ANALYSIS ON OUT-PATIENT FEEDBACK VS SATISACTION

DONE FOR

Project Report Submitted in partial fulfilment of the requirement of
PONDICHERRY UNIVERSITY for the award of the degree of
MASTER OF BUSINESS ADMINISTRATION

By

POLKAM SRIDEVI
(Reg. No. 22401024)

Under the Guidance of

Dr. S. AMOLAK SINGH
Assistant Professor
&
NARSIMHA RAO
Unit Manager, Lotus Hospitals

DEPARTMENT OF MANAGEMENT STUDIES
SCHOOL OF MANAGEMENT
PONDICHERRY UNIVERSITY
PONDICHERRY-605014

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DEPARTMENT OF MANAGEMENT STUDIES
SCHOOL OF MANAGEMENT
PONDICHERRY UNIVERSITY
PONDICHERRY-605014

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This is to certify that this project report entitled **" Analysis on Out-Patient feedback vs Satisfaction"** done for <u>Lotus hospitals</u> is submitted by **Polkam Sridevi (Reg.No:22401024),** II MBA (DA) to the **DEPARTMENT OF MANAGEMENT STUDIES, SCHOOL OF MANAGEMENT, PONDICHERRY UNIVERSITY** in partial fulfilment of the requirements for the award of the degree of **MASTER OF BUSINESS ADMINISTRATION (DATA ANALYTICS)** and is a record of an original and bonafide work done under the guidance of **Dr. S. Amolak Singh**, Assistant Professor, Department of Management Studies, Pondicherry University. This report has not formed the basis for the award of any degree, diploma, associateship, fellowship or other similar title to the candidate and that the report represents an independent and original work on the part of the candidate.

<div align="right">

Dr. S. Amolak Singh
Assistant Professor and Project Guide
Department of Management Studies

</div>

Dr. R. Kasilingam
Professor and Head
Department of Management Studies

Date:
Place: Pondicherry 605 014

DECLARATION

I hereby declare that the project titled, **"Analysis on Out-Patient feedback vs Satisfaction"** is an original work done by me under the guidance of **Dr. S. Amolak Singh, Assistant Professor,** Department of Management Studies, Pondicherry University, and **Narsimha Rao, Unit Manager, Lotus Hospitals, Kukatpally**. This project or any part thereof has not been submitted for any Degree / Diploma / Associateship / Fellowship / any other similar title or recognition to this University or any other University.

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Polkam Sridevi
Reg. No. 22401024
II MBA (DA)
Department of Management
Pondicherry University

Date:
Place:

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ACRONYMS

NABL   National Laboratory Accreditation Council

NABH   National Council for the Accreditation Board of Health care

NICU   Neonatal Intensive Care Unit

AAIMS   All India institute of Medical Sciences

EDA   Exploratory Data Analysis

NPS   Net Promoters Score

OP   Out-Patient

LH   Lotus Hospital

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Chapter – 1

INTRODUCTION

1.1 Introduction

The project is all about the analysis of feedbacks given by the out patients (OP) Lotus Hospitals. The dataset containing the out – patient feedbacks is called NPS data. Before conducting the analysis using the dataset, an observational study was done to understand how in general patients behave in the hospital, if they are facing any difficulties, if they are raising any concerns and so on.

The software analysis done are the data cleaning, the descriptive study and the linear regression. Based on the results, few suggestions were given to the management which are under consideration.

1.2 Scenario of NPS

NPS or the Net Promotor Score is calculated from the patient's response to the question, 'I will recommend Lotus Hospitals', in the feedback form they receive post their OP consultation.

If the response (or rating) is greater than 8, then the patient is a 'Promotor'. If the rating is 7 or 8, the patient is considered as 'Neutral' and if the rating is less than 7, then the patient is a 'Detractor'.

1.3 Need for the Study

NPS is one of the most critical data that helps to understand the patient's experience in the hospital as well as their expectations from the hospital.

It helps to analyse what are the facilities that are performing well or least well, what are the areas that require immediate attention and improvement, etc.

Based on the analysis, improvement steps will be taken and tested. If these steps help to improve the NPS, then it will be implemented in the Lotus Hospital.

1.4 Objectives of the Study

The primary objective of the study is to estimate variables that are influencing the Net Promotor Score.

Other objectives are:

➢ To check the influencing variables, and measure their impact.

