# DISSERTATION

# AT

# DELOITTE, BENGALURU

# (FEB 10 – MAY 2, 2014)

**By**

**Saumya Verma**

**PGDHM**

**2012-2014**

**INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH**

**NEW DELHI**

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**Analysis of Issues in Radiology Information System faced by the End Users**

By

Saumya Verma

Under The Guidance

**Dr. Anandhi Ramachandran**

**Post Graduate Diploma in Hospital and Health Management**

**2012-2014**

## TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Saumya Verma** student of Post Graduate Diploma in Hospital and Health Management (PGDHM) from IIHMR, New Delhi has undergone dissertation training at Deloitte USI from **10- Feb-2014** to **02-may-2014**.

The candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The internship is in fulfillment of the course requirements.

I wish her all success in all her future endeavors.

05/05/2014

Dean, Academics and Student Affairs

IIHMR, New Delhi

Supervisor

IIHMR, New Delhi

## INTERNATIONAL INSTITUTE OF HEALTH MANAGEMENT RESEARCH

## NEW DELHI

# Deloitte.

May 02, 2014

## To Whom It May Concern

This is to certify that Ms. **Saumya Verma** was on a fixed term Internship from **February 10, 2014** to **May 02, 2014**. She has successfully completed her Internship in **Application Management Services**.

We wish you the very best in your future endeavors.

Yours truly,

For Deloitte Consulting India Pvt. Ltd.

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8c76bd3dda7880b456ecc3b562d2f
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## CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled ..Analysis..of..Issues..........
..in..Radiology..Information..System..faced
......by..end..users.............. and submitted by (Name)
..........Saumya..Verma........................ Enrollment
No. ........PG/12/079............ under the supervision of
........Dr...Anandhi..Ramachandran for award of Postgraduate

Diploma in Hospital and Health Management of the Institute carried out during the period from

...10/02/14.... to ...02./05./14......... embodies my original work and has not formed

the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any

other Institute or other similar institution of higher learning.

Saumya

Signature

4

# Certificate of Approval

The following dissertation titled "**Analyze the issues in Radiology Information System faced by end users** " is hereby approved as a certified study in management carried out and presented in a manner satisfactorily to warrant its acceptance as a prerequisite for the award of **Post-Graduate Diploma in Health and Hospital Management** for which it has been submitted. It is understood that by this approval the undersigned do not necessarily endorse or approve any statement made, opinion expressed or conclusion drawn therein but approve the dissertation only for the purpose it is submitted.

Dissertation Examination Committee for evaluation of dissertation.

Name                                          Signature

PARTHA DEY

Anandti Ramachandar                    K A

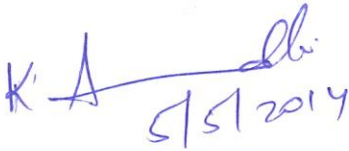ABHIJIT CHAUMASSONIM                05/05/14

# CERTIFICATE FROM DISSERTATION ADVISORY COMMITTEE

This is to certify that Saumya Verma a post graduate student of Post Graduate Diploma in Health and Hospital Management has worked under our guidance and supervision. She is submitting this dissertation report entitled "Analysis of issues in Radiology Information System faced by end users" in partial fulfilment of the requirements for the award of the Post Graduate Diploma in Health and Hospital Management

This dissertation has a requisite standard and to the best of our knowledge no part of this has been reproduced from any other dissertation, monograph, report or book.

Dr. Anandhi Ramachandran

Assistant Professor

IIHMR, New Delhi

Mr. Siddharth Biswas

Team Lead

Deloitte U.S.I

# FEEDBACK FORM

**Name of the Student:** Saumya Verma

**Dissertation Organisation:** Deloitte Consulting India Pvt. Ltd.

**Area of Dissertation:** Analysis of Issues in Radiology Information System faced by the End Users

**Attendance:** 10th Feb 2014 till 2nd May 2014

**Objectives achieved:** Saumya is now familiar with the Radiology Information System in Hospitals and Clinics – in both end user workflows and administrator configurations. Additionally, she also knows about the Incident and Change Management processes followed during the course of EMR maintenance.
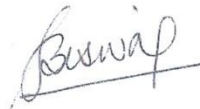
**Deliverables:**

Saumya has analysed issues occurring in the Radiology Information System. She has done on Root Cause Analysis on the same and has determined the trends occurring in the Hospitals and Clinics. On the basis of this, she was able to recommend suggestions to forecast and reduce the issues occurring in Radiology Information System.

**Strengths:**

Saumya has performed exceptionally well during her Internship period. She is a quick learner and has strong analytical skills. She quickly picked up the Radiology Information System configurations and workflows and has also used them in her daily work. In addition, she is also a good team player – she has helped in organizing monthly team events.

**Suggestions for Improvement:**

Saumya should try and improve her business communication skills as it will be an integral part of her daily work in future.

Signature of the Officer-in-Charge/ Organisation Mentor (Dissertation)

**Date:** Bangalore

**Place:** 2nd May 2014

# ABSTRACT

The Radiology module is an electronic server-based application designed with high flexibility and ease of usage, implemented in single clinics and polyclinics. It is a complete management system that handles all the business functions from patient management, diagnosis and reporting, to inventory control.

This study analyzes the issues faced by the end users after the implementation of the Radiology Information System in hospital and clinics.150 issues were gathered from the incident management tool and a root cause analysis was done. The issues were categorized into 5 major heads i.e. user training, security, incorrect build, data migration and interface issues. Good practices to reduce the recurrence of  the issues.

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## ACKNOWLEDGMENT

Hard work, guidance and perseverance are the pre requisite for achieving success. Support from an enlightening source helps us to proceed on the path. I wish to thank first of all the almighty that provided me energy for the successful completion of dissertation report at Deloitte, Bengaluru.

I am thankful and obliged to my mentor at Deloitte, Bengaluru Mr. Siddharth Biswas for giving me an opportunity to work on this report and for his continuous support, guidance and perseverance during the course of my report generation.

I am highly indebted to my mentor at IIHMR, New Delhi Dr. Anandhi Ramachandran for her valuable guidance and motivation on various aspects of report..

It has been my good fortune to be benefited by their knowledge, guidance and deep insight without which this report would not have taken the exact shape .To them, I tender my heartfelt regards.

## LIST OF FIGURES

# LIST OF ABBREVIATIONS

| | |
|---|---|
| RIS | Radiology Information System |
| EMR | Electronic Medical Record |
| PACS | Picture Archiving and Communication System |
| IHE | Integrating the Healthcare Enterprise |
| ECG/ EKG | Electrocardiogram |
| CT | Computed Tomography |
| PL | Protocoling List |
| SL | Signing List |
| RL | Reading List |
| MAR | Medication Administration Record |
| A.D | As Directed |
| A&E | Accident and Emergency |
| CAT | Computed Axial Tomography |
| CXR | Chest X Ray |

# INTRODUCTION

An Electronic Medical Record (EMR) is a digital version of a paper chart that contains all of a patient's medical history from one practice. It is mostly used by providers for diagnosis and treatment and it allows providers to track data over time, identify patients who are due for preventive visits and screening, monitor how patients measure up to certain parameters, such as vaccinations and blood pressure readings and improve overall quality of care in a practice and takes care of the billing of the procedures performed.

