A STRATEGIC EVALUATION MODEL FOR DIGITAL HEALTH ADOPTION: CONSTRUCTING A PURCHASING POWER INDEX FOR INDOOR NAVIGATION IN INDIAN HOSPITALS

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by

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Under the Supervision and Guidance of

Dr. Tripti Bisawa

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BOOTWAY INAAS PRIVATE LIMITED

JAGATPURA, JAIPUR (302017)

CIN - U63999RJ2024PTC097270

BootWay

CERTIFICATE

This is to certify that **Mr. Khushal Sharma**, has successfully completed his internship at **BootWay iNaaS Pvt. Ltd.** The internship was undertaken during the period from **10th March to 7th June 2025**. During this time, Mr. Sharma demonstrated a sincere commitment to his responsibilities and contributed meaningfully to the organization's ongoing projects.

We acknowledge his efforts in market research and wish him success in all his future professional endeavors.

Bharat

Bharat Agrawal

Director

15/6/2025

BOOTWAY INAAS PVT. LTD.

IIHMR UNIVERSITY

CERTIFICATE

This is to certify that dissertation titled "**A Strategic Evaluation Model For Digital Health Adoption: Constructing A Purchasing Power Index for Indoor Navigation in Indian Hospitals"** is a record of the research work undertaken by **Mr. Khushal Sharma** in partial fulfilment of the requirements for the award of the degree of MBA Hospital and Health Management from the IIHMR University, Jaipur under my guidance and supervision and her approach to the research study has been sincere, scientific, and analytical.

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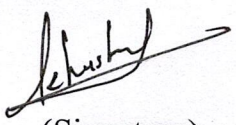
DECLARATION BY STUDENT

I hereby declare that this dissertation titled **"A Strategic Evaluation Model for Digital Health Adoption: Constructing a Purchasing Power Index for Indoor Navigation in Indian Hospitals"** is the Bonafide record of my original research work. I declare that it has not been submitted to any other university or institution for the award of any degree or diploma. Information derived from the published or unpublished work of others has been duly acknowledged in the text.



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ABSTRACT

Background: In recent years, Indian hospitals have increasingly recognised the value of digital transformation beyond just clinical services. With growing hospital footfalls and complex infrastructure, the need for non-clinical digital solutions, such as indoor navigation systems, has gained prominence. This study aimed to assess which hospitals across India are financially and structurally ready to adopt such technologies by developing a Purchasing Power Index (PPI). The research was undertaken in partnership with BOOTWAY, a healthcare technology startup focused on indoor navigation.

Objective: The primary objective of the study was to create a reliable PPI model that captured both the financial and structural capacity of hospitals to adopt indoor navigation systems. The goal was to identify high-opportunity hospital segments for BOOTWAY and other non-clinical health tech startups, while also informing policy-level discussions on digital innovation in healthcare.

Methodology: A sample of 100 hospitals was selected across nine Indian states, Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Delhi, Punjab, Rajasthan, Tamil Nadu, and Uttar Pradesh, representing three ownership categories: government, private, and private chains. Data was collected on parameters including bed capacity, digital investment status, empanelment (CGHS and PMJAY), accreditations, capital expenditure, revenue, and participation in the Smart City Mission. A composite PPI score was then calculated for each hospital. The study involved descriptive statistics, comparative analysis across categories, correlation analysis, and a geographical assessment of PPI adoption levels.

Results/Findings: Private chain hospitals recorded the highest average revenue (₹301.61 Cr) and capital expenditure (₹16.77 Cr), with a corresponding high average PPI score (7.27). Government hospitals, despite lacking revenue and CapEx disclosure, achieved the highest PPI score (8.72) due to their high structural readiness—large bed capacity, digital investment, and empanelment under national schemes. Geographical analysis revealed that Delhi (8.9), Tamil Nadu (7.81), and Karnataka (7.13) had the highest state-wise average PPI scores. A strong positive correlation was observed between revenue and CapEx ($r = 0.98$), and a moderate correlation existed between both these factors and the PPI score ($r \approx 0.45$).

The hypothesis tested stated that hospitals with higher revenue tend to invest more in digital systems. The findings supported the alternative hypothesis. While 99% of hospitals had already

made some form of digital investment, those with higher revenue demonstrated greater depth and quality in those investments, further reflected in higher PPI scores.

Conclusions: The study concluded that while financial strength contributes to higher digital adoption, structural factors such as bed size, empanelment, and government participation schemes also significantly influence readiness. Government hospitals, despite financial data gaps, displayed high adoption potential. For BOOTWAY and similar startups, targeting private chains and government hospitals in high-PPI states offers the best market entry strategy.

Keywords: Purchasing Power Index, Smart Hospitals, Digital Health Adoption, Indoor Navigation, HealthTech Innovation

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Abbreviation	Full Form
INS	Indoor Navigation System
PPI	Purchasing Power Index
CapEx	Capital Expenditure
B2B	Business-to-Business
PMJAY	Pradhan Mantri Jan Arogya Yojana
CGHS	Central Government Health Scheme
IPS	Indoor Positioning System
BLE	Bluetooth Low Energy
RFID	Radio Frequency Identification
UWB	Ultra-Wideband
IT	Information Technology
EHR	Electronic Health Record
PPI	Purchasing Power Index
TAM	Technology Acceptance Model
UTAUT	Unified Theory of Acceptance and Use of Technology
READHY	Readiness and Enablement Index for Health Technology
NABH	National Accreditation Board for Hospitals & Healthcare Providers
NABL	National Accreditation Board for Testing and Calibration Laboratories
JCI	Joint Commission International
PMJAY	Pradhan Mantri Jan Arogya Yojana
CGHS	Central Government Health Scheme
CapEx	Capital Expenditure
HIS	Hospital Information System
IoT	Internet of Things
H_0	Null Hypothesis
H_1	Alternative Hypothesis
HIS	Health Information System
NDHM	National Digital Health Mission
ABDM	Ayushman Bharat Digital Mission
PPP	Public Private Partnership
SaaS	Software as Service
KPIs	Key Performance Indicators

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Chapter 1: Introduction

1.1 Background and Context

India's health sector is undergoing digital transformation owing to rising patient expectations, government advances, and technological advancements. Where previously, hospitals only had to concern themselves with successful clinical outcomes, they've transformed into entities that must now operate successfully and focus on patient experience across the board. Thus, one of the new penetration options emerging in the field is Indoor Navigation Systems (INS). An INS is a system that facilitates wayfinding for patients and visitors of the hospital within complicated and vast hospital campuses, reducing confusion and wait time and reducing administrative duties at the front desk. Thus, INS can also facilitate better hospital operations with staff wayfinding, asset tracking, and general operational integration.

Yet, INS are not commonplace in India. Compared to the rest of the world, and much more digitally progressed medical facilities, one would think that such a relatively low penetration would not be true. Low penetration is due to a variety of factors, however, ranging from no awareness to no sensitivity to high pricing to lack of infrastructure. Therefore, this is where Bootway comes into play. Bootway is a technology startup looking to establish a concrete indoor navigation system based on the navigation requirements of Indian hospitals. Therefore, as part of its go-to-market strategy, Bootway is conducting a thorough evaluation to find out which hospitals can financially and strategically support the implementation of such systems.

Toward this purpose, this dissertation presents a new model - “Purchasing Power Index (PPI)” for hospitals to assess readiness to adopt INS. The index is based on information from 100 hospitals in India spanning nine states — Maharashtra, Karnataka, Tamil Nadu, Rajasthan, Uttar Pradesh, Madhya Pradesh, Gujarat, Delhi and Punjab. The hospitals studied represent a diverse mix of ownership types, including government, private, and private chains. Each hospital was evaluated based on multiple parameters such as bed capacity, annual revenue, capital expenditure (CapEx), accreditation status, empanelment under government schemes, digital and technology investment, and participation in Smart City initiatives.

1.2 Problem Statement

The Problem For Bootway, and, indeed, the entire ecosystem of healthcare technology companies, is figuring out which hospitals are going to be most interested in adopting

innovative solutions like INS. There is an increasing interest in digitalisation, but the reality of preparedness and the potential to invest in these systems differ greatly. If there is no systematic method to assess readiness to buy, these marketing attempts could lead to a waste of time and resources if potential leads lack the budget or strategic fit to justify INS intervention by the company.

This study contributes to filling this gap by proposing a multidimensional PPI framework. The framework does not just look at a hospital's financial strength, but also how strategically positioned it is to be part of the digital transformation, which could even be reflected in measures like accreditation and empanelment and participation in smart city projects. Through this composite index of variables, the study intends to provide actionable intelligence for hospital segmentation for B2B marketing, product-market fit evaluation, and strategic partnerships.

1.3 Purpose of the Study

This study aims to propose a data-driven model to measure the buying readiness of Indian hospitals for IN Systems with a new Purchasing Power Index (PPI). The research aims to measure the influence of determinants ascribed to institutions in wireless investment decisions and adoption. Through review of the data in a random sample of 100 hospitals, the study aims to:

- Create a composite index to represent purchasing readiness.
- Identify high-potential states and hospital types for INS adoption.
- Segment hospitals into actionable categories for targeted B2B strategies.
- Support Bootway and similar firms in making informed go-to-market decisions.

1.4 Significance of the Study

This study holds practical and strategic significance in several ways:

1. **For Bootway**, it provides a powerful decision support for customer targeting and acquisition tactics. Since the startup hasn't found its earliest customers yet, having this data-driven approach to reduce business risk and boost chances of success is super important.

2. **For the Healthcare Sector**: It provides an overview of the digital preparedness in Indian hospitals, enabling policymakers and healthcare management personnel to determine the areas in which investment in digital healthcare infrastructure is most required.
3. **For the Academic Community**: It adds to the small literature on digital transformation readiness in Indian healthcare and, more particularly, on the indoor navigation technologies.
4. **For Future Entrepreneurs**: It's a new way of as composite indices that could be utilised to comprehend B2B technology adoption potential in laggard low-tech sectors such as leather too.

1.5 Research Objectives

The research aims to achieve the following objectives:

1. Develop a Purchasing Power Index (PPI) scoring model for evaluating hospital readiness for INS adoption.
2. Analyse how bed strength, revenue, and accreditation status influence the PPI score.
3. Assess how government empanelment (PMJAY, CGHS) and smart city participation correlate with INS readiness.
4. Segment hospitals into high, medium, and low PPI categories for targeted B2B marketing.
5. Evaluate state-wise variation in PPI scores across Indian hospitals.
6. Identify correlations among revenue, CapEx, and other strategic indicators that influence INS adoption.

1.6 Research Questions

To achieve these objectives, the following research questions are posed:

1. How do accreditation status and government empanelment correlate with INS adoption potential?
2. What is the state-wise variation in PPI scores across Indian hospitals?
3. How do factors like bed capacity, annual revenue, and CapEx influence a hospital's PPI?
4. Can hospitals be effectively segmented into adoption tiers for strategic marketing?

5. What is the relationship between strategic factors (smart city participation, digital investment) and PPI?

1.7 Hypothesis: Relationship Between Revenue and Digital Investment

- **Null Hypothesis (H_0):** There is no significant relationship between a hospital's annual revenue and its digital investment.
- **Alternative Hypothesis (H_1):** Hospitals with higher annual revenue tend to have higher digital investment.

