Needs Assessment for Indoor Navigation: Quantitative Insights from Stakeholders in a Tertiary Care Facility

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Introduction

Navigating large healthcare facilities can be challenging for patients, visitors, and even staff.

Poor wayfinding contributes to missed appointments, stress, and reduced operational efficiency.

Indoor navigation systems (digital or physical) are increasingly seen as essential tools to enhance hospital accessibility and patient satisfaction.

This study presents a quantitative needs assessment to understand stakeholder perspectives on indoor navigation at a tertiary care facility.

The goal is to inform the development of an effective, user-centered indoor navigation solution.

Objectives

To identify navigation-related challenges encountered by patients, attendants, and hospital staff.

• To evaluate stakeholder perceptions regarding the usefulness of indoor navigation systems.

• To determine the most desired features and functionalities in BootWay iNaaS from a quantitative perspective.

• To quantify stakeholder readiness for adopting a digital navigation solution in the hospital setting.

Research Questions

1. What are the common navigation difficulties reported by hospital users?

2. What is the perceived usefulness of indoor navigation technology like BootWay iNaaS?

3. Which features are considered most essential by different user groups?

4. What is the level of readiness and openness toward adopting a digital wayfinding system?

Methodology

- **Study Design:** Descriptive cross-sectional study
- **Study Setting:** Tertiary Care Facility
- **Sample Size:** 100 respondents including patients (N=41), attendants (N=30), and hospital staff (N=29)
- **Sampling Technique:** Stratified random sampling
- **Data Collection Tools:** Structured questionnaire (close-ended questions, multiple choice)
- **Inclusion Criteria:**

➢ Age 18 years and above.

➢ Patients, attendants, and hospital staff present during data collection.

➢ Willingness to participate voluntarily.

- **Exclusion Criteria:**

➢ Visitors under 18 years old.

➢ Staff with less than 6 months of experience.

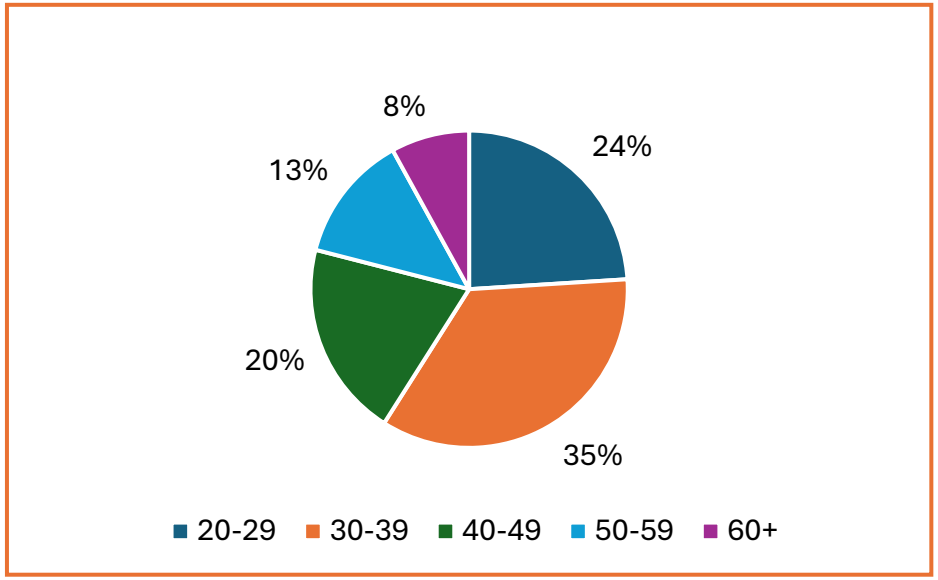
➢ Incomplete or duplicate responses.

- **Data Analysis:** Descriptive statistics (frequencies and percentages), Bar graphs, pie charts, histograms using MS Excel/SPSS