Radiology module is crucial for clinical support since imaging fundamental to clinical diagnosis, range and volume of imaging exams are increasing, imaging has key role in disease management, follow up and screening, image guided minimally invasive therapies radiologists increasingly utilized.

A Radiology Information System (RIS) is a computerized database used by radiology departments to store, manipulate, and distribute patient radiological data and imagery. The system generally consists of patient tracking and scheduling, result reporting and image tracking capabilities. RIS complements HIS (Hospital Information Systems), and is critical to efficient workflow to radiology practices.

Basic Features : Radiology information systems supports the following features:

Patient Registration

Scheduling of the appointments for the imaging procedures

Patient List Management

Interface with modality via Work list.

Radiology Department workflow management

Request and document scanning

Result(s) Entry

Reporting and printout

Result(s) Delivery including faxing and e-mailing of clinical reports

Patient Tracking

Interactive Documents

Technical Files Creation

Modality and Material management.

Epic's Radiology Information System – Radiology Module has tools for rules-based scheduling, documentation, results communication, chart/film tracking and detailed statistical reporting in a unified system that is fully integrated with the clinical systems of the client organization. It allows clients to link images and reports with a single system that can be accessed simultaneously by multiple users in multiple departments. The Radiology module is established in both hospitals and standing clinics of US. The project analyzes the issues that come up after the module has been implemented in the setups.

## REVIEW OF LITERATURE

1. CARA2 - WP2 - **Gap Analysis of the metadata of the structured radiological report**; Version 1.0, 12.01.2012; François Wisniewski

   Introduction: The aim of the eSanté-CARA project is to study and establish the basic functional and technical requirements for an IT system to share medical radiology data (reports and images) between the main actors of the Luxemburgish public health system, i.e. hospital radiology departments, doctors and patients. The outcome so far is that a centralized, government provided platform for the reliable and secure storage and exchange of medical patient data, called eSanté, will be the preferred solution. The present document aims to estimate how far away the actual metadata used in the individual hospitals' radiology departments are away from metadata requirements of the structured radiological report.

   The following hospitals are included in the study:

   1. Centre Hospitalier Emile Mayrisch (CHEM)

   2. Centre Hospitalier du Nord (CHdN)

   3. Centre Hospitalier Luxembourgeois (CHL)

   4. Fondation François-Elisabeth / Hôpital Kirchberg (FFE)

   5. Zitha Klinik (ZK)

   **Methods:** the following details were gathered for the each type of hospital:

   Language

Data identifying the patient

Exam information

Medical data

Report information

The assessment rules for the gap analysis were established.

**Conclusion:** In order to enable the data exchange with the eSanté platform, a minimal structure of the exchanged report is required. This report structure makes the information understandable by all systems of the various stakeholders and usable for anonymous statistics. This metadata gap analysis aims to raise the hospitals' awareness of the basic requirements for the metadata in the structured radiological report and to show individual hospitals where they stand in respect with those requirements. Alternatively the results presented in the document can be used by the hospitals to close their own individual metadata gaps in respect with the eSanté platform.

A list was configured with the metadata that have an average gap among all hospitals strictly below the 50%. This list should support the agence eSanté to set up a standardised header for the CDA document of the structured radiological report and enable exchange .

2. **Workflow management – integration technology for efficient radiology**; T. Wendler1 and C. Loef2; MEDICAMUNDI 45/4 November 2001

**Background**: Radiology is changing rapidly. In the healthcare system – and in radiology as an integral part of it – we are facing a challenging situation of shrinking budgets increasing cost pressure, and growing demands to increase both the efficiency and the

quality of services. Reacting to these challenges, healthcare enterprises increasingly rely on Information Technology (IT) solutions.In digital imaging departments, typical IT environments consist of various application systems: hospital information systems (HIS), radiology information systems (RIS), picture archiving and communication systems (PACS) and imaging modalities. Historically, these systems have been designed and developed by different communities, and are typically implemented and installed by different vendors. End users of systems are not generally interested in the technology-induced fragmentation of their IT infrastructure: it is simply a hindrance to providing an efficient service. Integration of application systems is therefore an urgent requirement, and the object of increasing attention.

**Introduction:** With respect to radiology, access to information is an important aspect, but not the only one. We are beginning to understand that the transition from film-based digital systems is much more than a change in the technology for storage, distribution or display data. We now see that these changes are accompanied by simultaneous changes in the processes of radiology and the organization of work. Business process re-engineering (BPR) and process automation (Workflow Management) are increasingly seen as key factors for the successful operation of digital imaging departments and hospitals.

**Methods**:

1.      Analyze the present situation: process integration and workflow management .

2.      Workflows in the radiology were identified,

3.      Workflow management technology in the radiology department was identified.

4.    Identify workflow enabled application systems

**Conclusions**: Workflow Management is an integration technology focusing on processes. It appears attractive for the automation of the majority of structured, routine processes in radiology, and can be beneficially applied in radiology to improve efficiency, co effectiveness and quality of services. Introduction of generic, process-independent

3.    **Integrated Radiology Information System, Picture Archiving and Communications System, and Teleradiology Workflow-Driven and Future-Proof**; Yao-Yang Shieh and Glenn H. Roberson

**Background**: The proliferation of integrated radiology information system/picture archiving and communication system (RIS/PACS) and teleradiology has been slow because of two concerns: usability and economic return. A major dissatisfaction on the usability issue is that contemporary systems are not intelligent enough to support the logical workflow of radiologists.

**Introduction**: The Paradigm Shift from film-based imaging to digital-data-based imaging requires a reevaluation of radiology operations. Contemporary radiology information systems (RIS) picture archiving and communications systems (PACS)-based radiology systems 14 have evolved considerably from the original systems developed in early 1980s, but image interpretation using PACS is still not generally accepted as the norm due to concerns regarding usability and affordability. On the usability issue, contemporary systems do not yet live up to the expectations of radiologists by presenting images and/or clinical data effectively. Common problems include the following: (1)

Contextual information pertaining to the current episode such as patient's symptoms, complaints, and reason for doing an x-ray procedure is lacking or incomplete. (2) Delays in bringing upa new case, especially when the total number of images in the case is large. (3) The field-of-view provided by the monitor is different from that of traditional view box station. This makes the comparison between different series awkward and difficult. (4) The previous examination is made available in its original form for the radiologist to review. The radiologist has to spend the same amount of time reviewing the whole series images in an examination over again to refresh his impression of any previous examination.

**Methods**:

1. Contextual information will be retrieved automatically from RIS.

2. The display of images can be arranged to consist of two windows.

3. Provision of flexibility in comparison formats.

4. Provision of a utility to enable the radiologist to tag of even add annotation to frames of significance.

4. **Significance of using DICOM communication standard in quality assurance in radiation oncology - an institutional experience**; Tobias P1, Vrana D, Cwiertka K, Gremlica D, Slampa P ;      1Department of Radiation Oncology, Masaryk Memorial Cancer Institute and Masaryk University, Faculty of Medicine, Brno, Czech Republic

**Introduction**: The purpose of this article was to highlight the importance of data management systems in radiotherapy.