Chapter 2: Literature Review

1. The Navigation Challenge in Indian Hospitals

Indian hospitals, especially those at the tertiary level, can have complex departmental set-ups and large physical areas of operation. This spatial complexity is difficult for patients and their attendants to navigate without assistance while trying to locate a consultation room, diagnostic lab, ward, or billing counter. Hassle, missed appointments, delays, and possibly even bad health could result from the resulting confusion. Hospital managements are coming to understand that the ability to navigate is more than an operational necessity and is related to patient happiness as well as clinical efficiency, both of which will come into sharper focus in India as its healthcare system continues to focus more on patients — and their families — than it has in the past (Gupta, 2023). Consequently, there is increasing interest in applying Indoor Navigation Systems (INS), which consist of real-time digital mapping interfaces that assist visitors in navigating through extensive and often disorienting healthcare campuses.

2. Technological Backbone of Indoor Navigation Systems

INS relies on a sophisticated network of digital technologies, popularly known as Indoor Positioning Systems (IPS). Some of these include Bluetooth Low Energy (BLE) beacons, Wi-Fi triangulation, RFID tags, and Ultra-Wideband (UWB) sensors, among others. These technologies allow for real-time indoor positioning that cannot be offered by GPS technology alone due to signal limitations. A meta-analysis of 38 global case studies revealed BLE and Wi-Fi as the most prevalent IPS solutions applied in healthcare due to their affordability, energy efficiency, and simplicity of integration on existing hospital IT networks. The success of BLE and Wi-Fi implementation, however, relies not only on technology readiness but institutional readiness, such as the availability of strong IT infrastructure, maintenance support, and trained technical personnel. In the Indian context, such readiness is extremely heterogeneous in terms of types of hospitals, ownership patterns, and geographies, necessitating a formal process to establish feasibility before INS implementation.

3. Financial and Structural Barriers to INS Adoption in India

Despite the technological feasibility and increasing awareness, the adoption of INS in Indian hospitals remains limited. Financial constraints are frequently identified as a significant barrier. A qualitative study involving 20 healthcare IT administrators in India revealed key challenges, including restricted IT budgets, competing infrastructural priorities, fragmented decision-

making processes, and a general reluctance to embrace non-clinical technologies. Most hospitals typically allocate their investments towards core systems such as billing, diagnostics, or Electronic Health Records (EHR), while tools that improve user experience, like navigation, are often deprioritized. Furthermore, budget planning in numerous Indian hospitals fails to consider ongoing IT expenses, including software licenses, server maintenance, or hardware upgrades. These structural and financial challenges underscore the necessity for a metric, such as the Purchasing Power Index (PPI), that can systematically assess a hospital's ability to invest in such technologies.

4. Patient Readiness and Behavioural Adoption of Digital Tools

The ultimate implementation on the user side is rather determined by the behaviour of end-users. Several studies have been conducted to understand how patients interact with digital health tools by employing frameworks such as TAM and UTAUT. These frameworks focus on perceived usefulness, ease of use, and institutional support as pivotal parameters promoting the overcoming of resistance to digital technology.

Of course, further aspects are always coming to the fore. Data protection and cybersecurity were never the main concerns expressed by the targeted user.

It is thus suggested that much more power is in the design of a patient-centred project, onboarding experience, and institutional support than in the reassurance of any form of technical fear.

For INS to flourish, health centres have to find ways to ensure that patients are not only taught but also actively encouraged to use the systems via possibilities such as clear signage and staff assistance as well as vocal endorsements.

Therefore, any institutional readiness framework such as the PPI should address behavioural and operational elements that influence usage apart from the technical side of implementing it.

5. Global Insights: Tech Investments Beyond India

International comparisons offer a big picture for comprehending the factors that foster or inhibit technological innovation within hospitals.

A cross-national analysis, involving hospitals from Germany, India, Thailand, South Korea, and the United States, reveals that institutional investment in digital infrastructure depends on a variety of factors, even including affordability.

Namely, technology acceptance culture, the fit with national health policies, regulatory requirements, and the maturity of healthcare systems, among others.

For instance, in South Korea and Germany, government subsidies and strict digital health regulations have fast-tracked the adoption of technology, whereas in India, with its largely privatised and fragmented healthcare sector, there is hardly any policy support available for that purpose.

Therefore, it indicates that ownership (public versus private), government empanelment, and alignment with national digital strategies are crucial indicators of readiness that need to be reflected in the Purchasing Power Index in order to simulate actual conditions better.

6. Structural Divide in Indian Healthcare

There exists in India a significant structural divergence between public and private healthcare systems. Private institutions dominate the urban market and often boast better infrastructure, while public hospitals remain crowded with a shortage of financial support. Jarosławski and Saberwal (2014) found that funding models and operational continuity hamper many digital health initiatives in India. Even where a system is put in place, the system rarely scales up either due to poor integration, lack of skilled personnel, or resistance from users. Samuel (2020) went on to add that private hospitals having financial independence tend to be left out of national e-health initiatives, partly due to inadequate regulation. Thereby, accentuating the need for a composite metric that looks beyond mere infrastructure to include economic and cultural capacity of hospitals to implement systems like INS.

7. Extending Digital Readiness Models to Institutions

Although numerous digital readiness models exist, the vast majority are individual-level oriented. Measures such as the READHY (Readiness and Enablement Index for Health Technology) assess individual-level digital literacy, emotional readiness, and support infrastructure instituted to enable the uptake of digital technology. Although the READHY model is individual-oriented, it represents core principles that can be extrapolated to the institutional setting. Organizational culture, for instance, as well as the openness of the administration to change and internal training initiatives, serve as organizational surrogates for individual-level readiness measures. Application of such models within the hospital setting would allow for a more sophisticated understanding of readiness, one that would extend beyond money or equipment to encompass culture, training, and systemic support dimensions. A Purchasing Power Index, therefore, with such extended criteria would yield a more realistic readiness estimate for INS adoption.

8. Research Gaps and Justification for the Purchasing Power Index (PPI)

The literature captures gaps in both understanding and practice. For instance, there is no systematic hospital preparedness INS evaluative tool concerning financial readiness. While maturity models of digital infrastructure do exist, they focus on overarching infrastructure and do not consider specific use cases such as navigation systems.

Furthermore, there is a tendency to focus on either the technology and systems employed by the hospital or the patients' actions, ignoring the strategic and economic competencies of the hospital to allocate resources to peripheral systems. Lastly, widely adopted models such as TAM, UTAUT, and READHY are useful, but designed for institutional application and not for evaluation of particular hospital-centric factors like governance structure, IT budget, or accreditation level.

Indian hospitals suffer from a severe lack of quantitative methodologies to strategically prioritize investments in digital technologies, resulting in arbitrary decisions that undermine long-term expansion and sustainability.

The suggested Purchasing Power Index (PPI) aims to fill these voids by developing a multi-faceted tool that integrates financial, structural, and cultural metrics. It will evaluate elements such as annual hospital revenue, IT capital expenditures, ownership type, government empanelment, accreditation status, and receptiveness to digital innovation. In doing so, it will empower stakeholders—from hospital administrators to policymakers—to make informed, data-driven choices regarding the most effective implementation of INS.

Conclusion

This review has emphasised the complex nature of digital readiness of Indian healthcare organisations, especially in the context of Indoor Navigation Systems. Several factors, varying from technological enablers to patient habits and organisational constraints, have a material influence on the implement ability and success of these initiatives. But the absence of a widely accepted, actionable framework for assessing purchasing readiness is a significant limitation. The Purchasing Power Index (PPI) proposed in this study tries to bridge this gap by providing a practical, context-sensitive tool that facilitates the systematic and scalable roll-out of INS. The tool not only enables hospitals to monitor their own performance but also informs policy at a higher level by reporting where targeted investment and support are most needed.

Chapter 3: Methodology

This chapter outlines the detailed methodological framework used to conduct the study on developing a Purchasing Power Index (PPI) to assess the readiness of Indian hospitals for adopting Indoor Navigation Systems (INS). This research is descriptive in nature and relies exclusively on secondary data collected from publicly available sources. The purpose of the methodology is to ensure a robust, replicable approach that aligns with the research objectives and supports accurate insights for strategic decision-making by BOOTWAY.

3.1 Research Design

The study follows a **descriptive research design** aimed at systematically measuring, analyzing, and interpreting quantitative data from a wide range of Indian hospitals. This type of design is most suitable for answering the primary research questions:

1. How do accreditation status and government empanelment correlate with INS adoption potential?
2. What is the state-wise variation in PPI scores across Indian hospitals?

The choice of descriptive design is justified because it enables the researcher to compute summary statistics, explore relationships, and identify trends within and across hospital types, ownership patterns, and geographies.

3.2 Nature and Source of Data

The study is entirely based on **secondary data** gathered from publicly available sources. All 100 hospitals included in the sample were selected randomly across nine major Indian states: Maharashtra, Karnataka, Tamil Nadu, Rajasthan, Uttar Pradesh, Madhya Pradesh, Gujarat, Delhi, and Punjab. These hospitals represent a diverse mix of **government, private, and private chain hospitals**, ensuring that the sample captures the full spectrum of infrastructure readiness and financial capacity in the Indian healthcare system.

The dataset comprises both **quantitative** and **categorical** variables across 23 fields. To construct a comprehensive Purchasing Power Index, the selected variables were categorized into two major domains:

a) Structural Indicators:

These represent the hospital's existing infrastructural readiness and strategic alignment with digital transformation. They include:

- **Bed Capacity**
- **Ownership Type** (Government, Private, Chain)
- **Accreditation Status** (NABH/NABL/JCI or none)
- **Government Empanelment** (PMJAY and CGHS)
- **Smart City Participation**
- **Digital and Technological Investment**

These parameters were chosen because they reflect the hospital's institutional maturity, openness to public health programs, and orientation towards digital innovation—key elements for INS adoption readiness.

b) Financial Indicators:

These reflect the economic capability of a hospital to adopt and scale new technologies. They include:

- **Annual Revenue (in INR Cr)**
- **Annual CapEx in IT & Infrastructure (in INR Cr)**

These variables were selected to reflect actual purchasing power and strategic financial commitment. While revenue indicates general financial health, CapEx in digital infrastructure captures the intent and preparedness to invest in technological upgrades like Indoor Navigation Systems.

Some data points for revenue and CapEx in government hospitals were not directly available; in such cases, estimates were made based on historical data, similar hospital benchmarks, or trends observed in published financial reports. The rest of the data was either extracted from hospital websites, their annual reports, government databases, or smart city portals. Since the data is already in the public domain, ethical approval or patient-related confidentiality considerations were not required.

3.3 Hospital Selection Criteria

The sample size of 100 hospitals was selected through **random purposive sampling**, ensuring geographical and ownership diversity. A slightly higher number of hospitals were taken from **Maharashtra (19 hospitals)** and **Karnataka (12 hospitals)** due to their prominence in the Indian healthcare ecosystem. Other states included 9 to 10 hospitals each. No deliberate bias influenced the hospital selection; the goal was to capture variance in PPI scores based on state-specific and ownership-specific factors.