Results

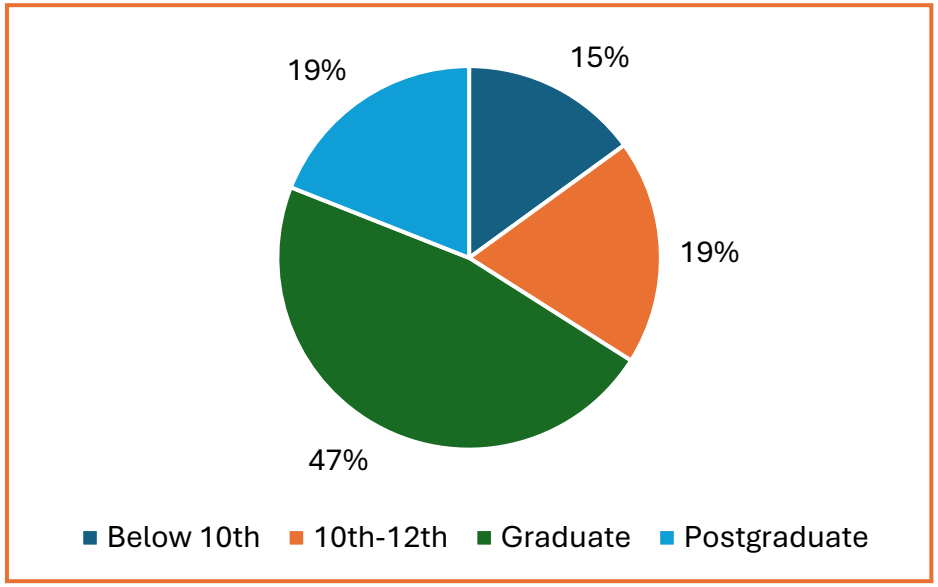
Age Distribution of Hospital Stakeholders (N=100)

- A cumulative 66% (N=55) of the respondents belong to the younger adult age groups (20-39 years), of which 31% (N=26) are in the 20-29 age group and 35% (N=29) are in the 30-39 age group. Approximately 24% (N=20) of the respondents fall in the 40-49 age group, while only 13% (N=11) are in the 50-59 age group, and another 13% (N=11) are in the 60+ age group.



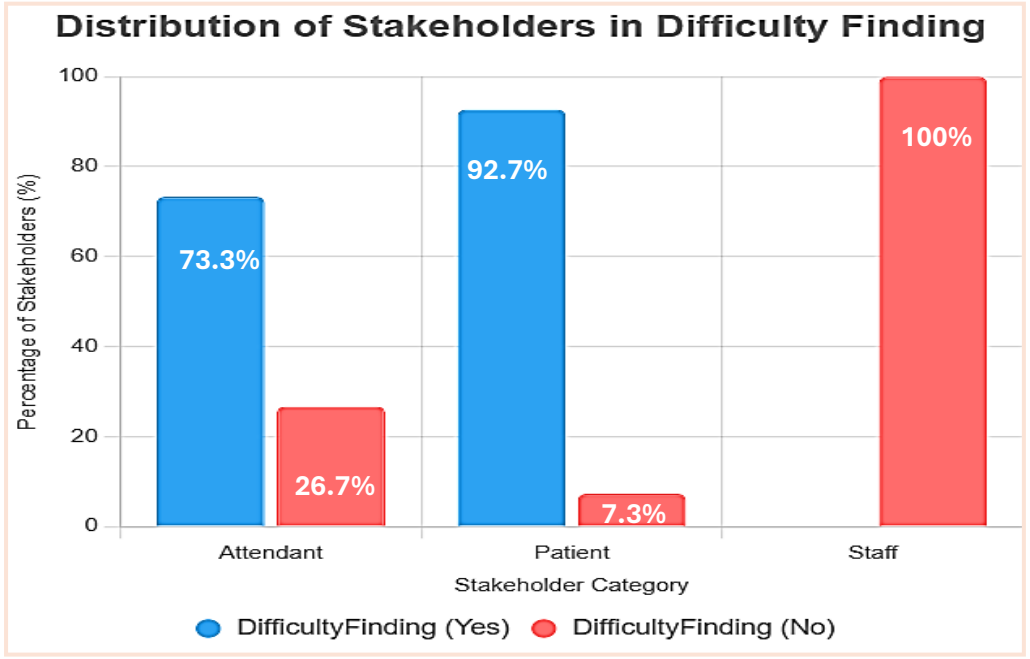
Level of Education Distribution (N=100)

- A total of 66% (N=66) of respondents have higher education, with 47% (N=47) holding a Graduate degree and 19% (N=19) a Postgraduate degree. Meanwhile, 19% (N=19) have a 10th-12th education, and 15% (N=15) have Below 10th education, showing most hospital stakeholders are well-educated.