**Method**: We performed a database search to review the errors or potential errors in radiotherapy planning and delivery which could be prevented in case of using the DICOM communication system.

**Results**: We registered the following rates of errors: 1) Errors caused by manual rewriting of treatment plan 30%; 2) Errors caused by wrong assignment of the verification system 15%; 3) Errors during the manual rewriting of treatment data to the verification system 15%; 4) Patient identification 5%; 5) Field verification 15% 6) Wedge orientation 10%.

**Conclusion**: DICOM communication system may significantly improve the quality assurance in radiotherapy

5. **Implementation of a departmental picture archiving and communication system: a productivity and cost analysis**; Macyszyn L1, Lega B, Bohman LE, Latefi A, Smith MJ, Malhotra NR, Welch W, Grady SM ; Department of Neurosurgery, University of Pennsylvania, Philadelphia, Pennsylvania 19104, USA. Lukasz.Macyszyn@uphs.upenn.edu

**Background:** Digital radiology enhances productivity and results in long-term cost savings. However, the viewing, storage, and sharing of outside imaging studies on compact discs at ambulatory offices and hospitals pose a number of unique challenges to a surgeon's efficiency and clinical workflow.

**Objective:** To improve the efficiency and clinical workflow of an academic neurosurgical practice when evaluating patients with outside radiological studies.

**Methods:** Open-source software and commercial hardware were used to design and implement a departmental picture archiving and communications system (PACS).

**Results:** The implementation of a departmental PACS system significantly improved productivity and enhanced collaboration in a variety of clinical settings. Using published data on the rate of information technology problems associated with outside studies on compact discs, this system produced a cost savings ranging from $6250 to $33600 and from $43200 to $72000 for 2 cohorts, urgent transfer and spine clinic patients, respectively, therefore justifying the costs of the system in less than a year.

**Conclusion:** The implementation of a departmental PACS system using open-source software is straightforward and cost-effective and results in significant gains in surgeon productivity when evaluating patients with outside imaging studies

**6.** **Consolidated Imaging: Implementing a Regional Health Information Exchange System for Radiology in Southern Maine;** Stephenie Loux, MS; Robert Coleman, BS; Matthew Ralston, MD; Andrew Coburn, PhD;

**Background**: The traditional, film-based radiology system presents serious limitations for patient care. These include forcing clinicians to make decisions based on information that is often less than optimal and making transfers of films and prior studies to other facilities more complicated than they need to be. Picture Archiving and Communication Systems (PACS) address these issues by allowing for acquisition, storage, display, and communication (e.g., transportation) of images in a digital format. Although PACS has been shown to improve patient care, many rural health care organizations have found

obtaining these systems cost-prohibitive. The Consolidating Imaging Initiative (CI-PACS) in Maine provides an alternative way to offer this technology to rural hospitals.

**Introduction:** The health care system has increasingly focused on obtaining health information technology (HIT), especially electronic medical records (EMRs). Although the number of health care providers adopting HIT has increased, there continue to be significant barriers and challenges to acquiring this technology. Hospitals identify cost as the major barrier to adopting HIT, including initial and ongoing costs of maintaining the systems.2 Other important challenges include issues with interoperability with other systems, medical staff support and usage of HIT, difficulty building a strong business case for adoption, availability of IT staff, and privacy and security of patient information.

Sharing a PACS among multiple providers is not necessarily a new concept. However, most attempts involve organizations that all belong to the same health system and share the same technology infrastructure, patient identifiers, information systems, and support staff. They also share the same organizational structure, which reduces or even eliminates issues of trust, cooperation, persistence, and dedication to fundamental change. On the other hand, a shared PACS must integrate multiple organizations in order to make each hospital's system compatible with the shared system. They also must gain the trust and cooperation of independent radiologists.

**Methods :**

1. Identify the hospitals or clinics involved.

2. Establish the workflow for the transfer and storage of information and the images

24

3. Implement CI-PACS

a.      Phase 1: Pre-implementation preparation.

b.      Phase 2: Establish network connectivity.

c.      Phase 3: Demographics/radiology order flow.

d.      Phase 4: Computed radiography implementation.

e.      Phase 5: Modality connectivity and digital archiving.

f.      Phase 6: Diagnostic softcopy reading.

**g.**      Phase 7: Web access rollout.

**Conclusion:** The Consolidated Imaging Initiative developed by MaineHealth and Maine Medical Center can provide other rural and urban hospitals with a blueprint for developing systems within their own communities. Most staff at the rural hospitals thought the implementation process went well overall and was probably easier and faster than if they had implemented a stand-alone PACS. They have already perceived an impact of the shared system on their radiology departments, especially for access to relevant priors from other organizations.

## OBJECTIVES

### GENERAL OBJECTIVES:

- To analyze the issues in the radiology module of an EMR.

### SPECIFIC OBJECTIVES:

- Understand the workflow of the module along with the roles played by various stakeholders.

- Gather the issues faced after the implementation of the radiology module in at a client setup.

- To find the count of issue faced by the users.

- To identify and analyse the different types of issues face by the user.

- To identify the areas in the workflow where the issues crop up.

- Root cause analysis of the issues.

- Ways to reduce them.

# RESEARCH METHODOLOGY

## Research Design

Type of Research: Exploratory and Descriptive Research

## Sample Design

•        Sample Unit: Issue

•        Sample Size: 150

•        Sampling Technique: Purposive Sampling

•        Sampling Area: PC hospitals and clinics

## Data Collection

- Source

  Secondary Data:

- Data was collected from the system database,

- Data available on Internet and journals.

- Tools

  The data was collected through incident management application .

## Data Analysis

Statistical analysis

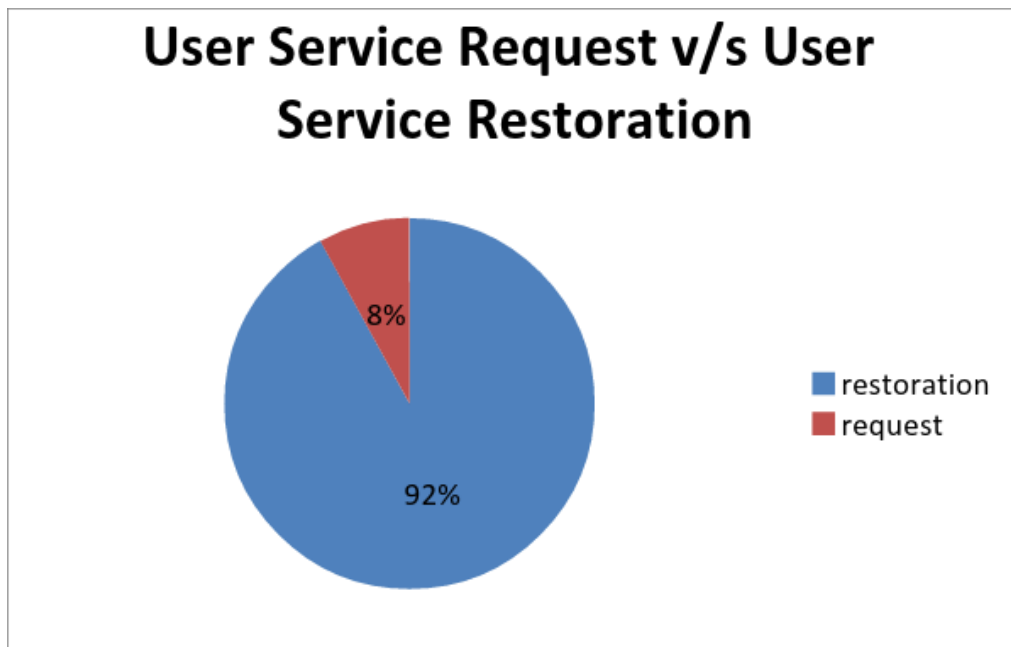Techniques: Frequencies, Cross-tabs, Factor analysis and Mean