3.4 PPI Score Calculation

The central part of the methodology involves creating a **Purchasing Power Index (PPI)**, a composite score designed to reflect a hospital's readiness—financial, infrastructural, and strategic—for adopting an Indoor Navigation System. This score ranges from **0 to 10**, and hospitals are categorized into:

- **High PPI**: Score between 8–10
- **Medium PPI**: Score between 6–8
- **Low PPI**: Score ≤ 5

The PPI was calculated by assigning a score (0–10) to each of the following weighted components:

a) Ownership Type (Weight: 5%)

Ownership structure is an important determinant of investment behaviour. Based on expert discussions with BOOTWAY's founder, the scores were assigned as follows:

- Government: 6
- Private: 8
- Private Chain: 10

Chain hospitals generally have standardised decision-making processes, higher-tech investments, and better alignment with innovation.

b) Bed Capacity (Weight: 15%)

Larger hospitals have higher footfalls and operational complexity, making INS more valuable.

- 700 beds: 10
- 500 beds: 8
- 300 beds: 6
- 200 beds: 4
- 100 beds: 2
- ≤50 beds: 0

c) Accreditation Status (Weight: 5%)

Accreditation ensures hospitals meet certain quality standards. A score of 10 was given if any recognised accreditation (NABH, NABL, JCI) was held; otherwise, the score was 0. The decision to assign full weight to any accreditation was due to the binary availability of such data.

d) PMJAY Empanelment (Weight: 5%)

PMJAY (Ayushman Bharat) empanelment indicates strategic alignment with government digital health missions. Empanelled hospitals scored 5; non-empanelled scored 0.

e) CGHS Empanelment (Weight: 5%)

Similar to PMJAY, CGHS empanelment suggests operational compliance with digital reimbursement and reporting. Scores were again binary—5 if empanelled, 0 if not.

f) Digital & Tech Investment (Weight: 5%)

Hospitals investing in HIS, EHR, telemedicine, or IoT infrastructure were assigned a full score of 10. Lack of digital investment resulted in a score of 0.

g) Smart City Participation (Weight: 10%)

Hospitals located in smart city zones or collaborating with smart city initiatives were scored 10, others 0. This dimension acts as a proxy for policy alignment, funding opportunity, and digital readiness.

h) Revenue Score (Weight: 25%).

Revenue is a direct indicator of purchasing capacity. Scores were as follows:

- INR 300 Cr: 10
- INR 200 Cr: 8
- INR 100 Cr: 6
- INR 50 Cr: 4
- ≤INR 50 Cr: 2
- Govt Hospitals: Default 10 (due to large-scale patient volumes and public subsidies)

i) CapEx in Digital Infra (Weight: 25%)

Capital Expenditure on IT and infrastructure reflects current priorities and spending behaviour. The score scale:

- INR 10 Cr: 10
- INR 8 Cr: 8
- INR 6 Cr: 6
- INR 4 Cr: 4
- INR 2 Cr: 2

These scores were then aggregated using the following formula:

PPI Score = (Ownership * 5%) + (Bed Capacity * 15%) + (Accreditation * 5%) + (PMJAY * 5%) + (CGHS * 5%) + (Digital Investment * 5%) + (Smart City * 10%) + (Revenue * 25%) + (CapEx * 25%)

This formula ensures a balanced assessment, with the highest weightage given to **Revenue** and **Digital CapEx** to reflect both purchasing ability and strategic intent.

3.5 Analytical Methods

All analysis was conducted using **Microsoft Excel**, leveraging its statistical and visualisation functions. The analytical methods included:

- **Descriptive Statistics**: To compute averages, frequencies, and distributions
- **Correlation Analysis**: To evaluate the relationships among ownership, revenue, CapEx, and PPI

- **Geographic Analysis**: Mapping state-wise variations in average PPI, revenue, and CapEx using colour-coded India maps
- **Visualisations**: Bar charts, pie charts, scatter plots to illustrate key findings

3.6 Hypothesis Statement

One key hypothesis explored in this research is:

- **Null Hypothesis (H_0):** There is no relationship between hospital revenue and digital investment.
- **Alternative Hypothesis (H_1):** Higher hospital revenue is associated with higher digital investment.

Correlation matrices and scatter plots were used to explore and validate this hypothesis.

3.7 Ethical Considerations

Since only publicly available secondary data was used and no patient-level or confidential institutional data was accessed, there were no significant ethical risks involved. Hospital names have been preserved in the backend for internal insight but are not revealed in any public presentation.

3.8 Limitations

Some data limitations included the unavailability of exact Capex and revenue figures for certain government hospitals. In such cases, informed estimations were used. While this may introduce slight variation, the impact on overall PPI categorization was carefully monitored.

Chapter 4: Results and Findings

This chapter presents the results derived from the descriptive analysis of the 100 hospitals studied for the development of the Purchasing Power Index (PPI) for Indoor Navigation System (INS) adoption readiness. The analysis primarily includes ownership types, state-wise distribution, bed capacity, government empanelment, digital investment, smart city participation, and the overall categorisation of hospitals based on PPI scores. This section summarises the current landscape of hospital infrastructure and financial readiness, setting the stage for deeper comparative and correlation analyses in subsequent sections.

4.1 Descriptive Analysis

The descriptive analysis reveals the basic distribution patterns across different categories and variables used in the study. It also serves as a foundation to understand the profile of hospitals and their alignment with digital health readiness.

4.1.1 Ownership-wise Distribution

Out of the 100 hospitals studied:

- **Government Hospitals**: 11
- **Private Hospitals**: 58
- **Private Chain Hospitals**: 31

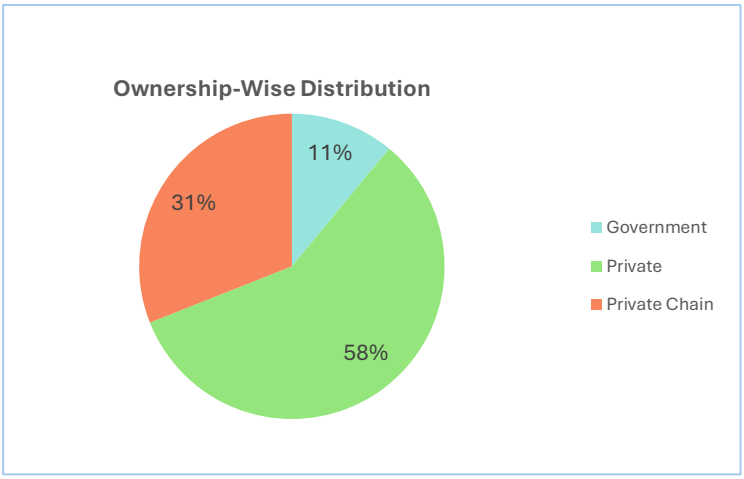

Figure 1 Ownership-wise distribution of hospitals

This shows that the majority of the sampled hospitals are privately owned, reflecting the reality of the Indian healthcare ecosystem where the private sector dominates healthcare delivery,

especially in urban and tier-2 cities. The inclusion of private chains is significant because they are often more structured in their operations and more proactive in digital adoption. Government hospitals, though smaller in number in the sample, represent a crucial segment due to their volume-driven patient loads and participation in national health missions.

4.1.2 State-wise Hospital Distribution

The geographic spread of the hospitals is as follows:

- **Maharashtra**: 19
- **Karnataka**: 12
- **Gujarat, Tamil Nadu, Rajasthan, Madhya Pradesh, Uttar Pradesh, New Delhi**: 10 each
- **Punjab**: 9

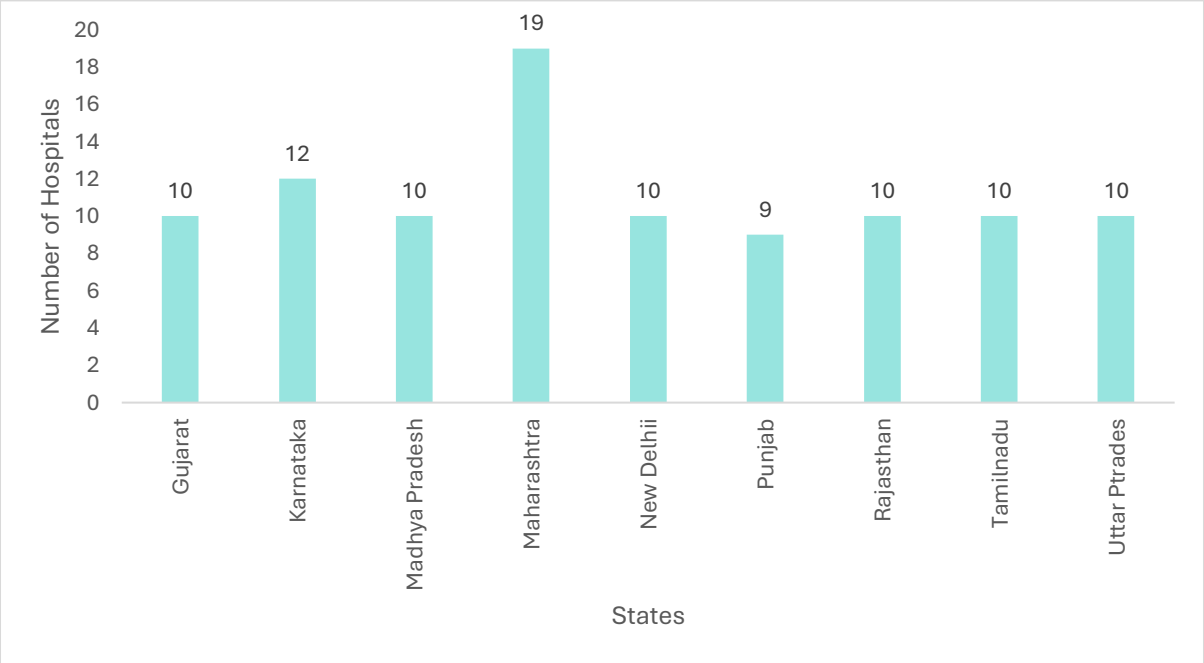

Figure 2 : Bar graph of hospitals from each state

Maharashtra and Karnataka lead in the number of hospitals selected, which can be attributed to their prominence in healthcare innovation and infrastructure. These two states house several large tertiary care centres and smart cities, making them important focal points for technology adoption.