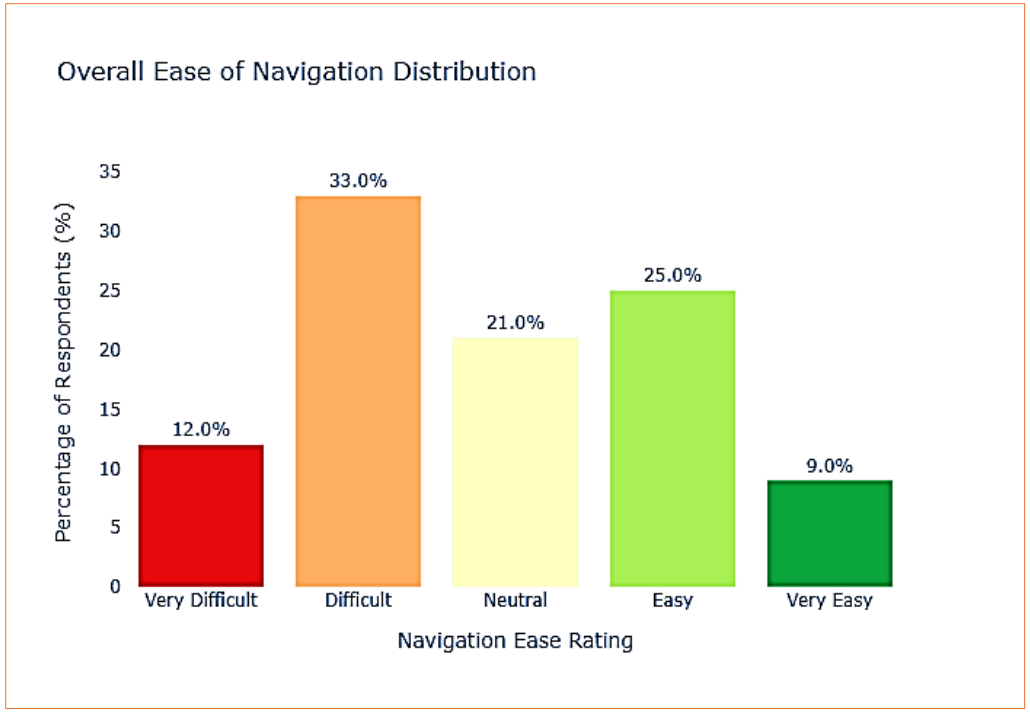
Distribution of Stakeholders in Difficulty Finding (N=100)

- Among stakeholders, 92.7% (N=38) of Patients and 73.3% (N=22) of Attendants reported difficulty finding their way, while 0% (N=0) of Staff faced this issue, highlighting significant navigation challenges for Patients and Attendants



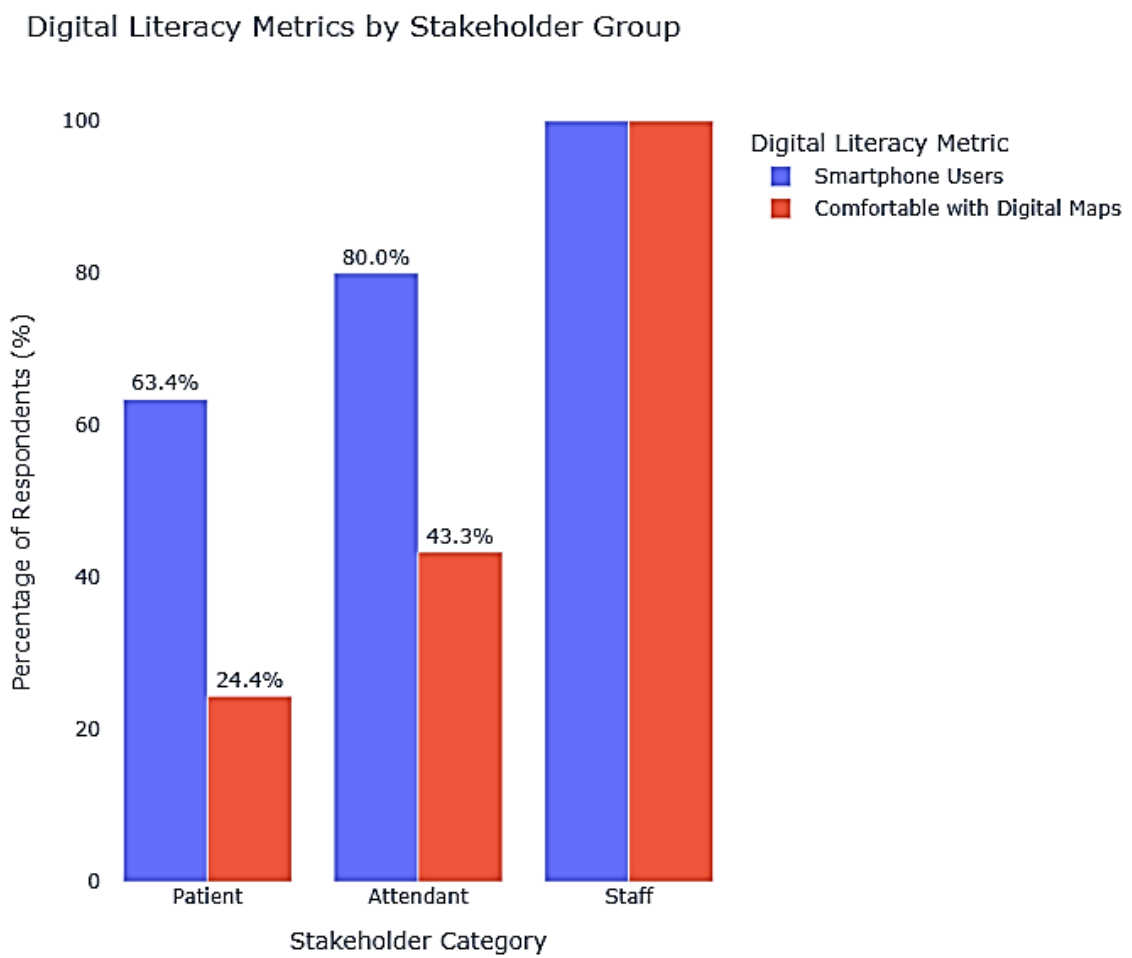
Overall Ease of Navigation Distribution (N=100)