➢ Compare the results of observational study to the software analysis results.

Chapter – 2
COMPANY AND INDUSTRY PROFILE

2.1 Company Profile

Link - https://www.lotushospitals.in/

The legacy of Lotus Hospitals is that of Dr. V.S.V. Prasad and one that precedes Lotus Hospitals itself. Having studied medicine and completed his residency in All India Institute of Medical Sciences (A.I.I.M.S) in 1991, Dr. Prasad further specialised in the US and UK to acquire his Fellowship in Paediatric Critical Care & Neonatology. After 7 years of training, he then returned to India to set up a paediatric care hospital of global standards. He helped set up and founded a few children's hospitals in Hyderabad before setting up Lotus Hospitals in 2006 with the mission to provide quality healthcare that was accessible to all.

Dr. V.S.V. Prasad has built Lotus Hospitals as an institution that is forever growing in its infrastructure, knowledge and services. After having established Lotus Hospitals as a leading centre for Paediatric Services in Hyderabad, he then grew it to accommodate the medical needs of a small family unit by adding obstetrics and fertility to its services at Lotus Hospitals in Lakdi ka Pul, Kukatpally and L.B. Nagar.

With the intention of providing quality care for all, he has furthered Lotus Hospitals' reach to Visakhapatnam by establishing an equally well-equipped hospital with world class facilities.

Lotus Hospitals has been recognised by the National Accreditation Board of Healthcare Organisations, Government of India (N.A.B.H.) for following all the safety and hygiene protocols laid down by them. The Neonatal Intensive Care Units (N.I.C.U.) have been constructed with corridors that are lined with large glass walls. This allows for parents to interact with the doctors and see their child without entering the highly sterile environment of the N.I.C.U., a unique infrastructure feature that was introduced in India by Lotus Hospitals.

The Paediatric Intensive Care Unit has been accredited by the Indian Academy of Paediatrics — Intensive Care Chapter & the Paediatric Section of the Indian Society, New Delhi. This is

owing to the challenging cases that we take on of tertiary level care and above when it comes to emergency and intensive paediatric care.

With four centres across the city of Hyderabad and the first centre in Visakhapatnam, Lotus Hospitals is ever-growing so that we remain a hospital that offers a wholesome value system that is accessible to all.

2.2. Industry Profile

Healthcare industry is India's one of the largest sectors, both in terms of revenue and employment. It comprises of hospitals, medical devices, clinical trials, outsourcing, telemedicine, medical tourism, health insurance and medical equipment. India's healthcare delivery system is categorised into two major components - public and private. The public healthcare system (government), comprises limited secondary and tertiary care institutions in key cities and focuses on providing basic healthcare facilities in the form of primary healthcare centres (PHCs) in rural areas. The private sector provides majority of secondary, tertiary, and quaternary care institutions with major concentration in metros, tier-I and tier-II cities.

Indian Market Size

The Indian healthcare sector is expected to record a three-fold rise, growing at a CAGR of 22% between 2016–22 to reach US$ 372 billion in 2022 from US$ 110 billion in 2016. By FY22, Indian healthcare infrastructure is expected to reach US$ 349.1 billion. The healthcare sector is expected to generate 27 lakh jobs in India between 2017-22, over 5 Lakh jobs per year.

India's public expenditure on healthcare touched 2.1 % of GDP in FY23 and 2.2% in FY22, against 1.6% in FY21, as per the Economic Survey 2022-23.

In FY22, premiums underwritten by health insurance companies grew to Rs. 73,582.13 crore (US$ 9.21 billion). The health segment has a 33.33% share in the total gross written premiums earned in the country.

The Indian medical tourism market was valued at US$ 2.89 billion in 2020 and is expected to reach US$ 13.42 billion by 2026. According to India Tourism Statistics at a Glance 2020 report, close to 697,300 foreign tourists came for medical treatment in India in FY19. India has been ranked tenth in the Medical Tourism Index (MTI) for 2020-21 out of 46 destinations by the Medical Tourism Association. With US$ 5-6 billion size of medical value travel (MVT) and 500000 International patients annually, India is among the global leader destinations for international patients seeking advanced treatment.

The e-health market size is estimated to reach US$ 10.6 billion by 2025.