4.1.3 Bed Capacity Distribution

Bed capacity is a significant structural indicator. Hospitals were categorised into three segments:

- **<100 beds**: 4 hospitals
- **100–300 beds**: 39 hospitals
- **>300 beds**: 57 hospitals

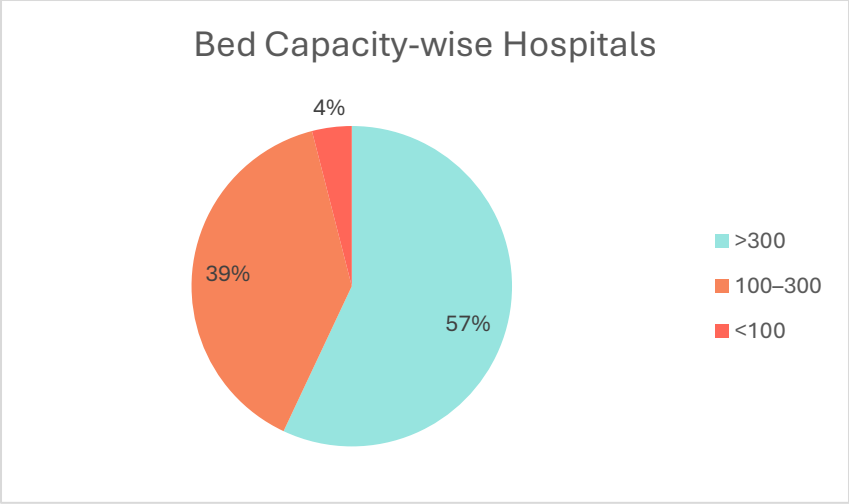

Figure 3: Bed capacity-wise hospitals

More than half of the hospitals in the dataset have a bed capacity exceeding 300, indicating a focus on large, multi-speciality, tertiary care centres. This is aligned to assess PPI in hospitals with complex infrastructure where INS implementation would be most beneficial.

4.1.4 Empanelment Status

a) CGHS Empanelment:

- Yes: 33 hospitals
- No.: 67 hospitals

b) PMJAY Empanelment:

- Yes: 63 hospitals
- No.: 37 hospitals

Empanelment under central schemes like CGHS (Central Government Health Scheme) and PMJAY (Ayushman Bharat) plays a strategic role in digital transformation. CGHS

empanelment implies compliance with digital billing and monitoring standards set by the government. Similarly, PMJAY empanelment reflects participation in the largest publicly funded health assurance scheme in the world, necessitating some level of IT infrastructure for claim management and reporting.

The higher percentage of hospitals under PMJAY compared to CGHS indicates a broader national reach and deeper penetration of Ayushman Bharat even in smaller and mid-sized hospitals.

4.1.5 Smart City Participation

- **Smart City Participation**: 59 hospitals
- **No Smart City Participation**: 41 hospitals

Participation in smart city initiatives suggests proximity to government-driven urban infrastructure projects, which often include digital health as a component. Hospitals in such zones are more likely to receive funding, regulatory support, and technical guidance for smart health innovations.

4.1.6 Digital Investment Readiness

- **Digital Investment Present**: 99 hospitals
- **Digital Investment Absent**: 1 hospital

This finding is extremely positive, showing that nearly all hospitals in the dataset have undertaken some form of digital investment, be it in Hospital Information Systems (HIS), Electronic Health Records (EHR), Telemedicine, or Internet of Things (IoT)-based monitoring. This affirms the market potential for more advanced technologies like INS.

4.1.7 Categorisation by PPI Score

The 100 hospitals were categorised into three groups based on their composite PPI scores:

- **High PPI (Score 8–10)**: 35 hospitals
- **Medium PPI (Score 6–8)**: 40 hospitals
- **Low PPI (Score ≤ 5)**: 25 hospitals

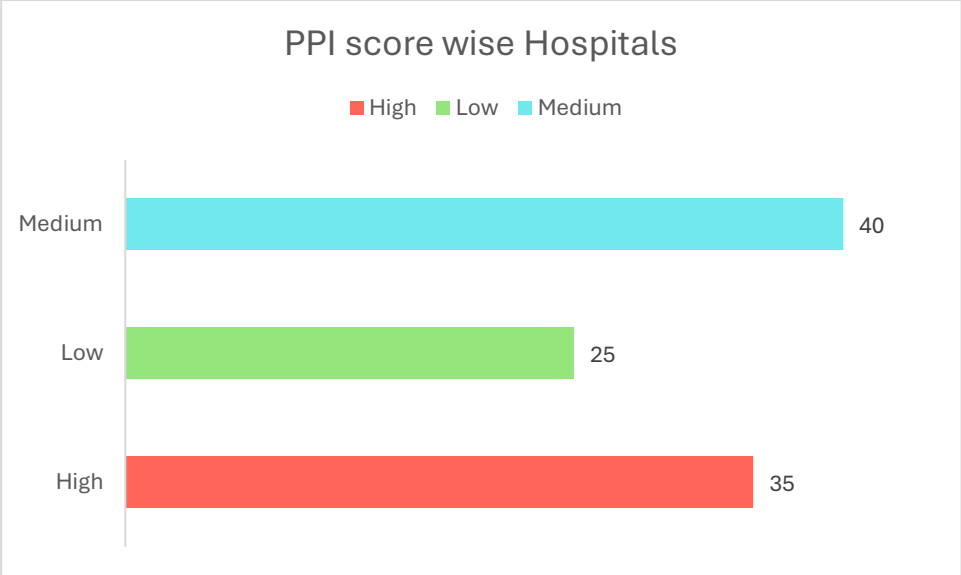

Figure 4: Cluster graph of PPI score-wise hospitals

This distribution indicates that more than one-third of the hospitals fall into the 'High PPI' category, meaning they have strong financial and infrastructural readiness to adopt Indoor Navigation Systems. About 40% are moderately positioned, and only 25% fall into the low category. These insights are useful for BOOTWAY to prioritise leads and tailor its go-to-market strategy.

4.1.8 Averages Across All Hospitals

The average values across all 100 hospitals are as follows:

Average bed capacity	626.83 beds
Average revenue	INR 206.644 crores
Average Cap EX-	INR 10.894 crores
Average PPI Score	6.6305

Table 1: Averages across all hospitals

These averages reflect a generally high level of operational capacity and spending potential in the sampled hospitals. A bed capacity of over 600 indicates substantial infrastructure, while an average revenue of ₹206 Cr and CapEx of nearly ₹11 Cr imply strong purchasing power and openness to innovation.

4.1.9 Summary Insights from Descriptive Analysis

1. **Private Sector Dominance**: Private and chain hospitals make up 89% of the sample, aligning with industry trends. These institutions tend to be more agile in technology adoption.
2. **Geographic Focus**: States like Maharashtra and Karnataka show a high concentration of hospitals, providing fertile ground for early adoption strategies.
3. **Strong Structural Base**: Most hospitals are large (>300 beds), indicating that Indoor Navigation Systems can offer real utility by improving patient flow and reducing navigational stress.
4. **High Empanelment Rates**: A combined 96 hospitals are empanelled under at least one central scheme (CGHS/PMJAY), ensuring digital compliance and funding support.
5. **Near-Universal Digital Readiness**: With 99 hospitals already investing in digital health, INS emerges as a logical next step.
6. **Smart City Integration**: A significant number of hospitals are part of smart city programs, suggesting readiness for future-proof health tech integrations.
7. **Promising PPI Scores**: With a majority of hospitals scoring in the medium to high PPI range, BOOTWAY has a strong market to target.

These descriptive statistics paint a favourable picture of the digital maturity and infrastructural strength of Indian hospitals. In the next section, comparative and geographic analyses will delve deeper into the differences across states and ownership models to refine strategic recommendations for INS deployment.

4.2 Comparative Analysis

Building on the descriptive insights, this section presents a comparative analysis to uncover deeper patterns across ownership types, states, bed capacity, and key financial variables such as revenue and CapEx, and their influence on the overall PPI score. The findings help understand which segments of hospitals exhibit the greatest readiness for adopting Indoor Navigation Systems.

4.2.1 Ownership-wise Comparison

A comparison across different ownership types reveals critical insights into purchasing power and digital readiness:

Ownership	Average of Numeric revenue	Average of Numeric capex	Average of Total PPI Score
Government	NA	NA	8.722727273
Private	134.5086207	6.625431034	5.888793103
Private Chain	301.6129032	16.77419355	7.275806452

Table 2: Ownership-wise Comparison

Although actual revenue and CapEx data for government hospitals are unavailable, these institutions received full scores in these parameters within the PPI calculation due to their extensive infrastructure, high patient volumes, and significant catchment areas. Private chain hospitals lead in average revenue and CapEx, suggesting strong financial power and organisational structures that favour tech investments. Government hospitals, while often resource-constrained, scored highly on PPI due to structural dominance and extensive public services.

The high PPI score of private chains shows their strategic alignment with innovation and operational excellence. Private standalone hospitals, though numerically dominant, appear less financially prepared compared to chains.

4.2.2 PPI Category vs Revenue, CapEx, and Bed Capacity

The following table presents a comparison of hospitals segmented by their PPI category:

PPI Category	Avg. Revenue (₹ Cr)	Avg. CapEx (₹ Cr)	Avg. Bed Capacity	Avg. PPI Score
High	308.29	18.15	1008.77	8.67
Medium	123.63	5.71	564.4	6.61
Low	56.66	2.36	192	3.8