- A total of 45% (N=45) of respondents found navigation challenging, with 33% (N=33) rating it Difficult and 12% (N=12) Very Difficult. Meanwhile, 34% (N=34) found it easy, with 25% (N=25) rating it Easy and 9% (N=9) Very Easy, while 21% (N=21) were neutral, indicating a significant navigation challenge for many stakeholders.



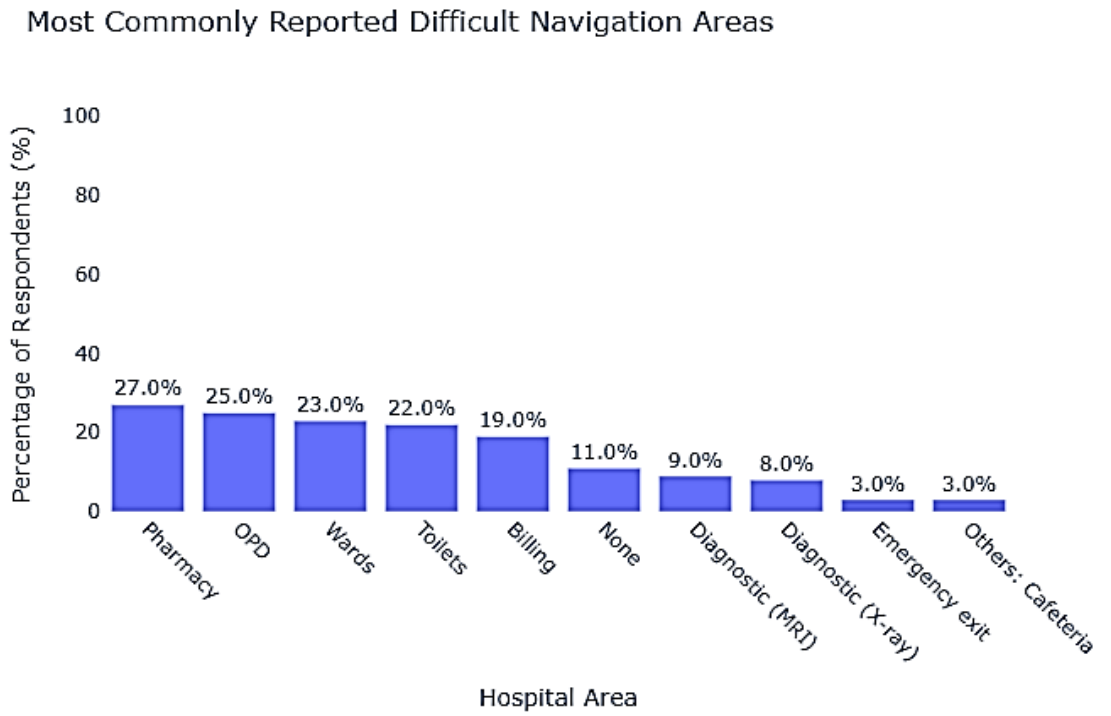
Digital Literacy Metrics by Stakeholder Group

- The chart shows that while most patients (63.4%) and attendants (80%) use smartphones, far fewer are comfortable with digital maps (24.4% and 43.3% respectively). In contrast, all staff (100%) are digitally literate in both areas. This indicates a digital gap among patients and attendants, suggesting the need for training, support, or simplified tools to ensure effective adoption of indoor navigation systems.