## RESULTS

1. **User Service Request v/s User Service Restoration**

   User service request issues are the ones in which the end users require some modifications in the application to streamline their workflows with that of the application. It takes care of those modifications in the existing functionalities .
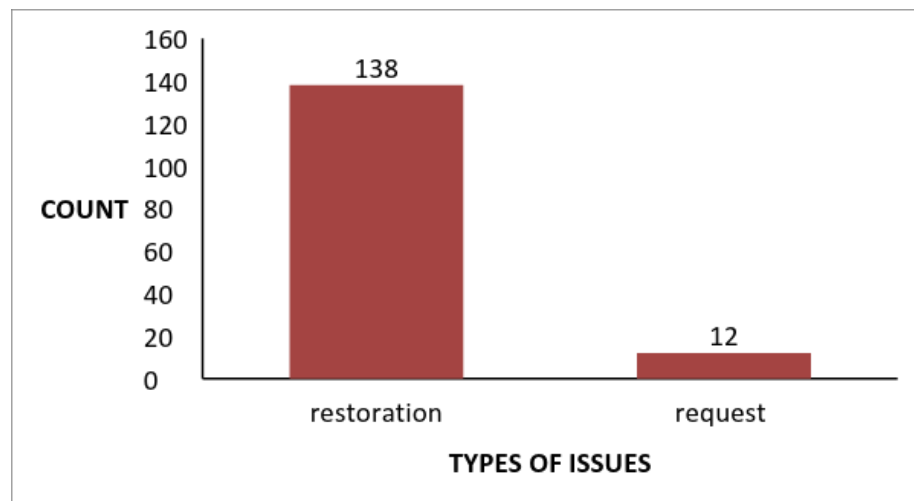
   User service restoration is the category for the issues that require a build – fix issues. It fixes those functionalities that are supposed to function properly but are not.

   | Total issues | 150 |
   |---|---|
   | User service request | 12 |
   | User service restoration | 138 |

**Figure 1**



**User Service Request v/s User Service Restoration**

- restoration
- request

8%

92%

**Figure 2**



160
140    138
120
100
COUNT  80
60
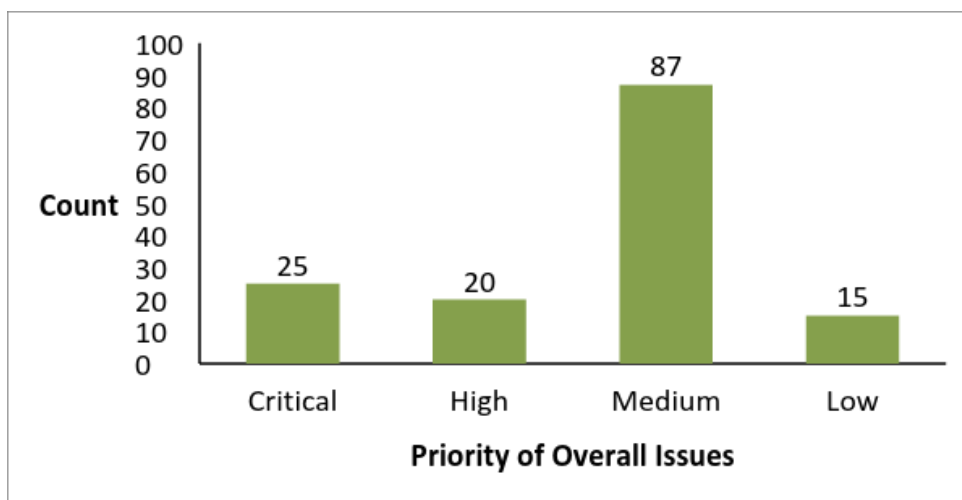40
20    12
0
       restoration          request
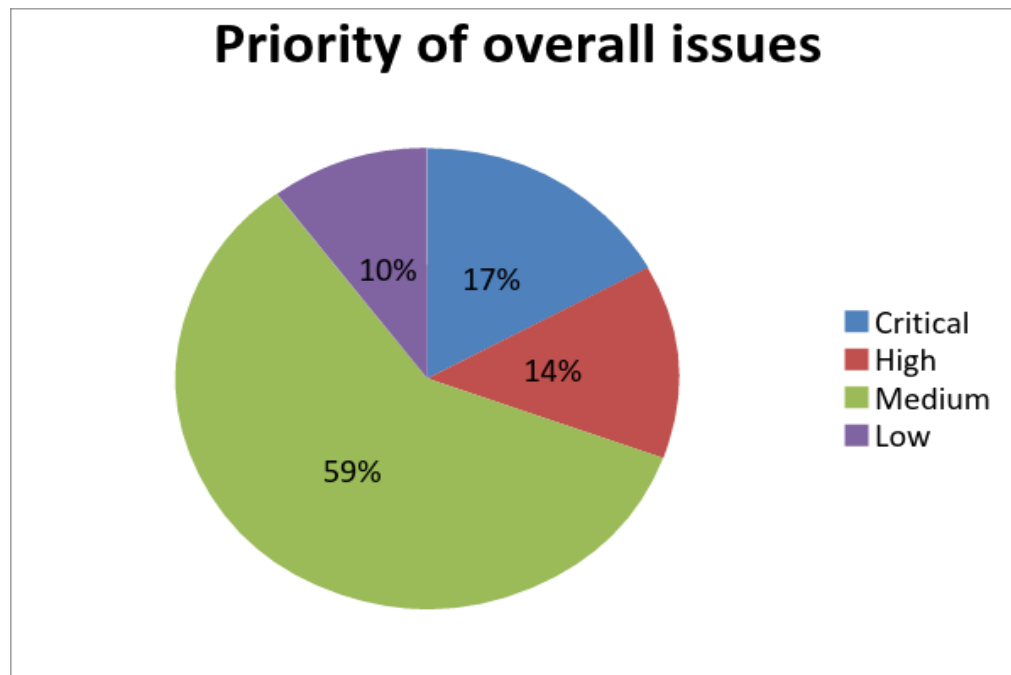
**TYPES OF ISSUES**

2.	Priorities of overall tickets: Priority is decided at the first level of triaging on the basis of the impact and urgency of the issue.

| Total | 150 |
|---|---|
| Critical | 25 |
| High | 20 |
| Medium | 87 |
| Low | 15 |

