## Description



The most important stakeholders are **radiologists, doctors who rely on these reports, patients waiting for results, and trainees learning the process.**

Right now, radiologists have to spend a lot of time **going through hundreds of MRI images, dictating or typing detailed findings, turning those findings into a clear impression, and comparing them with older scans.** This work is often **repetitive, stressful, and time-sensitive,** which can lead to differences in the way reports are written and sometimes even delays in delivering results. Patients and doctors, in turn, depend on these reports for fast and accurate treatment decisions.



To solve these issues, the project explores **creative ICT-based solutions:**

1. **AI-generated draft impressions (BioBART):** Automatically creating a first version of the impression to save time.
2. **AI refinement:** Checking the draft for accuracy, completeness, and consistent medical language.

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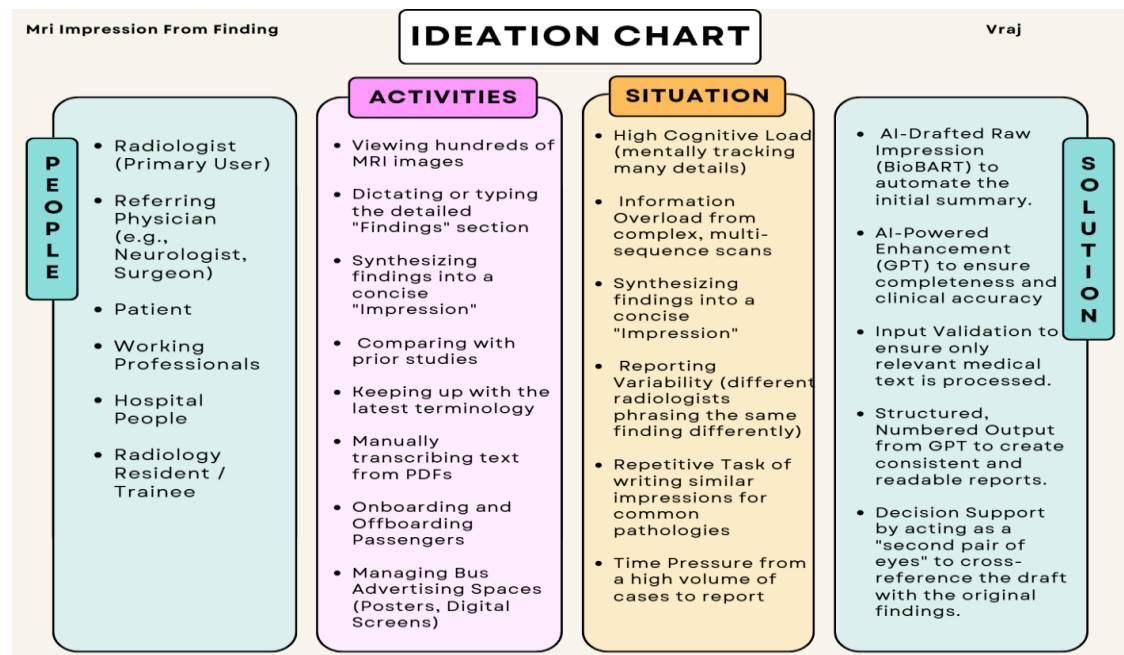
3. **Input filtering and structured output:** Making sure only useful text is processed and producing reports in a clear, numbered format.
4. **Decision support:** Acting like an extra set of eyes for the radiologist, helping cross-check the draft against the original findings.

By focusing on these needs and solutions, the project makes reporting **faster, more reliable, and less stressful for radiologists**, while also improving clarity for doctors and patients. It shows how ICT, especially **AI and NLP technologies**, can bring real improvements to healthcare practice.

## Requirements



### Stakeholder Identification

The project involves several key stakeholders, each with their own needs and challenges:



#### 1. Radiologists (Primary Stakeholders)

- **Needs:** Faster reporting, reduced repetitive work, consistent impressions, and support in handling large case volumes.

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- **Challenges:** High cognitive load from reviewing many images, pressure to deliver reports quickly, and risk of variability in how impressions are phrased.

## 2. Referring Doctors (Neurologists, Surgeons, Physicians)

- **Needs:** Clear, accurate, and standardized impressions that are easy to interpret for making treatment decisions.
- **Challenges:** Delays or inconsistent wording in reports can make decision-making harder and sometimes affect patient care.

## 3. Patients

- **Needs:** Timely and reliable reports so they can begin treatment without unnecessary waiting.
- **Challenges:** Slow turnaround times and variability in reporting styles can lead to confusion and stress for patients and their families.

## 4. Hospital Administration and Staff



- **Needs:** Efficient use of radiologists' time, reduced workload pressure, and improved overall workflow in imaging departments.
- **Challenges:** Managing high case loads with limited staff resources while maintaining quality and accuracy.

## 5. Radiology Trainees / Residents

- **Needs:** Guidance and consistency in report writing, exposure to standardized impressions, and tools that support learning best practices.
- **Challenges:** Inexperience can lead to longer reporting times and inconsistent terminology compared to senior radiologists.

The needs of stakeholders in this project were identified through two approaches:

1. **Direct input from stakeholders** – informal discussions with 2–3 practicing doctors and radiology residents, along with self-observation of clinical workflows.

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2. **Secondary research** – academic studies and professional reports on radiology workload, reporting practices, and AI adoption.