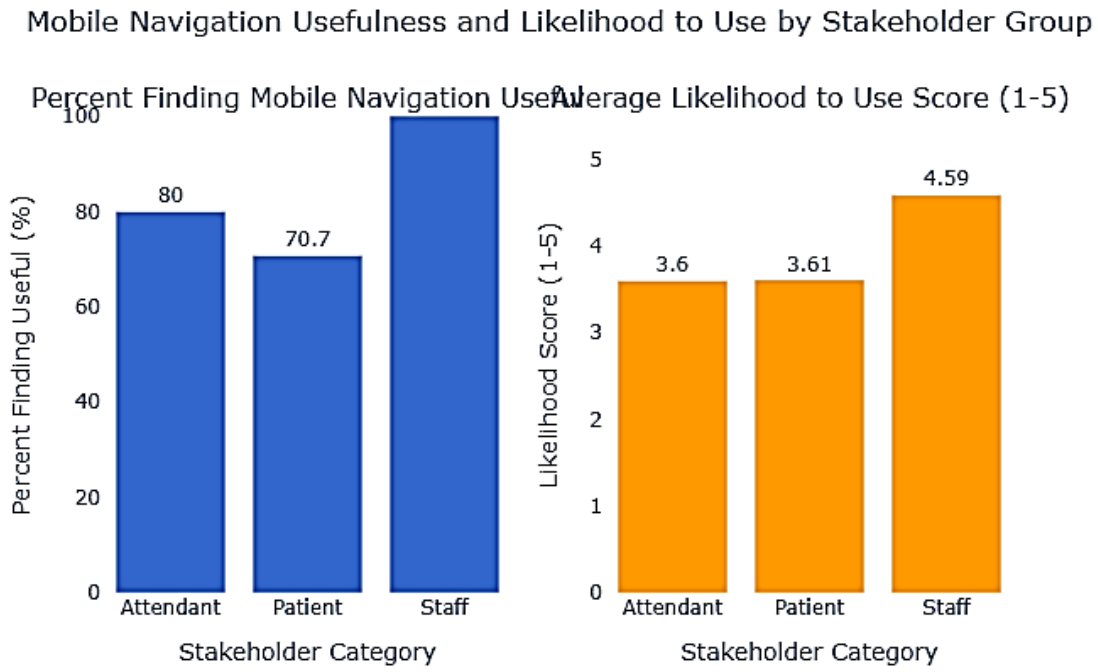
Most Commonly Reported Difficult Navigation Areas

- A total of 89% (N=57) of respondents who faced navigation challenges identified specific hospital areas as difficult, with 27% (N=17) reporting the Pharmacy as the most challenging, followed by 25% (N=16) for the OPD, 23% (N=15) for Wards, and 22% (N=14) for Toilets. Billing was noted by 19% (N=12), while 11% (N=7) reported no specific difficult areas. Diagnostic areas, such as MRI (9%, N=6) and X-ray (8%, N=5), along with Emergency exits (3%, N=2) and the cafeteria (3%, N=2), were less frequently mentioned. This highlights that Pharmacy, OPD, Wards, and Toilets are the primary areas needing improved navigation solutions, such as better signage or digital aids.