Table 3: PPI Category vs Revenue, CapEx, and Bed Capacity

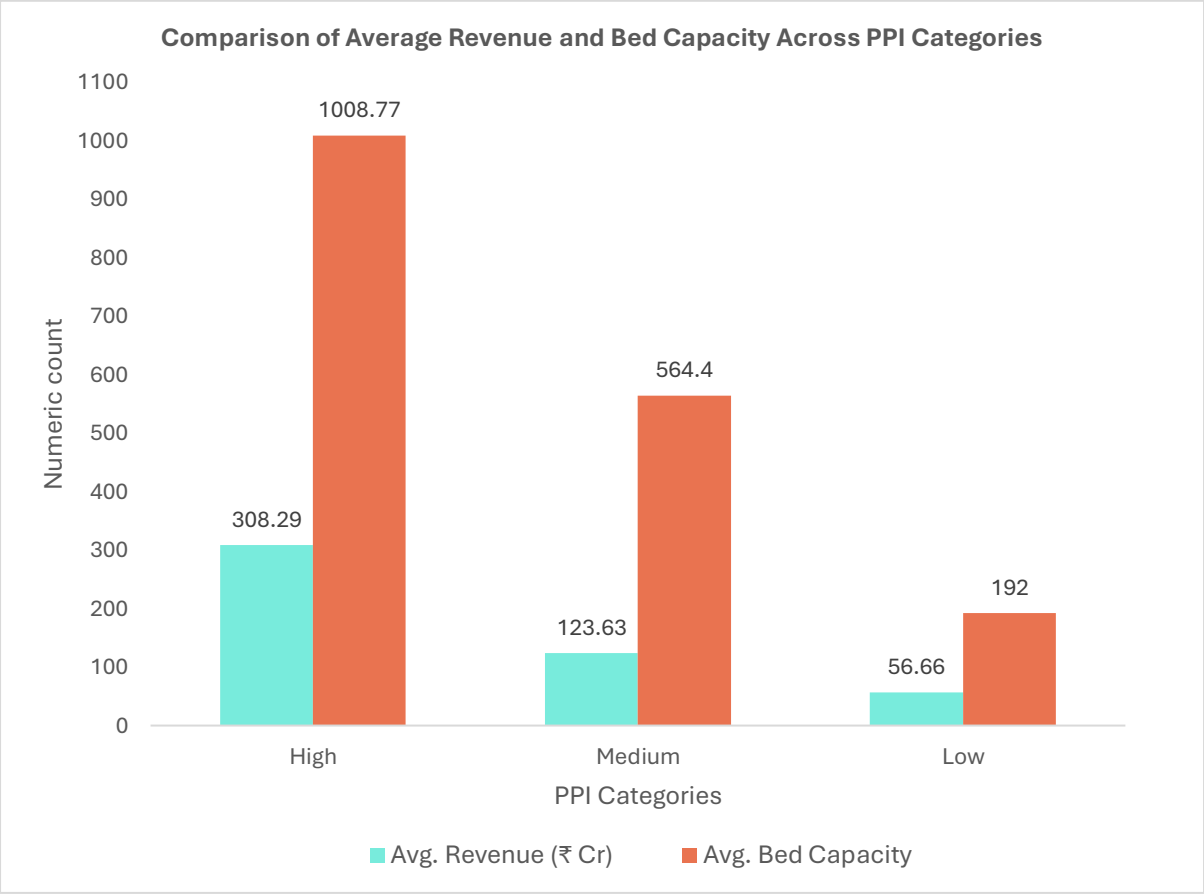

Figure 5: Comparison of Average Revenue and Bed Capacity Across PPI Categorie

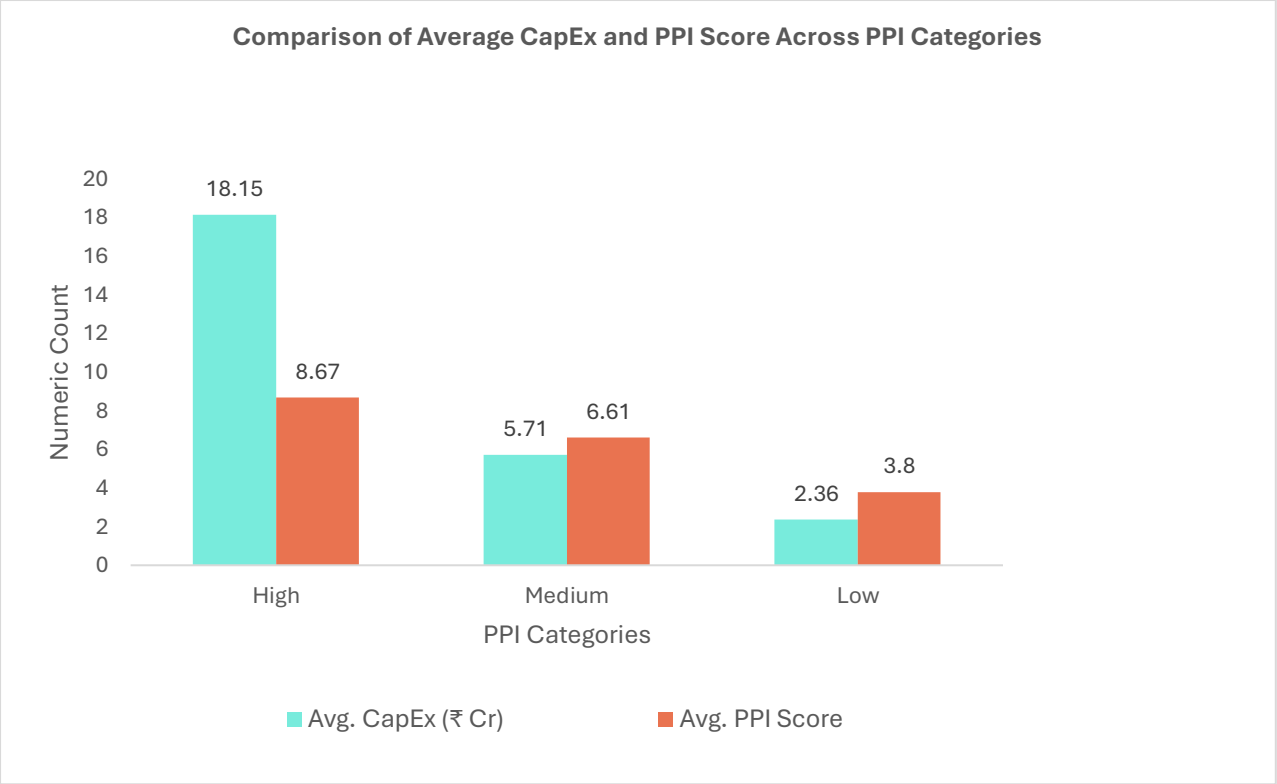

Figure 6: Comparison of Average CapEx and PPI Score Across PPI Categories

The high PPI group demonstrates significantly greater financial and infrastructural strength. On average, these hospitals have a revenue of over ₹300 Cr and invest nearly ₹18 Cr in digital technologies annually. Their bed capacity is also the highest, indicating the scale at which these hospitals operate. Conversely, low PPI hospitals are smaller in scale and operate on tighter budgets, explaining their lower readiness for high-tech implementations like INS.

4.2.3 State-wise Comparison of PPI

State-wise variation in average PPI score reveals regional disparities in healthcare digital readiness:

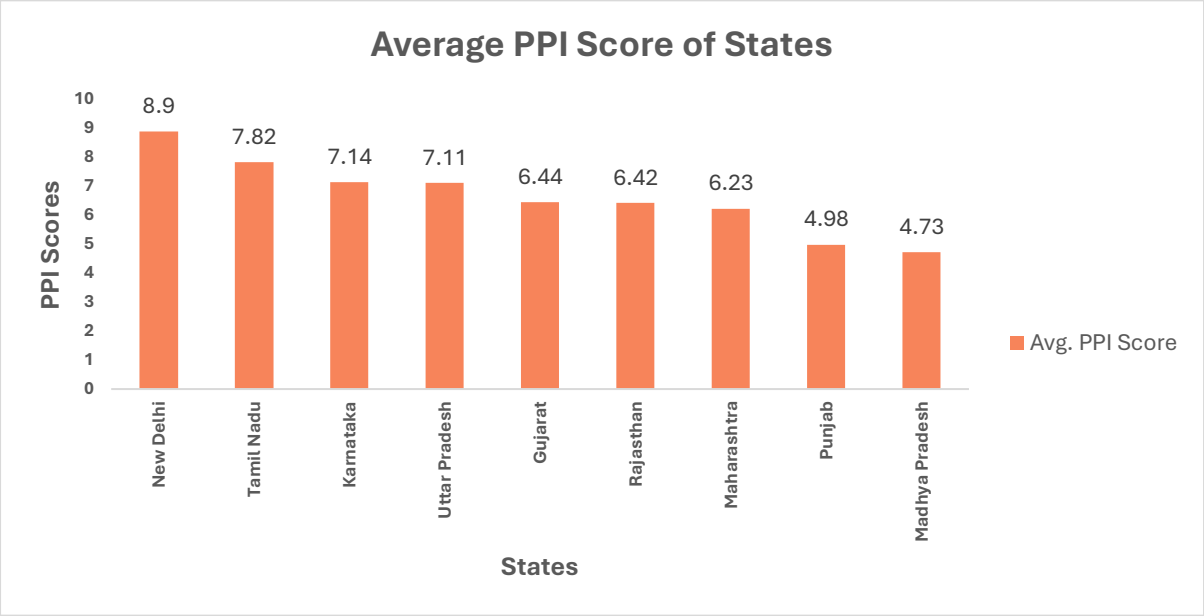

Figure 7: Average PPI Score of States

Hospitals in New Delhi lead in average PPI score, likely due to better funding, policy proximity, and integration with smart city initiatives. Tamil Nadu and Karnataka also show strong performance, benefitting from proactive health policies and high urbanisation. In contrast, states like Punjab and Madhya Pradesh fall below the national average, indicating either lower digital adoption or limited capital flow into healthcare infrastructure.

4.2.4 Bed Capacity vs PPI Score

Hospitals were also analysed based on bed size and their corresponding PPI scores:

Bed Category	Avg. PPI Score
<100 beds	3.09
100–300 beds	5.37
>300 beds	7.74

Table 4: Bed Capacity vs PPI score

There is a clear positive relationship between hospital size and PPI. Larger hospitals have more complex layouts, greater footfalls, and stronger operational budgets—all of which make them

more conducive to INS deployment. Smaller hospitals (<100 beds) have low PPI scores, suggesting minimal readiness or need for such systems.

4.2.5 Correlation Between Revenue, CapEx, and PPI

To further understand the interrelationships among the core financial variables and PPI, three scatter plots were generated:

1. **CapEx vs PPI**

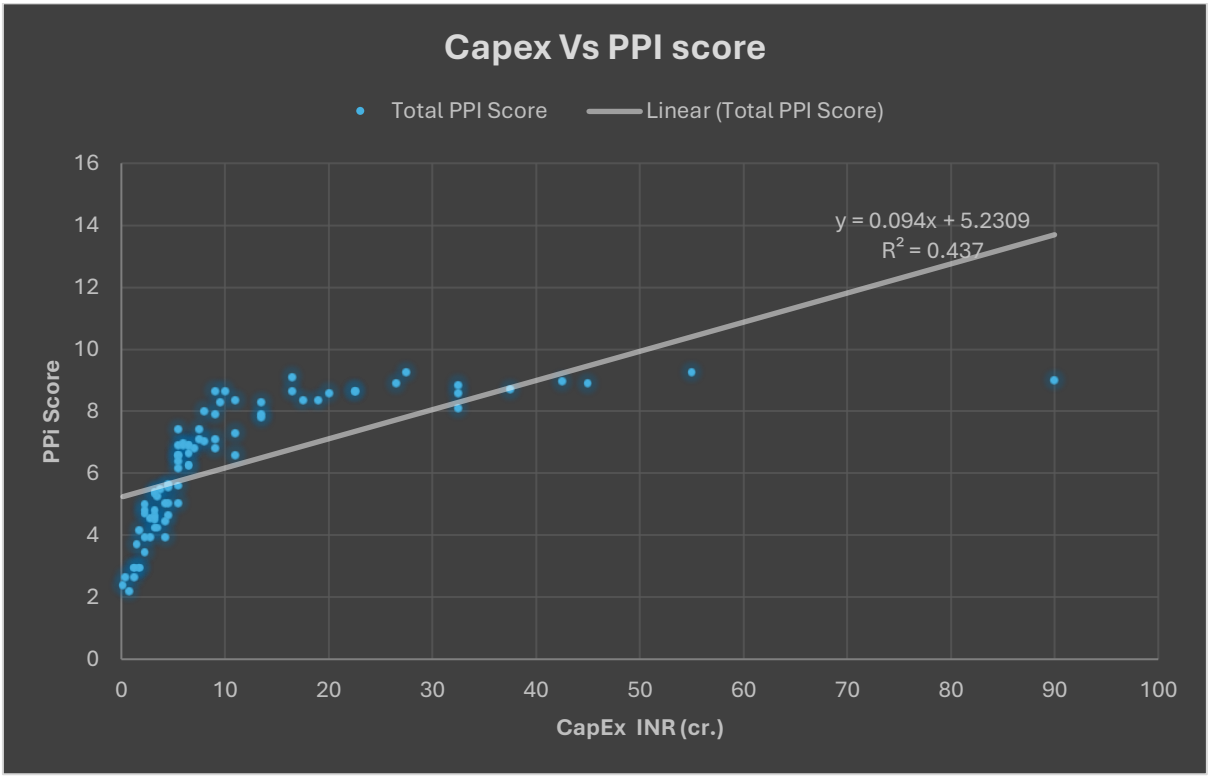

Figure 8: Scatter plot of Capex Vs PPI score

- Regression Line: **y = 0.094x + 5.2309**
- R^2 = **0.437**
- Interpretation: Moderate positive correlation. As capital expenditure increases, PPI scores tend to rise, though other factors also play a role.
- The scatter plot between hospital revenue and Purchasing Power Index (PPI) reveals a moderate positive correlation (R^2 = 0.437), indicating that hospitals with higher revenue tend to have higher PPI scores. However, the variation in scores suggests that while revenue is influential, other non-financial variables also significantly impact a hospital's investment readiness for indoor navigation systems.
-