As per information provided to the Lok Sabha by the Minister of Health & Family Welfare, Dr. Bharati Pravin Pawar, the doctor population ratio in the country is 1:854, assuming 80% availability of 12.68 lakh registered allopathic doctors and 5.65 lakh AYUSH doctors.

Advantages in India

- Rising income, greater health awareness, lifestyle diseases and increasing access to insurance   contribute to the growth.
- Healthcare sector is one of India's largest employers.
- In the Union Budget 2022-23, the government allocated Rs. 86,200.65 crore (US$ 11.28 billion) to the Ministry of Health and Family Welfare (MoHFW).

Opportunities

- Additional three million beds will be needed for India to achieve the target of 3 beds per 1,000 people by 2025. Also, India will have one doctor to every 800 patients by
- 2030.
- Additional 1.54 million doctors and 2.4 million nurses will be required to meet the growing demand for healthcare. 58,000 job opportunities are expected to be generated
- in the healthcare sector by 2025.
- India currently holds the fourth position in attracting VC funding to the health-tech sector, with investments of US$ 4.4 billion between 2016 – 21, with US$ 1.9 billion invested in 2021 alone.
- Start-up HealthifyMe, with a total user base of 30 million people, is adding half a million new users every month and crossed US$ 40 million ARR in January 2022.

- The medical devices market is expected to reach US$ 11 billion by 2022, backed by rising geriatric population, growth in medical tourism and declining cost of medical services.

Chapter – 3
RESEARCH METHODOLOGY

3.1 Source of Data

Both primary and secondary source data are used for the study. The two datasets used for the study are the NPS data and OP footfall data.

NPS data (or the feedback data) is the primary data collected from the patients post their OP consultation. OP footfall data is the secondary data extracted from the hospital's database.

3.2 Summary of Data

NPS Data

No. of Rows = 335

No. of Columns = 29

The set of main questions are classified as Primary Keywords. These are the main

columns in the NPS data set.

• Appointment Experience (Primary Keyword)

• OPD Reception (Primary Keyword)

• Doctor's Experience (Primary Keyword)

• Laboratory Services (Primary Keyword)

• Radiology Services (Primary Keyword)

• Pharmacy (Primary Keyword)

• Housekeeping & Facilities (Primary Keyword)

• Parking and Security (Primary Keyword)

• I will recommend Manipal Hospitals (Primary Keyword)

The columns contain the rating given by the patients. Based on the input provided, next set of questions comes up for them. Below are some of the secondary level keywords:

- Courtesy and responsiveness of desk staff (Second Level Keyword)

- Ease of booking – Website (Second Level Keyword)

- Toll free number (Second Level Keyword)

- Time taken for registration (Second Level Keyword)

- Ease and comfort of finding your way inside the hospital premises

- Courtesy and compassion of the doctor (Second Level Keyword)

- Explanation to your queries (Second Level Keyword).

3.3   Research Instrument

NPS data is collected from the patients using a 3rd party software called Treatwell. Patient observations were done to analyse the customer behaviour on ground.

3.4   Variables Studied

From all the variables from both the datasets, only a few variables were considered for the study, for data privacy and security reasons.

Dependent variable: NPD

The independent variables are:

- All primary keywords

- Age

- Gender

3.5   Summary of the Respondents

All the respondents are Lotus Hospitals OP patients. 51.04% are male respondents and rest are females (48.96%).

6.87% are in the age group of 0 – 1, 6.87% are in the age group of 1 -2, 12.24% are in the age group of 3 – 4, 57.31% are in the age group of 5 – 12 and 16.87% are in the age group of 13 – 15.

3.6 Period of Data Collection

The data for the study are collected between August 2023 to November 2023.

3.7 Data Analysis and Statistical Tools used

Exploratory Data Analysis is done on the data to derive the descriptive information from the data. Linear regression is run on the data to understand the different variables

that influence the Net Promotor Score the most.

Softwares used are:

• Excel – for data cleaning and EDA

• BlueSky Statistics – for linear regression

3.8 Scope of the Study

The study focuses on the different factors that influence the Net Promotor Score. The feedbacks provided by the OP patients post their consultation, between August 2021 and November 2022 are taken for the study.

A descriptive study for analysing the trends and linear regression for identifying the most influencing variables are done in the project.

3.9   Significance of the Study

NPS or Net Promotor Score is one of the important factors to maintain and develop any institute. It is very important for Lotus Hospitals. To analyse the feedbacks from its patients and to draw insights from it.