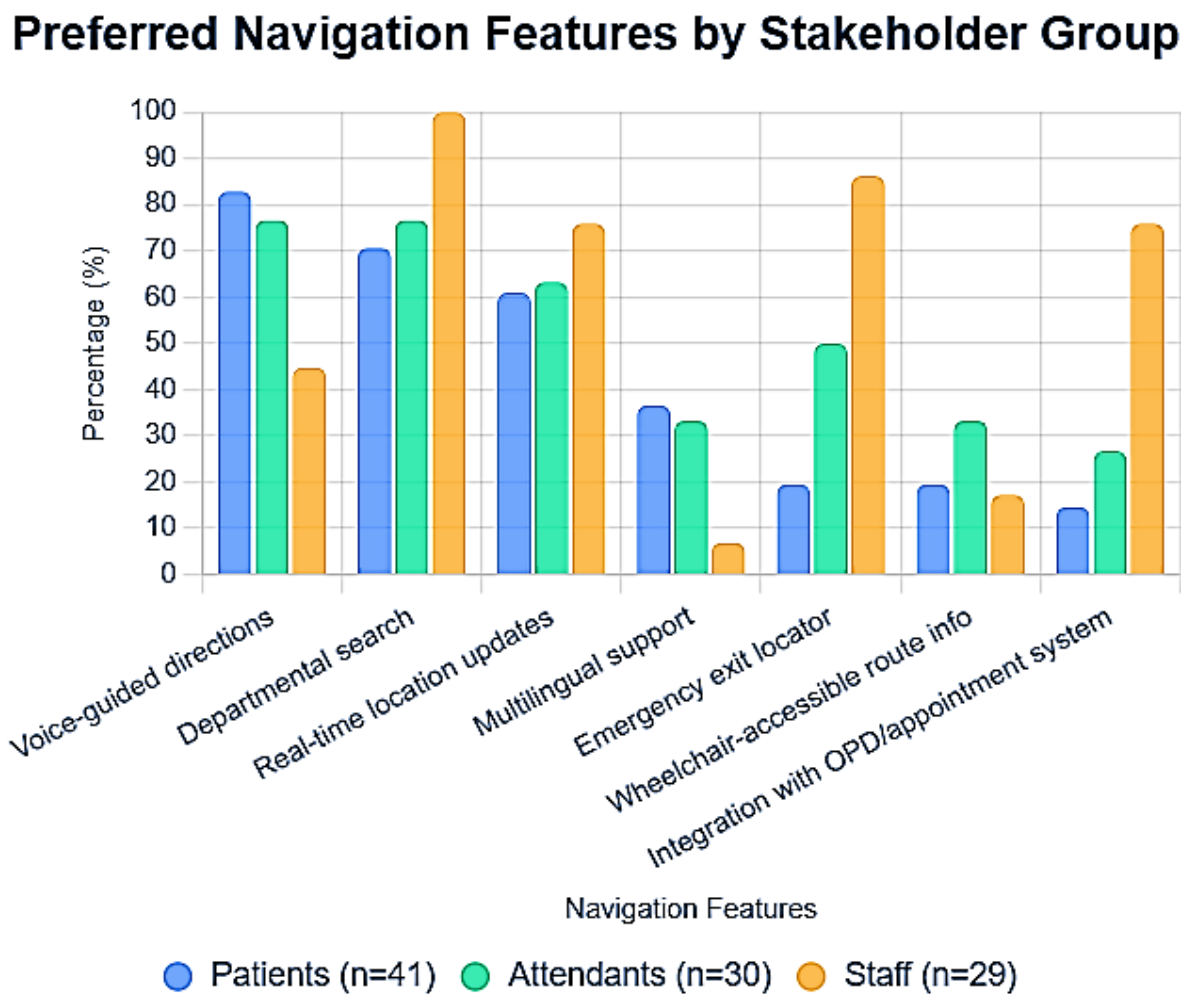
Mobile Navigation Usefulness and Likelihood to Use by Stakeholder Group

- A total of 100% (N=29) of Staff found mobile navigation useful, with a high likelihood to use score of 4.59, showing strong adoption. Attendants had 80% (N=24) finding it useful, with a moderate likelihood score of 3.6, while 70.7% (N=29) of patients found it useful, with a slightly higher likelihood score of 3.61. This indicates mobile navigation tools are most valued by Staff, with Attendants and Patients showing moderate acceptance, suggesting potential for improved usability to increase adoption among non-staff stakeholders