2. **Revenue vs PPI**

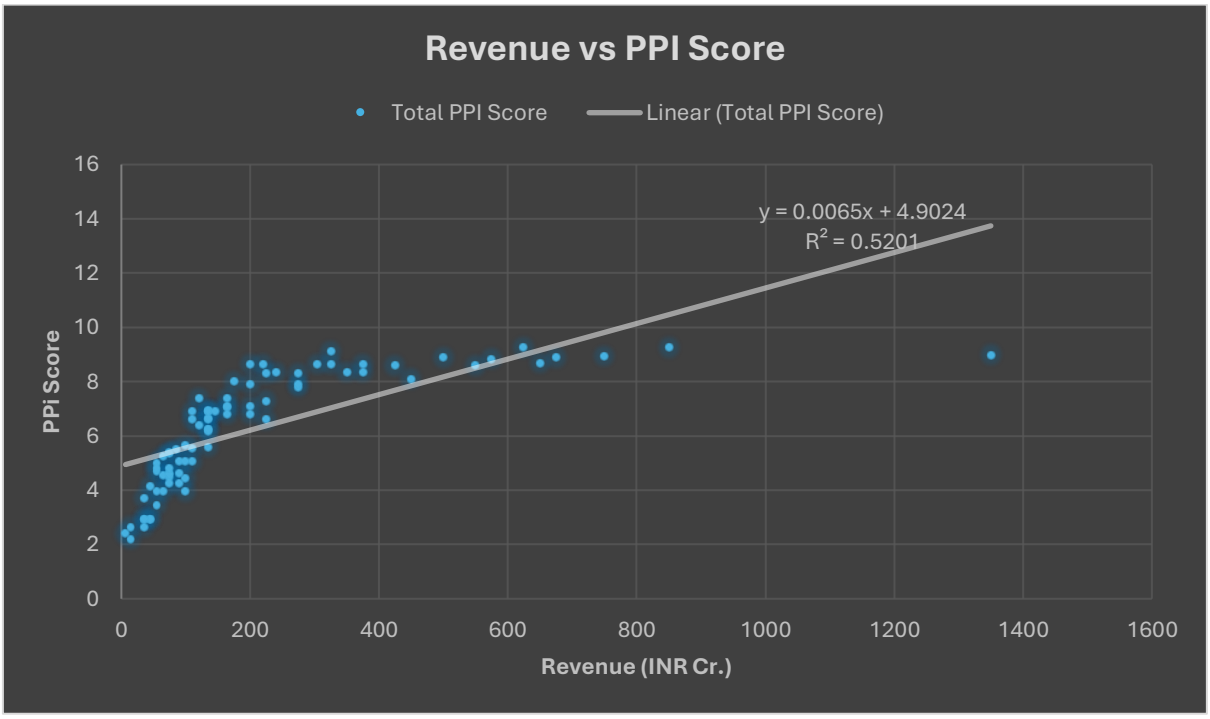

Figure 9: Scatter plot of Revenue vs PPI Score

- Regression Line: **y = 0.0065x + 4.9024**
- R^2 = **0.5201**
- Interpretation: A stronger correlation than CapEx. Higher revenue is more directly associated with higher PPI scores.
- The correlation analysis between revenue and Purchasing Power Index (PPI) Score indicates a moderately strong positive relationship ($R^2 = 0.5201$), where hospitals with higher revenues tend to show greater readiness to invest in digital infrastructure like indoor navigation systems. This suggests revenue is a critical determinant of technological adoption potential. However, the diminishing increase in PPI at higher revenue brackets suggests a saturation point, indicating mid-revenue hospitals may offer the most strategic opportunity for market entry.

3. **Revenue vs CapEx**

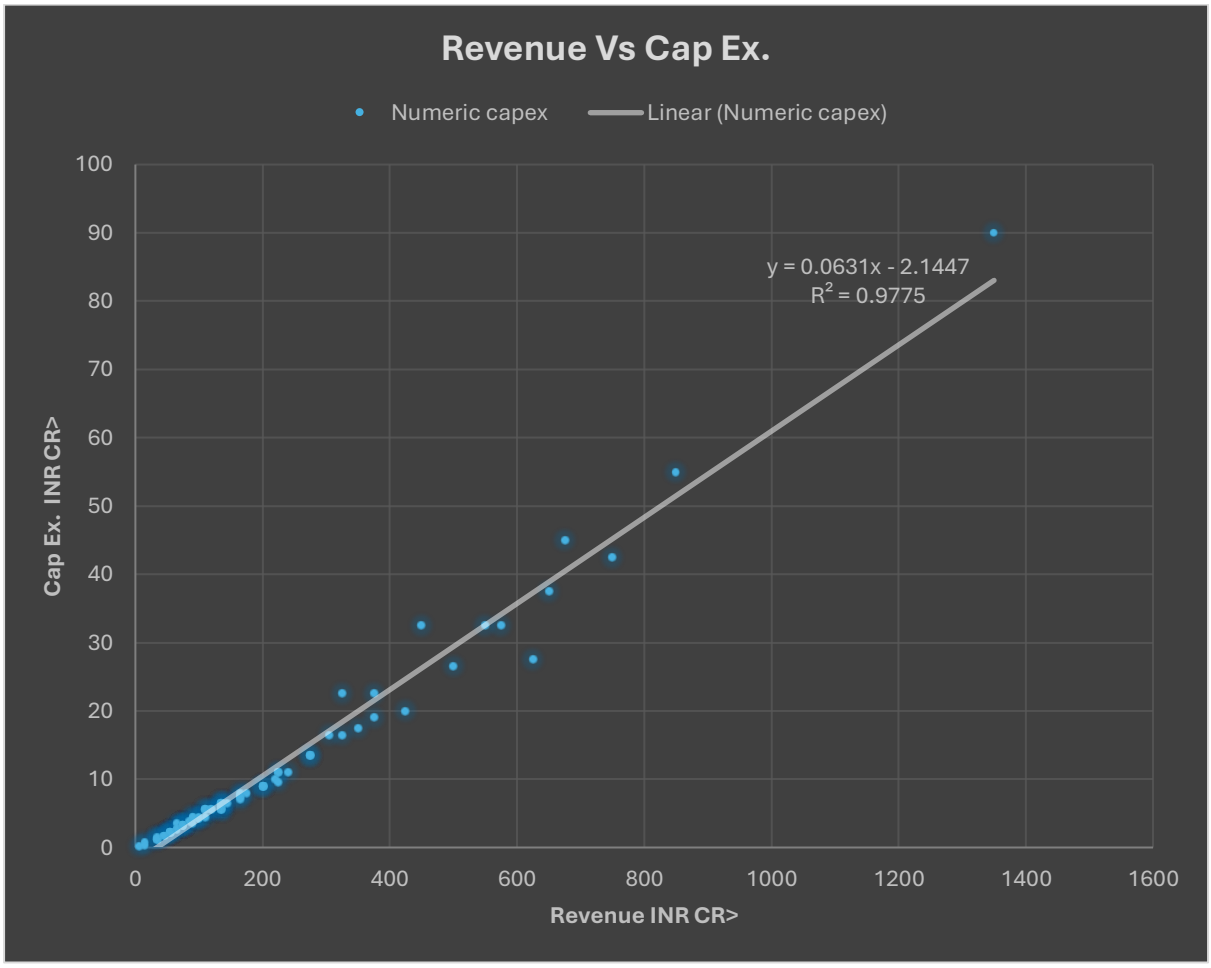

Figure 10: Scatter plot of Revenue Vs Cap Ex.

- Regression Line: **y = 0.0631x - 2.1447**
- R^2 = **0.9775**
- Interpretation: Extremely high correlation, suggesting that hospitals with higher revenue reliably invest more in digital infrastructure.
- The coefficient of determination (R^2) is **0.9775**, indicating a **very strong positive linear relationship** between revenue and CapEx. Approximately **97.75% of the variation in CapEx** among the observed hospitals can be statistically explained by their revenue figures.

These plots affirm the intuitive understanding that financial strength fuels infrastructural and technological readiness.

4.2.6 Correlation Matrix

The Pearson correlation coefficients among the three variables confirm these relationships numerically:

	Revenue	**CapEx**	**PPI**
Revenue	1	0.988	0.459
CapEx	0.988	1	0.450
PPI	0.459	0.450	1

Table 5: Correlation Matrix

- **Revenue vs CapEx**: Strongest correlation (0.988)
- **Revenue vs PPI**: Moderate correlation (0.459)
- **CapEx vs PPI**: Moderate correlation (0.450)

This means that while both revenue and CapEx influence PPI, their effects are intertwined, and high-revenue hospitals are more likely to invest in CapEx, which in turn boosts their PPI.

4.2.7 Summary Insights from Comparative Analysis

1. **Private Chains Lead in Financial Strength**: With the highest average revenue and CapEx, private chain hospitals are the strongest candidates for INS deployment.
2. **Government Hospitals Score High on PPI Despite Data Gaps**: They were awarded full scores for revenue and CapEx based on structural assumptions, highlighting their importance in public health strategy.
3. **Larger Hospitals Have Higher PPI Scores**: Institutions with >300 beds show the highest digital readiness.
4. **New Delhi, Tamil Nadu, and Karnataka Are Regional Leaders**: These states outperform others in PPI, reflecting better health policies and infrastructure.
5. **Strong Revenue-CapEx Link Drives PPI**: Financial investment is the backbone of digital readiness, making CapEx a critical area to track.

These comparative findings provide BOOTWAY with clear segmentation and prioritisation guidelines. Targeting private chain hospitals, large tertiary institutions, and hospitals in digitally mature states like New Delhi, Tamil Nadu, and Karnataka will yield faster traction for INS deployment. The next chapter will explore regional clustering and actionable strategy recommendations based on these insights.

4.3 Geographical Analysis

The geographical analysis explores the distribution of PPI scores across states and identifies spatial trends in digital readiness, revenue capacity, and capital expenditure. It aims to uncover which regions are best poised for INS deployment and which may require more infrastructural and financial attention.