**Figure 3**

**Figure 4**

## Priority of overall issues



10%   17%

14%

59%

- Critical
- High
- Medium
- Low

3.      Root cause analysis of the overall tickets:

The issues faced by the user after implementation of the radiology module can be categorized

into 6 major heads-

1.  User training issues

2.  Incorrect build

3.  Third party issues

4.  Security issues

5.  Interface issues
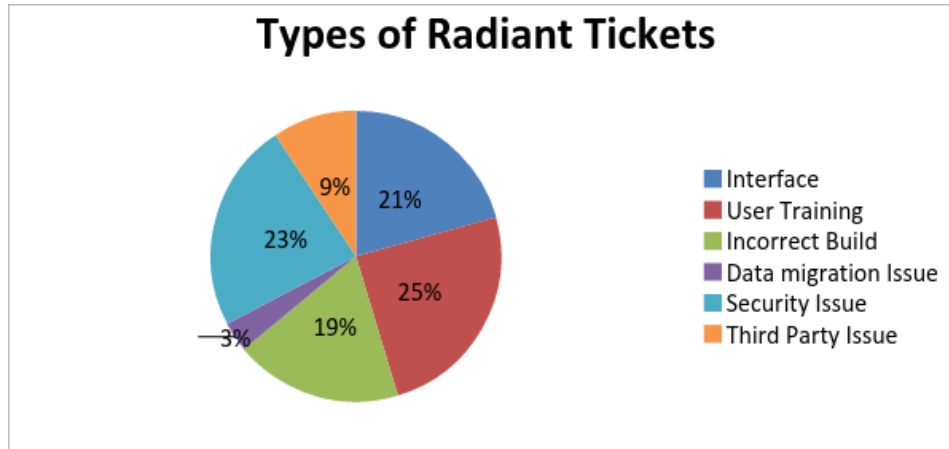
6.  Data migration issues

| Total issues | 150 |
|---|---|
| Incorrect build | 28 |
| Third party issues | 14 |
| User training issues | 37 |
| Security issues | 35 |
| Interface issues | 31 |
| Data migration issues | 5 |

**Figure 5**

**Figure 6**



## Types of Radiant Tickets

- Interface — 21%
- User Training — 25%
- Incorrect Build — 19%
- Data migration Issue — 3%
- Security Issue — 23%
- Third Party Issue — 9%
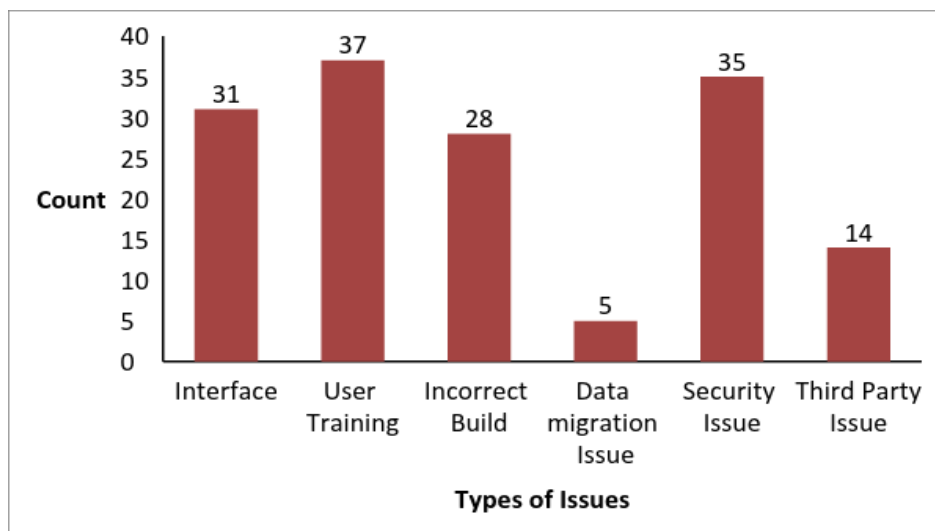
4.      Analysis of the type of priorities of user service restoration issues:

The priority of the ticket is decided on the basis of her impact and urgency of the issue. The criticality reduces on moving from critical to low.

| Total restoration issues | 138 |
|---|---|
| Critical | 25 |
| High | 19 |
| Medium | 81 |
| Low | 10 |

**Figure 7**
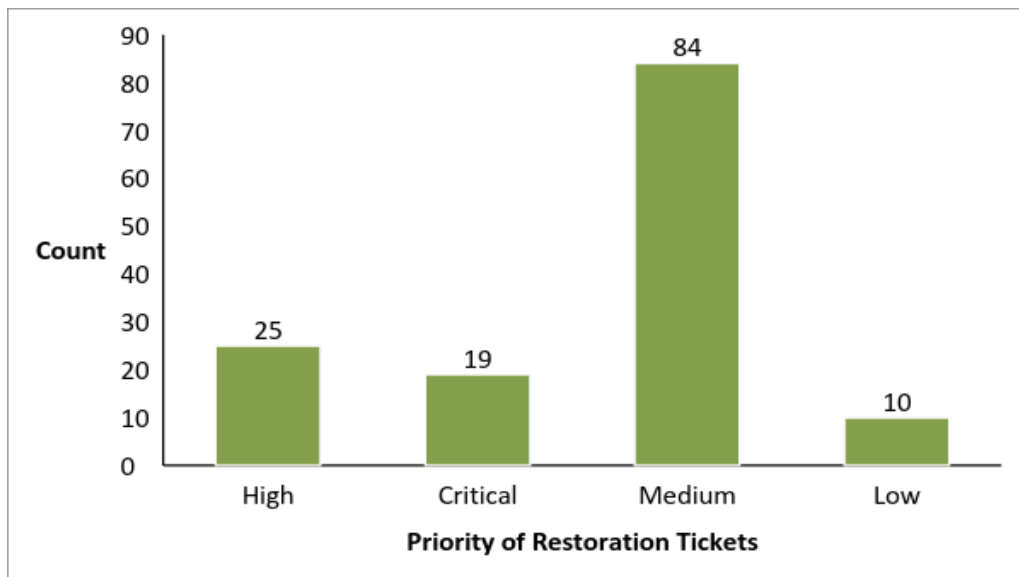


**Figure 8**
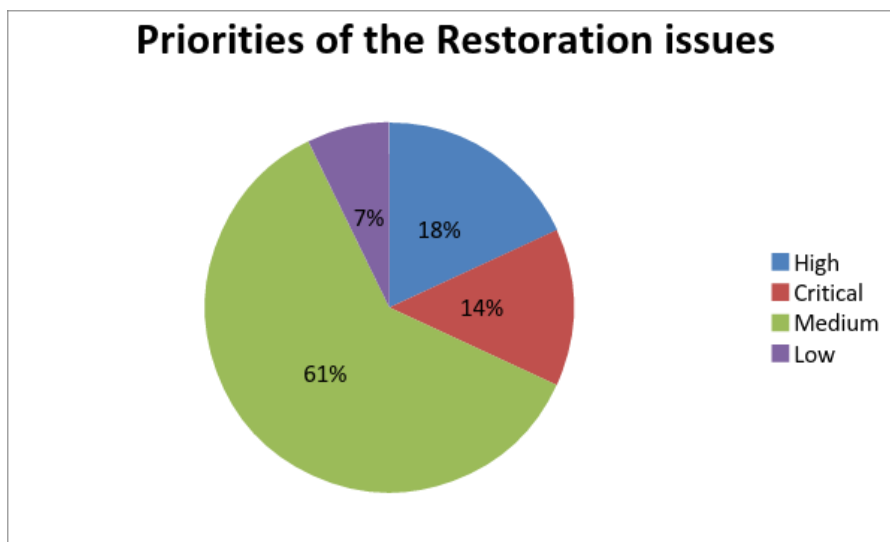
5.    Types of priorities of user service request issues:

| Total | 12 |
|---|---|
| Critical | 0 |
| High | 1 |
| Medium | 6 |
| Low | 5 |