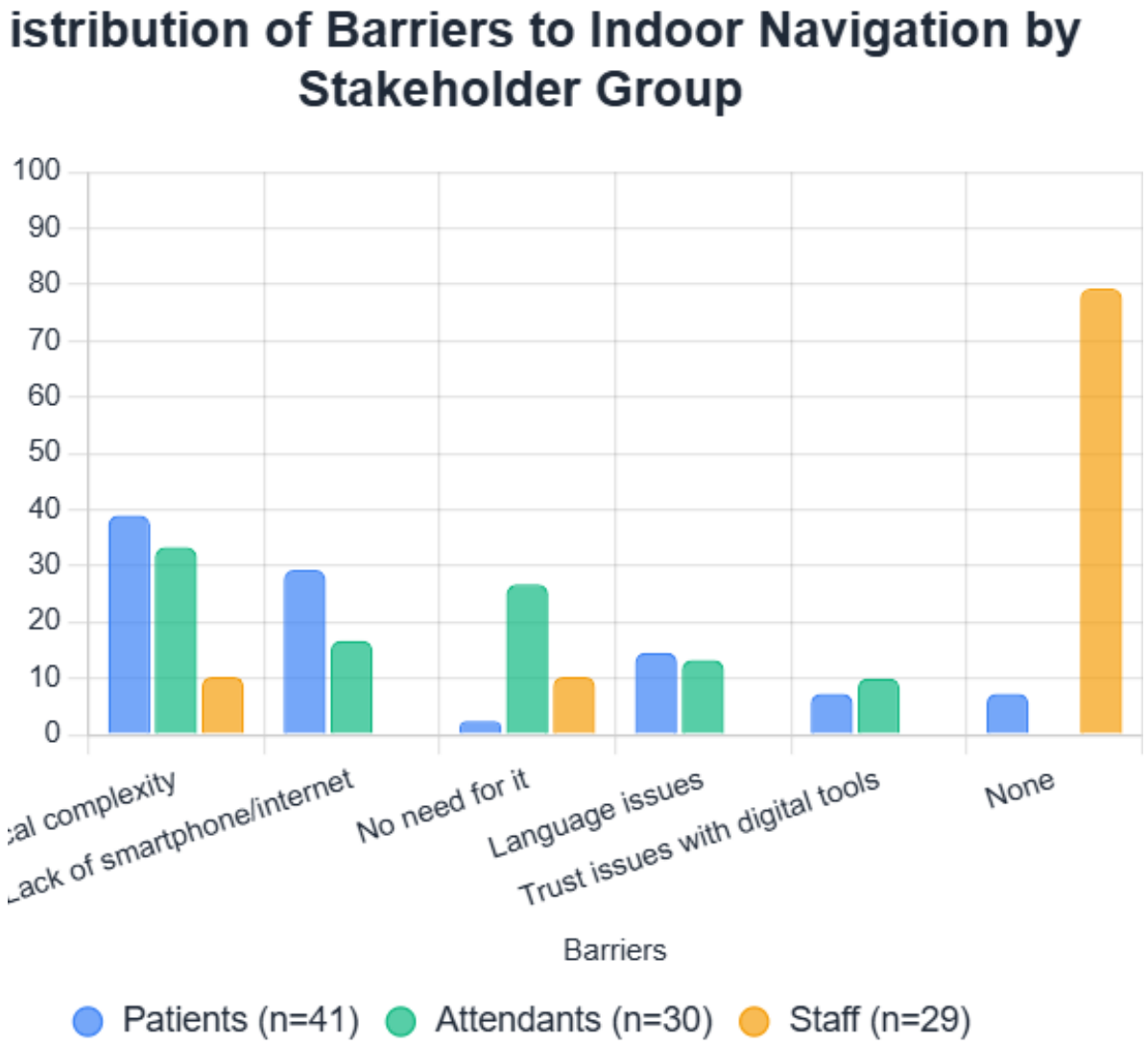
Preferred Navigation Features by Stakeholder Group

- **Key Findings**
  - **Voice-guided Directions**: Highly preferred by patients (82.9%) and Attendants (76.7%), less by Staff (44.8%), indicating non-staff need intuitive guidance.
  - **Departmental Search**: Universal for Staff (100%), high for Attendants (76.7%) and Patients (70.7%), showing broad demand.
  - **Real-time Location Updates**: Popular across Staff (75.9%), Attendants (63.3%), and Patients (61.0%), useful for dynamic navigation.
  - **Multilingual Support**: Moderate for Patients (36.6%) and Attendants (33.3%), low for Staff (6.9%), reflecting language barriers for non-staff.
  - **Emergency Exit Locator**: Critical for Staff (86.2%), moderate for Attendants (50.0%), low for patients (19.5%), highlighting staff's safety focus.
  - **Wheelchair-accessible Route Info**: Moderate for Attendants (33.3%), lower for patients (19.5%) and Staff (17.2%), indicating accessibility needs.
  - **OPD/Appointment Integration**: High for Staff (75.9%), less for Attendants (26.7%) and Patients (14.6%), showing staff's efficiency needs.