4.3.1 Distribution of High PPI Hospitals by State

State	Count of High PPI Hospitals	Avg. PPI Score
New Delhi	10	8.90
Karnataka	5	8.55
Maharashtra	5	8.58
Gujarat	4	8.36
Tamil Nadu	4	8.73
Uttar Pradesh	3	9.07
Rajasthan	2	8.55
Madhya Pradesh	1	8.15
Punjab	1	8.15
Total	**35**	**8.67**

Table 6: Distribution of High PPI Hospitals by State

New Delhi leads both in the count and the average PPI score, indicating an advanced level of readiness for INS deployment. Other metropolitan and healthcare-forward states like Karnataka, Maharashtra, and Tamil Nadu also show high potential.

4.3.2 Distribution of Medium PPI Hospitals by State

State	Count of Medium PPI Hospitals	Avg. PPI Score
Gujarat	2	7.08
Karnataka	5	7.20
Madhya Pradesh	3	6.22
Maharashtra	9	6.41
Punjab	3	5.82
Rajasthan	7	6.12
Tamil Nadu	6	7.21
Uttar Pradesh	5	6.88
Total	**40**	**6.61**

Table 7: Distribution of Medium PPI Hospitals by State

Tamil Nadu and Karnataka maintain strong positions in this bracket, while Maharashtra emerges as a key middle-tier region with a large number of moderately prepared hospitals.

4.3.3 Distribution of Low PPI Hospitals by State

State	Count of Low PPI Hospitals	Avg. PPI Score
Gujarat	4	4.20
Karnataka	2	3.45
Madhya Pradesh	6	3.42
Maharashtra	5	3.58
Punjab	5	3.85
Rajasthan	1	4.25
Uttar Pradesh	2	4.73
Total	**25**	**3.80**

Table 8: Distribution of Low PPI Hospitals by State

Madhya Pradesh has the highest number of Low PPI hospitals, indicating a regional concern regarding digital readiness and infrastructure gaps.

4.3.4 Final State-Wise Comparison

State	Hospital Count	Avg. PPI	Avg. Revenue (₹ Cr)	Avg. CapEx (₹ Cr)
New Delhi	10	8.90	295	17.25
Tamil Nadu	10	7.82	206.5	10.6
Karnataka	12	7.14	283.88	17.95
Uttar Pradesh	10	7.11	115.5	5.38
Total	100	6.63	171.52	9.13
Gujarat	10	6.44	186	9.05
Rajasthan	10	6.42	84	3.85
Maharashtra	19	6.23	186.05	9.92
Punjab	9	4.98	68.33	2.97
Madhya Pradesh	10	4.73	72.5	3.04

Table 9: Final State-Wise Comparison

- **Top Performers**: New Delhi, Tamil Nadu, and Karnataka consistently score high across PPI, revenue, and CapEx.
- **Underperforming Regions**: Madhya Pradesh and Punjab lag in PPI and financial indicators.

  These findings support a regionally targeted approach for INS implementation. High-performing states could be prioritised for early adoption pilots, while low-performing regions may benefit from focused capacity-building initiatives and infrastructural investments.

4.3.5 Visual Mapping of PPI Across India

A thematic map of India was developed to illustrate the digital readiness landscape. States were colour-coded based on their average PPI scores:

States	Average of Total PPI Score
Delhi	8.9
Tamil Nadu	7.815
Karnataka	7.1375
Uttar Pradesh	7.105
Gujarat	6.44
Rajasthan	6.42
Maharashtra	6.23421053
Punjab, India	4.98333333
Madhya Pradesh	4.73

Table 10: State-wise average PPI score

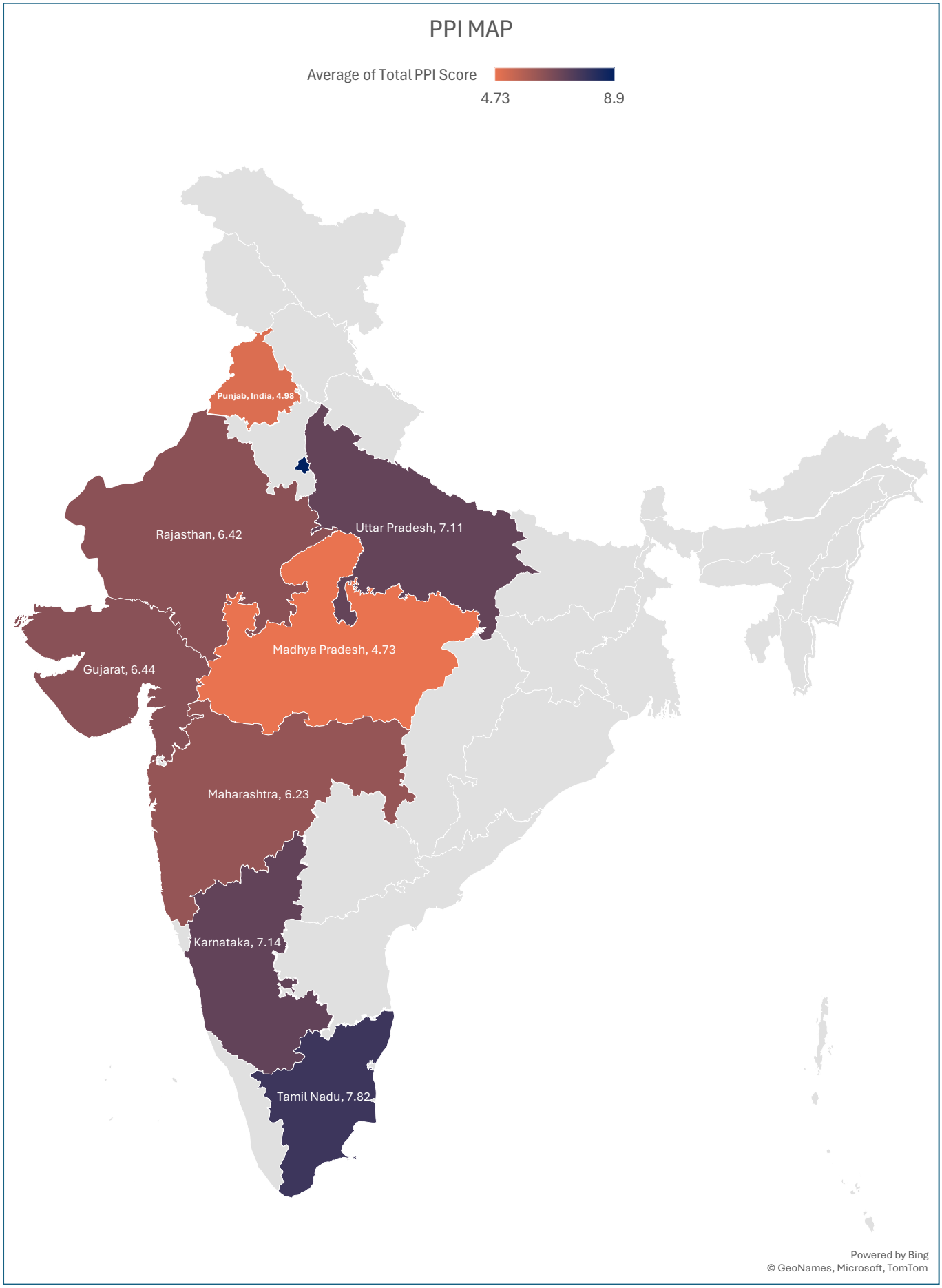
PPI MAP
Average of Total PPI Score
4.73
8.9
Punjab, India, 4.98
Rajasthan, 6.42
Uttar Pradesh, 7.11
Madhya Pradesh, 4.73
Gujarat, 6.44
Maharashtra, 6.23
Karnataka, 7.14
Tamil Nadu, 7.82
Powered by Bing
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Figure 11: Indian Map as per PPI Score

- **High Readiness**: New Delhi, Tamil Nadu, Karnataka
- **Moderate Readiness**: Gujarat, Maharashtra, Uttar Pradesh
- **Low Readiness**: Madhya Pradesh, Punjab, Rajasthan

This visual tool enhances strategic decision-making by allowing stakeholders to prioritise marketing, funding, and implementation activities geographically.

Summary: Insights from Geographical Analysis

1. **New Delhi and Southern States Lead**: With high average scores, advanced infrastructure, and substantial financial commitment, these regions are optimal for immediate INS rollouts.
2. **Madhya Pradesh and Punjab Require Attention**: These states exhibit systemic underperformance, suggesting the need for strategic investment and policy support.
3. **Balanced Potential in Western India**: Maharashtra and Gujarat have a strong mix of high, medium, and low PPI hospitals, offering both immediate and long-term opportunities.
4. **INS Feasibility Is Regionally Skewed**: Strategic decisions must consider regional disparities. A uniform rollout plan would be inefficient.
5. **Data Supports Tiered Rollout Strategy**: Start with high-readiness zones to demonstrate success, then scale to medium and low PPI regions using tailored engagement models.

With the geographical analysis complete, the next section will synthesise these insights with correlation findings to propose actionable recommendations for INS adoption across Indian hospitals.

Chapter 5: Discussion

This chapter presents a detailed interpretation of the findings from the study. It connects the results to previous research, identifies the strengths and limitations of the study, and provides a grounded understanding of what the data means for the adoption of Indoor Navigation Systems (INS) in Indian hospitals. The goal is to interpret the findings realistically, without making assumptions beyond what the data shows.

5.1 Interpretation of Key Findings

In our study, we created a new indicator named Purchasing Power Index (PPI), which aims to assess the economic and infrastructural preparedness of hospitals with regard to the adoption of Indoor Navigation Systems. The index especially focuses on capturing annual revenue and capital expenditures (CapEx), spending on information technologies, obtaining credentials, and engaging in smart city initiatives to depict a comprehensive picture of digital readiness. The analysis showed that there are both revenue and capital investment hospital segments that sustain higher scores in the Patient Satisfaction Index (PPI). These hospitals are either currently investing in or have a greater capacity to invest in digital solutions. This supports prior studies, such as Prakamya et al. (2023), which found that accessible finance is a major driver for the adoption of innovative technologies. The strength of association between revenue and CapEx was extremely high (correlation coefficient: 0.988), signifying that hospitals that make CapEx spend are more likely to generate revenue. Revenue had a moderate association with PPI (0.459) and CapEx (0.450), suggesting that while economic health is a key consideration, there are other factors that influence digital readiness.

Geographical segmentation also reinforced this trend. Top CapEx and revenue states such as New Delhi, Tamil Nadu, and Karnataka also scored high on the PPI scores. States such as Madhya Pradesh and Punjab ranked low on all three parameters consistently, indicating very low financial capability and digital preparedness.

Ownership structures provided further information on these trends. Government hospitals, although not reporting finances, were to be high in PPI, possibly due to size, patient volume, and stability in service infrastructure. Private chain hospitals reported the highest mean revenue and CapEx among reporting hospitals. This indicates the role of strategic planning and centralised management in facilitating digital growth.

Hospital size was also considered. The largest hospitals (>300 beds) had the biggest average PPI, suggesting that size is good for digital investment. This makes sense because larger hospitals would have more departments to navigate through, more patient flow, and more complex navigation needs, making indoor navigation systems more useful.

5.2 Hypothesis Testing

Null Hypothesis (H_0): There is no significant relationship between a hospital's annual revenue and its digital investment.

Alternative Hypothesis (H_1): Hospitals with higher annual revenue tend to have higher digital investment.