**Figure 9**

**Figure 10**



## Priorities of Request Issues

- Medium — 50%
- High — 8%
- Low — 42%
- Critical
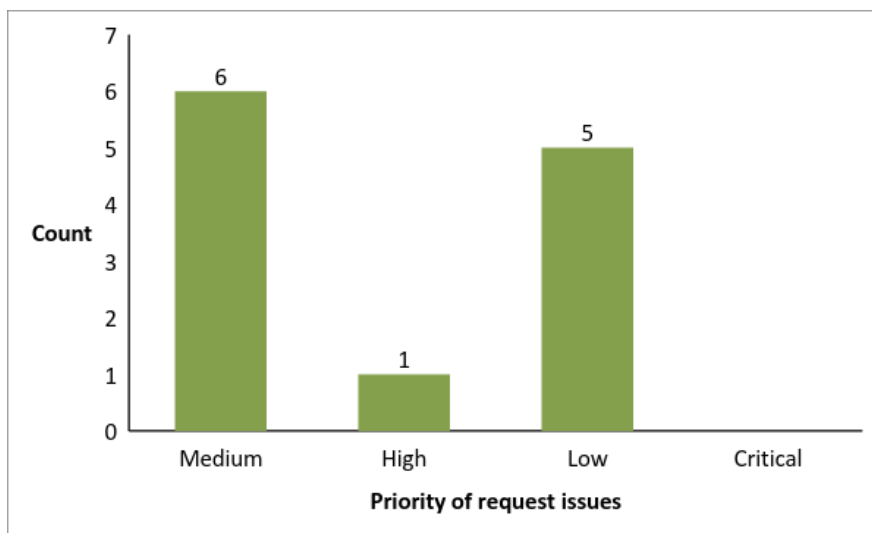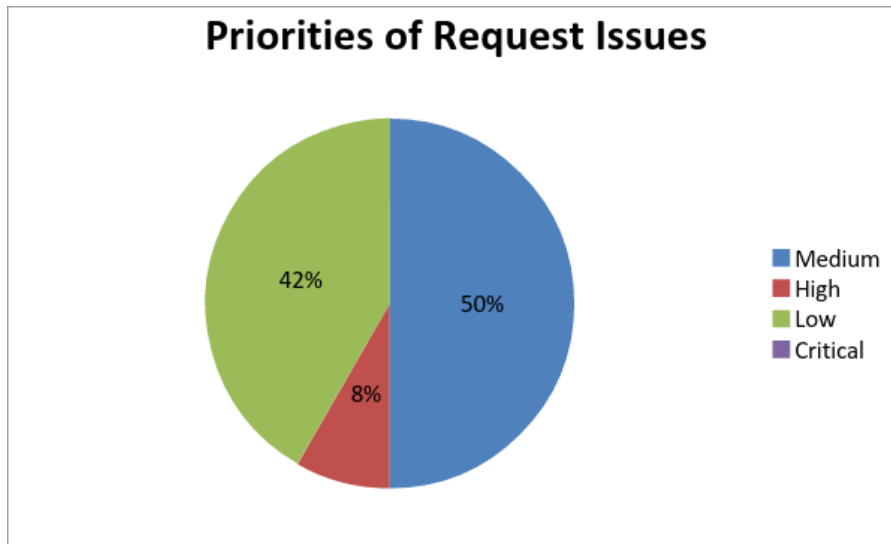
6.   Type of issues in user service request issues:

| Total | 12 |
|---|---|
| Incorrect Build | 4 |
| Security Issue | 4 |
| Third party issue | 2 |
| Interface | 2 |

**Figure 11**
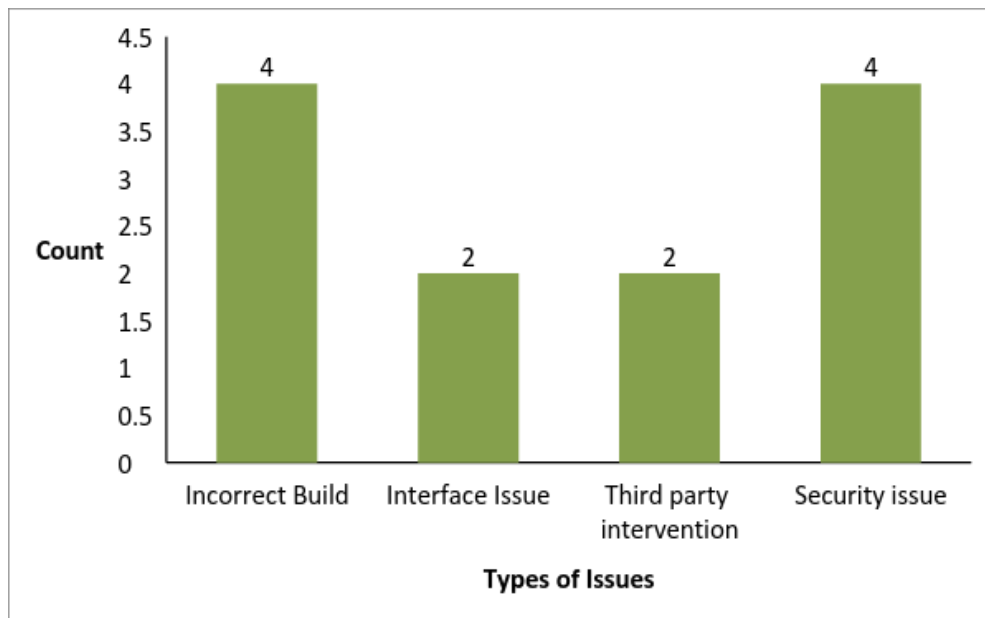


**Figure 12**
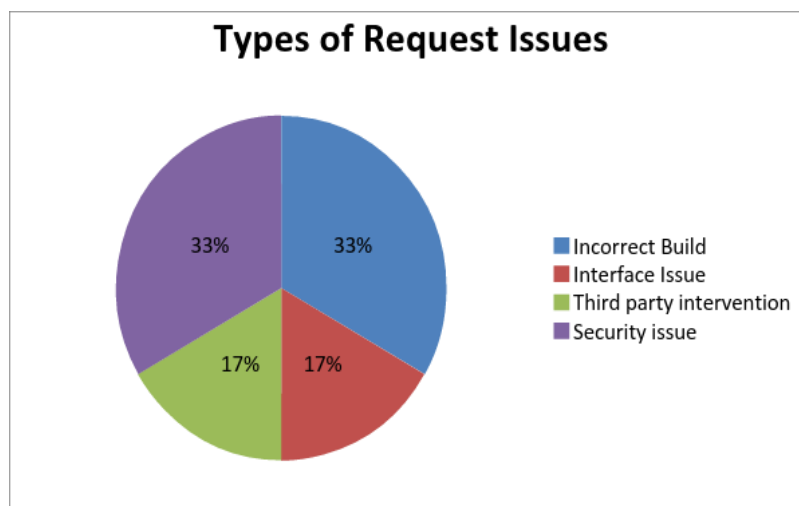
7.     The root cause analysis of the user service restoration issues :

| Total issues | 138 |
|---|---|
| Interface issues | 31 |
| User training issues | 37 |
| Incorrect build | 28 |
| Data migration issues | 5 |
| Security issues | 23 |
| Third party issues | 14 |