Distribution of Barriers to Indoor Navigation Implementation by Stakeholder Group

- **Key Findings**
  - **Technical Complexity:** Most significant for patients (39.0%) and Attendants (33.3%), less for Staff (10.3%), indicating non-staff struggle with digital navigation tools.
  - **Lack of Smartphone/Internet:** Notable for Patients (29.3%) and Attendants (16.7%), absent for Staff (0.0%), reflecting Staff's universal smartphone access (100% per dataset).
  - **No Need for It:** Highest among Attendants (26.7%), low for patients (2.4%) and Staff (10.3%), suggesting some Attendants see navigation tools as unnecessary.
  - **Language Issues**: Moderate for Patients (14.6%) and Attendants (13.3%), absent for Staff (0.0%), highlighting language barriers for non-staff.
  - **Trust Issues with Digital Tools:** Low for Patients (7.3%) and Attendants (10.0%), absent for Staff (0.0%), showing minor distrust among non-staff.
  - **None:** Dominant for Staff (79.3%), low for patients (7.3%), and absent for Attendants (0.0%), indicating Staff face fewer barriers due to familiarity and digital comfort.



Discussion

Navigation Challenges

- **Patients (92.7%)** and **attendants (73.3%)** struggle with hospital navigation; staff report no issues.
- **Problem areas:** pharmacy, OPD, wards, toilets, billing counters.
- **Literature**: Sahoo et al. (2024) noted 98% of visitors needed staff help despite signage; Kalyan et al. (2024) found signage insufficient for first-time patients.
- **Implication**: Digital tools like BootWay iNaaS can reduce spatial confusion and staff workload (Anagnostopoulos et al., 2017).

Digital Literacy

- **Smartphone use**: Patients (63%), attendants (80%), staff (100%).
- **Digital map comfort**: Patients (24%), attendants (43%), staff (100%).
- **Literature**: Ženka et al. (2021a, 2021b) link digital acceptance to education and age.
- **Implication**: Simplify onboarding with kiosks, intuitive interfaces, and multilingual support.

Perception of BootWay iNaaS

- **Usefulness**: Staff (100%, 4.59/5), patients (70.7%), attendants (80%).
- **Adoption scores**: Patients/attendants (~3.6/5).
- **Literature**: Wichmann & Leyer (2021) tie adoption to positive attitudes and norms.
- **Implication**: Strong demand for user-friendly digital navigation tools.

Preferred Features

- **Patients/Attendants**: Voice-guided directions, department search, real-time updates, multilingual support (36.6% of patients).
- **Staff**: Department search (100%), OPD/appointment integration (75.9%).
- **Literature**: Gupta et al. (2024) and Brodt et al. (2025) emphasize personalized, real-time solutions.
- **Implication**: Modular design to cater to diverse stakeholder needs.

Barriers to Adoption

- **Patients/Attendants**: Technical complexity (39%, 33%), lack of smartphones/internet (29.3%, 16.7%), language/trust issues (14–10%).
- **Staff**: 79.3% report no barriers.
- **Literature**: Wichmann (2022) and Ženka et al. (2021b) highlight UI simplicity and trust as key.
- **Implication**: Focus on training, offline modes, and low-literacy support.

Recommendations

Technology Providers (Bootway iNaas)

- **Simple Design**: Intuitive, inclusive UI for low-literacy and elderly.
- **Guidance**: Voice and visual turn-by-turn directions.
- **Offline Access**: Basic maps without high-speed internet.
- **Custom Modes**: Tailored features for patients, staff, attendants.
- **Analytics**: Dashboard for usage and satisfaction metrics.

Hospitals

- **Adopt Systems**: Use BootWay iNaaS to cut delays, improve satisfaction, and boost efficiency.
- **Multilingual Kiosks**: Install touchscreens at entries and junctions.
- **Staff Training**: Train receptionists and attendants to assist users.
- **Physical Signage**: Complement digital tools with clear signs.
- **OPD Integration**: Sync with hospital systems for real-time data.

Policy & Administration

- **NABH/NHM Inclusion**: Recognize navigation in accreditation.
- **Subsidies**: Fund wayfinding for public hospitals.
- **Standards**: Set UI/UX, multilingual, and privacy benchmarks.
- **ABDM Integration**: Align with Ayushman Bharat Digital Mission.

Conclusion

- Assessed navigation challenges and digital readiness among patients, attendants, and staff in tertiary care hospitals.
- Majority of patients and attendants face significant difficulties locating key areas like pharmacy, OPD, wards, and toilets.
- High smartphone use, but a digital confidence gap exists—especially among older patients.
- All stakeholder groups view BootWay iNaaS positively; staff show the highest likelihood of adoption.
- Users prefer intuitive features: voice guidance, real-time search, and multilingual support.
- Key barriers: technical complexity, limited internet, and language issues—mainly for non-staff users.
- Study highlights the need for an inclusive indoor navigation system to enhance patient experience and hospital efficiency.

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Thank you!