The correlation analysis revealed a nearly perfect positive correlation between revenue and CapEx (correlation coefficient: 0.988), as well as a moderate positive correlation between revenue and PPI (0.459). Given that CapEx was treated as a proxy for digital infrastructure investment, the results suggest that higher revenue hospitals tend to invest more in digital infrastructure.

Consequently, we accept the alternative hypothesis and reject the null hypothesis. Financial resources have a significant impact on the readiness of a hospital to adopt digital technologies such as indoor navigation systems.

Thus, this substantiates the assertion that revenue is more than a mere figure; rather, it serves as a threshold to digital transformation. Hospitals with higher earnings are more willing to spend on resources aimed at enhancing operational efficiency and improving the patient experience.

5.3 Strengths of the Study

- **Realistic Sample**: The study looked at 100 hospitals across 9 different states, including government, private, and chain hospitals, offering a broad and representative view.
- **Practical PPI Framework**: The PPI was built using measurable and logical indicators like revenue, CapEx, smart city participation, and accreditation status. This made the index grounded and usable in real-world decision-making.

- **Balanced Analysis**: The study used average values and comparison across hospital types and regions, which helped highlight differences without relying only on extreme cases.
- **Use of Visual Tools**: Visualisations like scatter plots and correlation matrices helped explain the patterns in a clear and accessible way. For example, the equation for CapEx and PPI ($y = 0.094x + 5.2309$; $R^2 = 0.437$) showed that CapEx contributes to PPI but isn't the only deciding factor.

5.4 Limitations of the Study

- **Incomplete Financial Data**: During the data collection found that the government doesn't disclose their revenue and capex for each hospital, so the score was estimated as per considering their other indicators.
- **Limited Regional Coverage**: The study didn't include all the states and union territories of India. So, the results can't be generalized to all other states.
- **Single Timeframe**: This study was majorly for a specific period of time, which assessed financial and digital readiness, but these factors can change quickly. For more better understanding, it'll require a long-term study.
- **Simplified Index**: PPI captures the external indicators only; it doesn't include the internal factors like staff digital awareness, IT maintenance, and all of which can also impact digital adoption.

5.5 Comparison with Previous Research

As demonstrated in prior research, such as Prakanmya et al. (2023), this study's results also show that mobile-based hospital navigation systems are a function of technology as well as the hospital's willingness to adopt such technology. The PPI in this study offers a systematic method for evaluating that readiness.

This study supports the argument of a "digital divide" in Indian healthcare, especially in the context of NDHM. The infrastructure of healthcare facilities situated in wealthier, urban states is far more advanced compared to those located in lower-income regions.

Other studies also showed that hospital accreditation, such as NABH, enhances digital development. In this study, too, accredited hospitals had higher PPI scores, confirming the assumption that institutional quality and digital preparedness are closely related.

5.6 Practical Implications

- **Target High-Scoring States First**: New Delhi, Tamil Nadu, and Karnataka should be prioritised for INS rollouts. These regions already have the infrastructure and governance needed to support early adoption.
- **Support for Low-Scoring States**: Madhya Pradesh and Punjab will need targeted funding and support. Policies that encourage digital investments in these areas could help close the gap.
- **Use PPI as a Planning Tool**: Hospitals and policymakers can use PPI scores to decide where to invest first. This removes guesswork and ensures that resources are used efficiently.
- **Phased Rollouts for Medium-Scoring Regions**: Hospitals with medium PPI scores (6–8) can follow a step-by-step rollout. They may need a mix of immediate improvements and long-term planning.
- **Work with Hospital Chains**: Chain hospitals have standard processes and central control, which makes scaling INS solutions easier.
- **Integrate with National Programs**: The findings can feed into Ayushman Bharat Digital Mission (ABDM) and Smart City initiatives, where INS can be added to broader digital infrastructure planning.

With the findings now interpreted, the strengths and limitations acknowledged, and the hypothesis tested, the study is now in a position to draw actionable conclusions and recommend steps for successful INS implementation. The next chapter will focus on summarising these insights and offering a practical roadmap based on the data.

Chapter 6: Conclusion

This chapter presents a comprehensive summary of the research findings and offers strategic recommendations for stakeholders, especially startups like BOOTWAY, working on non-clinical innovations such as indoor navigation systems (INS) for hospitals. The insights are strictly based on data collected from 100 hospitals across nine states in India, analysed using the Purchasing Power Index (PPI) framework. The chapter integrates academic interpretation with practical insights and concludes with forward-looking guidance for future innovations and policy-level interventions.

6.1 Summary of Key Findings

The study aimed to evaluate the financial and infrastructural readiness of Indian hospitals to adopt indoor navigation systems using a custom-designed Purchasing Power Index (PPI). The PPI was constructed using key variables: annual revenue, capital expenditure (CapEx), accreditation status, smart city participation, and digital maturity indicators. Hospitals were categorised as having High, Medium, or Low PPI scores.

Key observations from the analysis:

- **Strong Link Between Finances and Digital Readiness**: A clear correlation emerged between a hospital's revenue, CapEx, and its PPI score. The correlation coefficient between revenue and CapEx was exceptionally high (0.988), and both had a moderate correlation with PPI scores (0.459 and 0.450, respectively).
- **Ownership Matters**: Government hospitals, despite not disclosing financial data, performed well in PPI due to infrastructure and policy-driven initiatives. Private chain hospitals had the highest average CapEx and revenue, reflecting stronger financial health and centralised planning.
- **State-Level Patterns**: New Delhi, Tamil Nadu, and Karnataka were consistently top-performing in PPI scores, driven by higher investments and infrastructural maturity. Madhya Pradesh and Punjab lagged behind all major indicators.
- **Size of Hospitals**: Hospitals with over 300 beds had significantly higher average PPI scores. These facilities are more likely to benefit from digital navigation due to their complex layouts and high footfall.
- **Validation of Hypothesis**: The hypothesis that hospitals with higher revenue tend to have greater digital investments was statistically supported. The null hypothesis was rejected, confirming a strong financial-digital linkage.

This suggests a strategic pattern: hospitals with financial strength, higher infrastructure, and forward-looking administrative structures are most ready to adopt advanced digital tools like indoor navigation.

6.2 Implications of the Study

The implications of this research are far-reaching for hospital administrators, startups, investors, and policymakers:

- **Hospitals** can use PPI as a benchmarking tool to evaluate their digital readiness and plan future investments.
- **Startups**: Can target and segment hospitals using the PPI score to determine early adopters and laggards.
- **Investors**: Have a data-driven basis to invest in technology solutions meant for high-PPI hospital clusters.
- **Policy Makers** Can identify underperforming states or regions and allocate resources to improve their digital infrastructure.

6.3 Recommendations

A. Recommendations for BOOTWAY

1. Target Market Segmentation Based on PPI

- **Primary Targets**: Hospitals in New Delhi, Karnataka, and Tamil Nadu (High PPI states) should be prioritised for INS deployment pilots.
- **Secondary Targets**: Maharashtra, Gujarat, and Uttar Pradesh hospitals with Medium PPI scores could be approached with modular or phased offerings.
- **Tertiary Focus**: States like Punjab and Madhya Pradesh should be approached after policy engagement or via public-private partnerships (PPP).

2. Tiered Pricing Model Based on Hospital Capacity & Revenue

- **Enterprise Tier**: For large (>300-bed) private chains and hospitals with CapEx above INR 15 crore and revenue above INR 200 crore. Offer full-suite navigation with custom modules (multi-language, patient tracking, analytics dashboard).
- **Mid-Tier**: For medium hospitals (150–300 beds) with moderate CapEx (INR 5–15 crore). Offer plug-and-play navigation, with optional upgrades.
- **Lite Tier**: For smaller private or PPP hospitals. Offer essential features only (location tagging, department guides) at a low upfront cost or monthly SaaS pricing.

3. Value-Based Messaging for Marketing

- Position INS not just as a tech solution, but as a **patient experience enhancer**.
- Emphasise how INS reduces staff load and increases patient satisfaction, critical KPIs for NABH and JCI accreditation.
- Use case studies from high-PPI hospitals to build credibility.

4. Partnerships with Chain Hospitals

- Focus on deals with private chains for scaling across multiple branches. Chains have uniform procurement policies, easing rollout.
- Present INS as a scalable solution across locations, with central analytics.

5. Target Government-Funded Projects

- Approach the Smart Cities Mission and the Ayushman Bharat Digital Mission (ABDM) to pilot INS in government hospitals.
- Propose INS as a smart hospital layer rather than a standalone tech.

B. Recommendations for Emerging Startups in Non-Clinical Health Tech

1. Focus on Infrastructure-Backed Innovation

- Learn from the INS case: Financial infrastructure and government policy alignment are critical for adoption.
- Focus on problems that are essential yet underserved are patient navigation, queue management, and feedback systems.

2. Use PPI-like Indices for Market Readiness

- Build custom indices to segment clients not just by geography, but readiness to adopt. Align features and pricing accordingly.

3. Build for Scale but Launch with Focus

- Start with Tier-1 city hospitals or chains, gain proof of concept, and then scale to semi-urban areas with modular models.

4. Develop Lightweight, Modular Products

- Many hospitals lack dedicated IT teams. Products must work with minimal installation, preferably cloud-based and API-driven.

5. Proactively Educate the Market

- Conduct webinars, offer ROI calculators, and publish whitepapers that showcase the benefits of non-clinical digital transformation.

C. Recommendations for Government & Policymakers

1. Institutionalise Support for Non-Clinical Innovation

- INS and similar tools are often overlooked compared to EHR or telemedicine. Government schemes should explicitly list navigation, workflow tools, and patient experience tech as fundable components.

2. Create Centralised Platforms to Match Startups and Hospitals

- Build a digital marketplace where hospitals can view, compare, and reach out to verified health tech startups.
- Enable pilots under ABDM or State Digital Health Missions with fast-track approvals.

3. Offer Tiered Subsidies Based on PPI

- Use a PPI-like framework to allocate technology upgrade grants. Hospitals with low PPI should receive higher funding or guided transformation pathways.

4. Promote Public Awareness

- Many decision-makers in small hospitals are unaware of digital tools. The government should conduct outreach sessions in association with healthcare councils and hospital associations.

6.4 Final Reflection

The conclusion from the study can demonstrate a clear path for non-clinical innovation, like an indoor navigation system, in Indian hospitals. Capability to invest, the infrastructure of the hospitals and the administrations are focal for digital readiness. Whereas High PPI scoring states and facilities are immediate opportunities, but medium and low PPI scoring states and hospitals to get require a long-term strategy.

India's hospital system is open to innovation, but adoption is hindered by real-world constraints like revenue cycles, procurement clarity, and infrastructure. Startups should not build only solutions but also the systems, pricing models, and partnerships that can align with these realities.

The PPI framework used in this research not only guides INS adoption but also serves for other digital health strategy. By identifying where readiness is high and where support is needed, India can create smart hospitals in reality across the healthcare landscape.

Non-clinical innovation are no longer a luxury for healthcare system; it's gradually becoming necessity. The current time is right to grab the vast opportunity. India is ready to move from fragmented digital pilots to integrated, patient-friendly, tech-enabled hospital ecosystems.

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