**Figure 13**

**Figure 14**



Types of Restoration Tickets

Third Party Issue, 10%
Security Issue, 17%
Interface, 22%
Data migration Issue, 4%
User Training, 27%
Incorrect Build, 20%
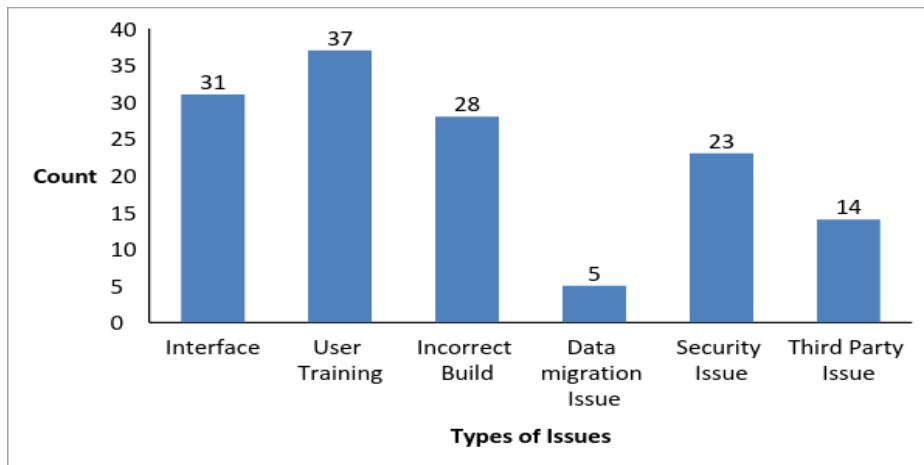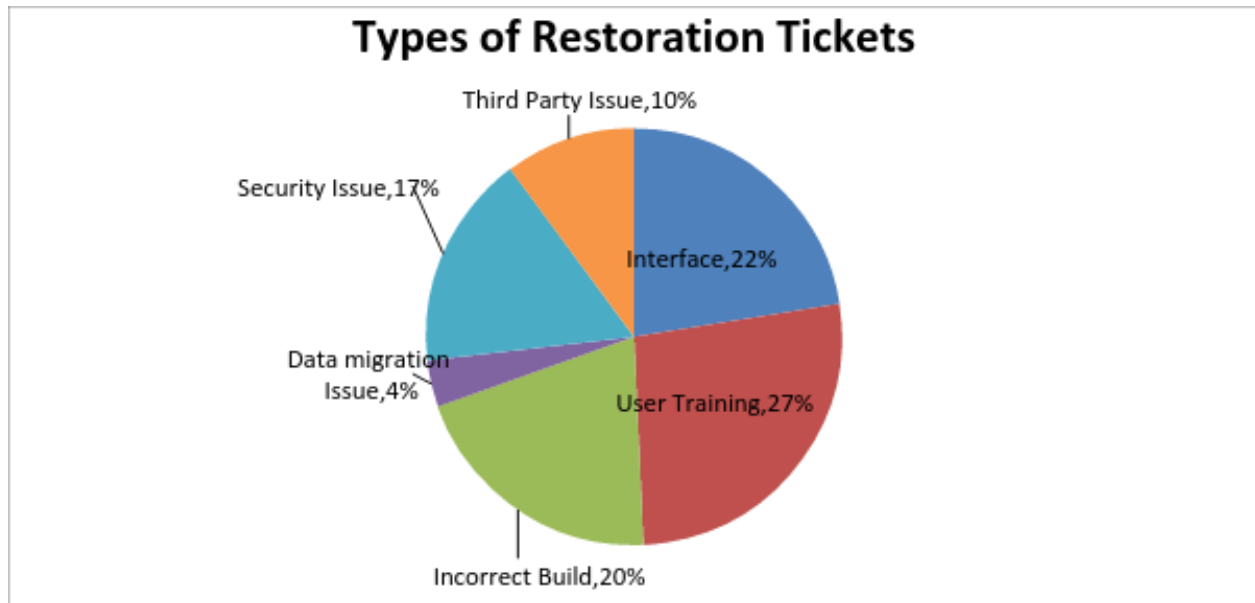
## DISCUSSION

As part of the project, the analysis of the issues faced by the end users, after the implementation of the radiology information system, has been done.

- Primarily the issues raised by the end users- front desk personnel, technologists and radiologist can be of 2 major categories. This classification has been done on the basis of whether the issue concerns a broken functionality or an modifying the existing functionality. If the issue is about a functionality is not working for the concerned user, then it is termed as User service restoration issue. If the issue is about a functionality which exists and the users needs modifications in it according to their workflow, then it is termed as User service request issue.

The analysis of the issues reveal that out of 150 issues analyzed, 138 were about the broken functionalities, i.e. they were user service restoration issues and 12 issues were where the end user required additional options  in the existing functionality. So the user service restoration accounts for 92% of the issues after the implementation of the radiology information system, and rest 2% is user service request. This exhibits that it is quite rare that users require an added feature, they have sufficient features for their scope of work.

- Radiology Information System is implemented in radiology labs of the clinics and hospitals. Although it directly does not provide patient care but is extremely significant in supporting patient care. The diagnosis of many abnormalities depends on the result of the imaging procedures. So on the basis of the impact and urgency of the procedures, the priority of the issues is decided. On the basis of its impact on the patient care and the urgency of the result of the procedure the priority can be categorized into 4 levels, i.e., critical, high, medium and low.

The critical issues, as the name suggests, are those which have the highest impact on the patient care and are extremely urgent. Such issues have to be resolved in the least time period.

The analysis of the issues reveal that out of 150 issues analyzed 25 were critical, 20 were high priority issues, 87 were that of medium priority and remaining 15 were that of low priority. So the critical issues accounts  for 17% of the issues after the implementation of

the radiology information system, high issues accounts for 14% of the issues, medium issues being the maximum of all accounts for 59% of the issues and issues with low priority accounts for 10% of the issues. This exhibits that in the radiology departments of the clinics or the hospitals most of the issues can be resolved easily within a relaxed time frame, but there can be issues at times where the patient care is at halt because of some issue.