The NPS data helps to understand the most satisfactory or dissatisfactory services / facilities in the hospital. It helps to maintain and improve those satisfactory services in future as well and identify the reasons behind dissatisfaction of any services and to rectify the same.

It helps, develop the overall functionalities of the organization.

3.10   Limitations

Due to data privacy and security reasons, some variables cannot be used for the academic research. Hence those areas could not be covered for the study. The target variable is categorical, therefore to study the linear relation between the variables, the target variable had to be converted to numerical variable. The data is highly biased towards the promotors.

Chapter – 4
DATA ANALYSIS AND FINDINGS

4.1   Data Pre-Processing

Data pre–processing is the manipulation or dropping of data before it can be used for the study. Excel and Python are used for the activity.

The pre-processing is done in 3 stages, based on the requirement:

1. For descriptive study or EDA

2. For overall linear regression

OP Footfall Cleaning for EDA

There are 335 rows and 29 columns in the data.

Delete irrelevant data

Name, mobile number, email id, UMRID, etc. are irrelevant.

NPS Data Cleaning for Linear Regression

The steps performed for Pre-processing are:

1. Merge NPS and OP footfall data.
2. Delete irrelevant data
    Submitted date, submitted time, submitted by, feedback source, name, email, mobile number, visit date, etc. are irrelevant.
3. Remove noise or unreliable data
    - Secondary keywords and few manually calculated fields are not required for the regression
    - UMRID
4. Creating new variable
    The target variable 'NPD' is created from the rating given in 'I will recommend Manipal Hospitals (Primary Keyword)' column.
    NPD – Neutral Promotor Detractor.
    The logic used for building the new column is:
    The ratings between 0 and 6 are Detractors, 7 and 8 are Neutrals and 9 and 10 are Promotors.

4.2   Descriptive Study of the Data

Descriptive study is done with the help of Excel. If helps to draw meaningful insights from the data.

A. Target

Table 4.2.1 – NPS %

NPS	Count of NPS
Detractors	0.60%
Passives	14.93%
Promoters	84.48%

From Table 4.2.1, it is evident that the promoters (84.48%) are higher than passives (14.93% or detractors (0.60%).
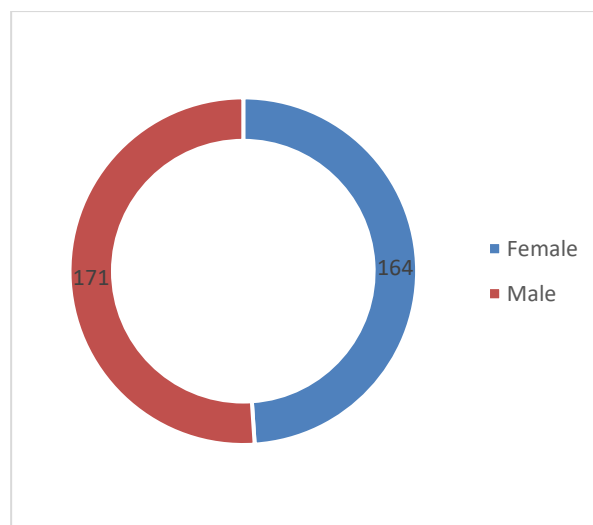
B. Demographics

<u>Gender</u>

Fig. 4.2.1 – LH Footfall

From the above figure, we infer the below:

- Male ratio is higher than female ratio with respect to footfalls, feedbacks and detractors.
- Fig.4.2.1 shows that the male footfalls ratio (51%) is higher than the female ratio (48%).

Age

Table 4.2.2 – Age group vs NPS

Age Group	Detractors %	Passives %	Promoters %	Grand Total %
Infant	0.00%	0.90%	5.97%	6.87%
Pre schooler	0.30%	1.79%	10.15%	12.24%
School aged child	0.30%	8.66%	48.36%	57.31%
Teens	0.00%	2.39%	14.33%	16.72%
Toddler	0.00%	1.19%	5.67%	6.87%
Grand Total	0.60%	14.93%	84.48%	100.00%

Table 4.2.2 shows the different age groups with respect to the NPS.

From the table, we can infer the below:

- School aged child group (48.36%) has highest promoters followed by teens (14.33%) and remaining followed by respectively.
- School aged child group (8.66%) has highest passives followed by teens (2.39%) and remaining followed by respectively.