From **first-hand observation** and conversations with doctors, several pain points became clear. Radiologists often work under time pressure, reporting 30–50 scans per day, which leaves little time for detailed impressions.

They also mentioned that drafting the “Impression” is the most cognitively demanding step, since it requires synthesizing multiple findings into one concise summary. Doctors emphasized that while automation could save time, it must be **accurate, transparent, and always allow human oversight**.

Several academic studies confirm the needs we identified for radiologists and related stakeholders.

For example,

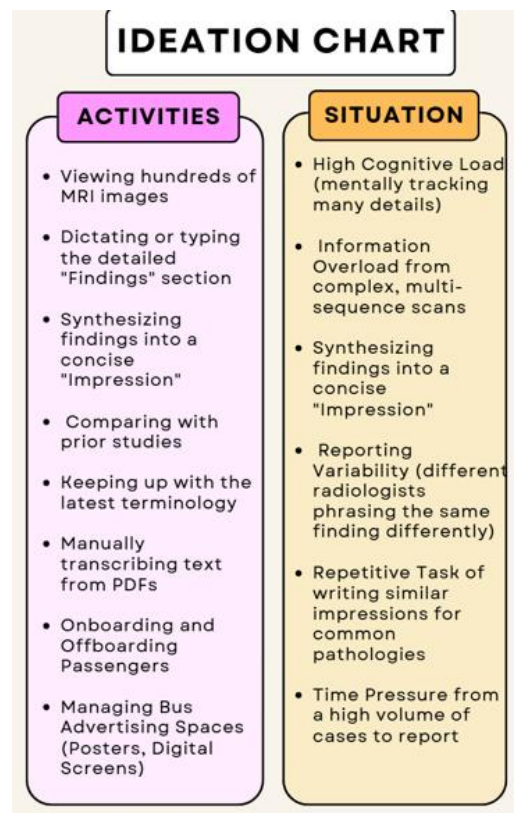
1. *Insights into Imaging* (2021) reports that diagnostic radiologists are facing a sharply increasing workload as more complex imaging and higher volume cases arise — many believe that AI will need to help manage this growth. [SpringerOpen](#)
2. A systematic review of NLP in radiology reports (BMC, 2021) finds that many models can extract structure or summarize, but often lack integration into workflows, pointing to stakeholders’ need for usability and reliability. [BioMed Central](#)
3. In *AJNR* (2024) comparing different summarization models, it was shown that although summarization by AI holds promise, current systems do not yet reach full clinical readiness — stakeholders require high accuracy and trust. [American Journal of Neuroradiology](#)
4. India Has Just One Radiologist for 100 Scans A Day. Here’s How It Can Plug the Shortage <https://www.news18.com/india/india-has-just-one-radiologist-for-100-scans-a-day-heres-how-it-can-plug-the-shortage-8619426.html>

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## Problem Statement



In today's healthcare systems, doctors spend significant time manually analyzing MRI reports to generate clinical impressions. This process is often repetitive, time-consuming, and prone to inconsistencies due to human fatigue or varying levels of expertise.

The lack of an automated support system delays diagnosis, increases workload, and can affect patient outcomes. Therefore, there is a need for an ICT-based solution that can assist radiologists and doctors in generating accurate, consistent, and time-efficient MRI impressions.



## Ideation of Solutions

Based on the needs identified, here are three potential solutions that can address the problem of lengthy and inconsistent MRI impression writing:

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### 1. AI-Drafted Impression Generator (Core Solution)



- Idea:** Use a domain-specific NLP model (e.g., BioBART or ClinicalBERT) trained on radiology text to automatically draft the “Impression” section from the detailed “Findings.” This reduces the time radiologists spend summarizing, lowers cognitive load, and ensures a structured, professional draft. Radiologists can then review and finalize instead of starting from scratch.
- Stakeholder Benefit:** Radiologists save time; doctors receive more consistent impressions; patients benefit from faster reporting.

### 2. AI-Powered Refinement and Consistency Checker

- Idea:** Combine the draft with a second AI (like GPT-based refinement) that checks for completeness, readability, and standard terminology. It can also flag missing critical information. Ensures impressions are not only quick but also consistent and clinically accurate, addressing variability between radiologists.
- Stakeholder Benefit:** Helps radiologists maintain quality and confidence; referring physicians get clearer and more reliable impressions; patients get fewer delays due to unclear reports.

### 3. Interactive Validation and Learning Feedback System

- Idea:** Provide an interface where radiologists can accept, edit, or reject AI-suggested impressions. These edits are then fed back into the system to improve future performance (continuous learning). Keeps human control at the center while making the AI smarter over time. Encourages adoption since radiologists don’t feel replaced, but supported.
- Stakeholder Benefit:** Radiologists retain full authority, hospitals see better adoption of AI, and patients benefit from safer, more reliable reporting.

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Together, these three solutions form a **hybrid decision-support system**:

1. **Draft Generation** (speed)
2. **Refinement & Checking** (accuracy + consistency)
3. **Interactive Feedback Loop** (human control + learning)

This multi-layered approach ensures the solution is **innovative, feasible, and directly meets stakeholder needs**.

## Conclusion:

This project addresses the real-world challenge of manually preparing MRI impressions by radiologists. Using **AI, NLP, and Generative AI**, it aims to generate accurate, consistent, and efficient impressions. The objectives are **smart**, the scope aligns with ICT, and the solution meets market needs while considering ethical standards. Overall, it is a **feasible, innovative, and impactful solution** for improving radiology workflows.