Table 4.2.3 Age group vs Gender vs Satisfaction

Age Group	Female %	Male %	Grand Total %
Infant	4.08%	4.08%	8.16%
Pre schooler	6.12%	6.80%	12.93%
School aged child	29.25%	28.57%	57.82%
Teens	4.76%	8.16%	12.93%
Toddler	1.36%	6.80%	8.16%
Grand Total	45.58%	54.42%	100.00%

Table 4.2.3 shows Age group with respect to the Gender and Satisfaction.

From the table, we can infer the below:

- Female (29.25%) of School aged child group is having higher satisfaction than the male (28.57%).
- Male (8.16%) of teens group is having high satisfaction than female (4.76%).
- Preschooler and teens group are having same satisfaction levels (12.93%).
- Infant and Toddler group are also having the same satisfaction levels (8.16%).

General Conclusion from the Descriptive Study

There are people who are dissatisfied with some or the other services provided at LH but still they are promotors and vice versa.

Factor Analysis

Table 4.2.4

	Factor1	Factor2
SS loadings	14.3350	1.1100
Proportion Var	0.7170	0.0560
Cumulative Var	0.7170	0.7720

Factor analysis is a statistical technique that reduces a set of variables by extracting all their commonalities into a smaller number of factors. It can also be called data reduction.

The factor analysis results suggest that there are two main dimensions of patient satisfaction with the hospital: satisfaction with staff and services and overall satisfaction and recommendation. These dimensions are consistent with previous research on patient satisfaction in healthcare settings.

It is important to note that the factor analysis results are based on a sample of patients from a single hospital. The results may not be generalizable to other hospitals or patient populations.

1. Factor Loadings:

  - Factor loadings represent the strength of the relationship between the original variables (survey questions) and the identified factors. In this analysis, two factors were extracted.

  - For Factor 1:

  - Variables that have high positive loadings (values close to 1) are strongly associated with Factor 1. These include "ease.of.getting.an. appointment," "response...courtesy. Of. staff," "registration.within.5.min," and others.

  - Factor 1 could be interpreted as "Service Quality" or "Hospital Efficiency" because it seems to capture aspects related to the ease of getting appointments, courteous staff, and efficient registration.

- For Factor 2:

- Variables with high positive loadings on Factor 2 include "explanation.about.service.provided.in. hospital," "consultation.within.15.min," "explanation. about. Treatment," and others.

- Factor 2 may represent "Communication and Care Quality," as it appears to capture factors related to how well the hospital explains services and treatments and the quality of care provided.

Hypothesis Testing

Table 4.2.5

	Values
Chi-sq statistic	727.2500
Degress of freedom	151.0000
P-value	3.1000e-76

- The chi-square statistic tests the hypothesis that two factors are sufficient to explain the underlying structure of the data.

- In this case, the chi-square statistic is 727.25 with 151 degrees of freedom, and the extremely low p-value (3.1e-76) indicates that the two-factor solution is statistically significant.

Chapter – 5
REGRESSION AND ESTIMATION

5.1   Linear regression on NPS Data

Linear regression is a statistical method used for modelling the relationship between a dependent variable and one or more independent variables by fitting a linear equation to the observed data. The simplest form of linear regression involves two variables, where one is considered the predictor variable, and the other is the response variable. The goal is to find the best-fitting straight line (linear regression line) that minimizes the difference between the observed values and the values predicted by the line.

Table 5.1.1 – LM Summary

LM Summary							
Residual Std. Error	df	R-squared	Adjusted R-squared	F-statistic	numdf	dendf	p-value
0.2509	92	0.8578	0.8284	29.2063	19	92	p-value < 2.2e-16

p-value $< 2.2e - 16$

Residuals				
Min	1Q	Median	3Q	Max
-0.7011	-0.0160	-0.0160	-0.0122	0.8439

The residuals section provides information about the distribution of residuals, including minimum, 1st quartile, median, 3rd quartile, and maximum values. It helps assess the model's assumption of normally distributed residuals.

In summary, this linear regression analysis aims to model the relationship between the overall satisfaction of care received at Lotus Hospital and various independent variables related to different aspects of the hospital experience. The results provide insights into which factors have a significant impact on overall satisfaction, and the model's goodness of fit is measured by R-squared, F-statistics, and p-values.

Table 5.1.2 – Linear Regression on NPS Data

	Estimate	Std. Error	t value	Pr(>|t|)	2.5 %	97.5 %
(Intercept)	-0.0602	0.3320	-0.1813	0.8565	-0.7195	0.5991
ease.of.getting. an.appointmen t	0.2303	0.1166	1.9752	0.0512 .	-0.0013	0.4619
response...cou rtesy.of.staff	0.1439	0.0993	1.4484	0.1509	-0.0534	0.3412
registration.wit hin.5.min	-0.0656	0.1633	-0.4019	0.6887	-0.3899	0.2587
query.handling	0.0705	0.0847	0.8327	0.4071	-0.0977	0.2387
explanation.ab out.service.pro vided.in.hospit al	-0.8000	0.1778	-4.4994	1.9884e-05 ***	-1.1532	-0.4469
consultation.wit hin.15.min	-0.0913	0.1677	-0.5442	0.5876	-0.4244	0.2418
explanation.ab out.treatment	0.9847	0.2023	4.8675	4.6671e-06 ***	0.5829	1.3865
privacy.during. consultation	-0.1057	0.1340	-0.7888	0.4322	-0.3719	0.1604
billing.services	-0.1020	0.0942	-1.0832	0.2815	-0.2891	0.0850
doctor.availabil ity.at.the.sched uled.appointed .time	-0.0685	0.1346	-0.5087	0.6122	-0.3358	0.1989
ease.of.getting .test.report	-0.0919	0.0994	-0.9246	0.3576	-0.2894	0.1056
radiology.staff. courtesy	0.7062	0.1273	5.5479	2.7598e-07 ***	0.4534	0.9590
lab.staff.courte sy	-0.0474	0.1173	-0.4043	0.6870	-0.2805	0.1856
nursing.staff.c ompetency.in.s ample.collectio n	-0.1400	0.1139	-1.2289	0.2223	-0.3663	0.0863
hospital.cleanil iness	0.3097	0.1329	2.3306	0.0220 *	0.0458	0.5737
waiting.area.a mbiance	-0.0440	0.1060	-0.4153	0.6789	-0.2546	0.1665
parking	0.0538	0.0488	1.1036	0.2727	-0.0430	0.1507
security	0.0496	0.1213	0.4093	0.6832	-0.1912	0.2905
how.happy.wo uld.you.feel.ab out.recommen ding.us.to.famil y.and.friends.	0.0115	0.0500	0.2300	0.8186	-0.0877	0.1107

Table 5.1.2 shows the ANOVA table that is required after running linear regression on the independent and dependent variables.

The cells under the column Pr(>|t|) shows the statistical significance (< 0.05) of the corresponding variables. Doctor experience, parking, OPD, radiology, housekeeping and are the statistically significant variables, in ascending order of significance.

Chapter – 6
FINDINGS, SUGGESTIONS AND CONCLUSION

6.1   Summary of Findings

- Male footfalls ratio (51%) is higher than the female ratio (48%).

- School aged child group has highest promoters followed by teens and

  remaining followed by respectively.

- Female of School aged child group is having higher satisfaction than the male.

- Infant and Toddler group are also having the same satisfaction levels.

- There are people who are dissatisfied with some or the other services provided

  at LH but still they are promotors.

6.2   Suggestions

- Maintain and improve the standard of all the facilities, in future as well.
- Parking, Reception, Pharmacy and House-keeping facilities which shows a negative impact on the overall.
- NPS should be considered and measures to improve are to be taken.
- People from all ages were having waiting time issues as most of them are

  working professionals. Therefore, it is very important to reduce the waiting

  time.

- Reason for poor patient's experience must be considered and appropriate actions should be taken.
- There should be a proper queuing mechanism to handle the waiting patients. Nurse / champion who calls in patients should be aware of time slots given to each patient and should try to maintain it.

  [Note: The comparison between observational study and software analysis cannot be published because of data privacy constraints.

6.2   Conclusion

The study was conducted to find those variables that influence the Net Promotor Score, by which the organisation can identify the areas that need immediate attention as well as those areas that are functioning as expected. Ground observation among the patients, observing their behaviour as well as software analysis on NPS data was both performed in order to achieve the objective.

The project report discusses only the software analysis due to data security issues. Post the analysis few areas that need immediate attention were identified and discussed to management. Few suggestions were also given.

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