- The root cause analysis of the issues, both restoration and request, reveals that the there are 6 categories in which all the issues raised by the end user after the implementation of the radiology information system, can be categorized into. They are:

    - Incorrect build

    - Interface issues

    - User training issues

    - Third party issues

    - Data migration issues

    - Security issues

- Incorrect build issues: there are number of functionalities that the end user can perform as part of their scope of work in the Radiology Information System. If any of these functionalities is not working for a particular user or a bunch of users with the same or different scope of work, that implies that there is something wrong with the back end configuration. In such a scenario the application support personnel has to navigate in the

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application, try to replicate the issue. If the personnel are also confident that there is a break in the backend configuration, they make the required changes in the backend.

- The analysis of the issues reveals that out of 150 issues raised by the end users, after the implementation of the radiology information system, 28 issues were that of incorrect build. This constitutes 19% of the total issues.

- It was also analyzed that all the incorrect build issues were of low priority, which means that the user had a work about for the non responding functionality.

- On analyzing the user service restoration issues, which are build – fix issues, it was noticed that out of 138 user restoration issues, 28 issues were that of incorrect build. This constitutes 20% of all the user restoration issues.

- On analyzing the user service request issues, which are upgradation issues, it was noticed that out of 12 user request issues, 4 issues were that of incorrect build. This constitutes 33% of all the user request issues.

Data migration issues: the hospitals and the clinics where the radiology information system was implemented earlier had other radiology modules. So whenever a new application system is installed or is upgraded, the data is transferred from the database of one application to that of other. This process is called data migration and how much so ever hard the implementation team attempts 100% data cannot be smoothly transferred across the databases.there can be many types of errors during the procedure like incomplete data transfer, incorrect data migration, mapping of the data can be improper, etc. in such scenarios only one solution is possible that , whenever such an issue comes up the implementation team should be immediately informed. The

implementation team can then make the due changes in the backend , by either reentering the data manually or finding the lost data.

- The analysis of the issues reveal that out of 150 issues raised by the end users , after the implementation of the radiology information system, 5 issues were that of data migration. This constitutes 3% of the total issues.this shows that such issues are rare.

- On analyzing the user service restoration issues, which are build – fix issues, it was noticed that out of 138 user restoration issues, 5 issues were that of data migration. This constitutes 4% of all the user restoration issues.

- On analyzing the user service request issues, which are upgradation issues, it was noticed that out of 12 user request issues, there were no data migration issues.

Security issues: in the radiology workflow it was noticed that there were mainly 3 stakeholders- the front desk personnel who places the orders and schedules them, the technologist who performs the exams  and the radiologist or the physician who documents the results and signs the final result of the imaging exam.since the roles and actions are clearly defined so the application provides the accessibility to the end users according to their role and responsibilities. All this already configured in the backend of the application . but if the workflow of some clinics or hospitals is even slightly different in terms of the roles and actions performed by their staff , then it requires changes in the backend from the application personnel.in such issues the application team first verifies the roles and actions with the administrator of the clinic or the hospital and then makes the due changes in the accessibility of the users.

- The analysis of the issues reveal that out of 150 issues raised by the end users , after the implementation of the radiology information system, 35 issues were that of security issues. This constitutes 23% of the total issues.

- It was also analysed that 18 of the security issues were of medium priority, 8 were of critical priority, 4 were that of high priority and rest 5 were of low priority.

- On analyzing the user service restoration issues, which are build – fix issues, it was noticed that out of 138 user restoration issues, 23 issues were that of security. This constitutes 17% of all the user restoration issues.

- On analyzing the user service request issues, which are upgradation issues, it was noticed that out of 12 user request issues, 4 issues were that of security. This constitutes 33% of all the user request issues.

## Priority of Security Issues
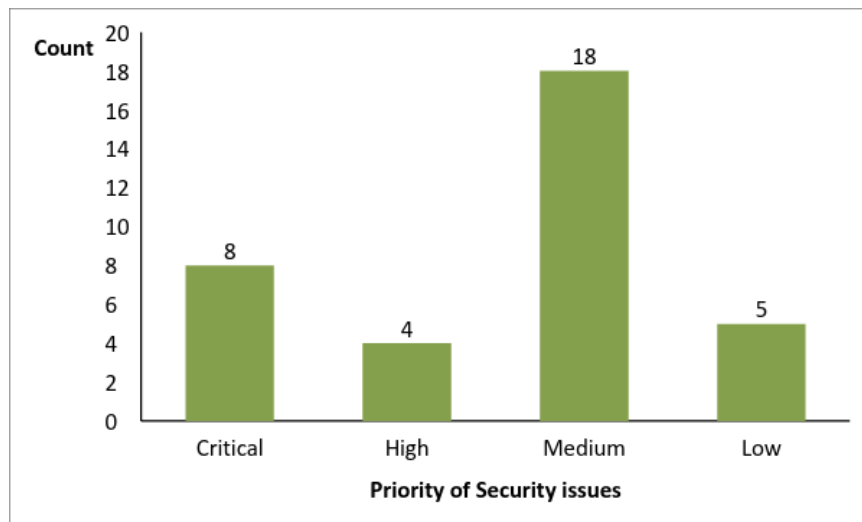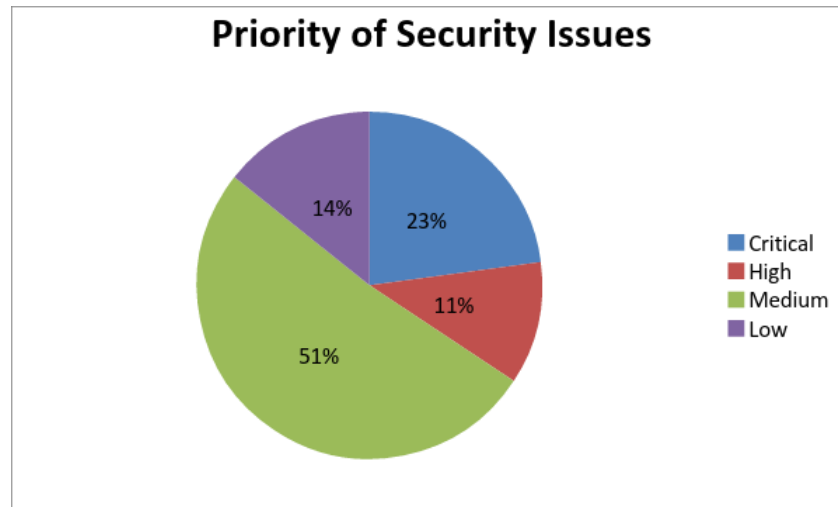


- User training issue: the users are supposed to receive training from the implementation team or the support team. But sometimes due to the tight schedule of the end users or the team the training either does not happen at all or is incomplete. On occasions where some server is down or some backend maintenance is going on , the users should be informed about such developments. There have been so many issues where the users were not able to perform their roles due to  such backend activities and they raised the issue without knowing that there was no fault in the application and only a backend activity was going on due which the data was not accessible. Such issues can be avoided if timely all the developments are communicated to the users whether it is about a new workflow or if any server is down or if there is any upgrade in the application.

  - The analysis of the issues reveal that out of 150 issues raised by the end users , after the implementation of the radiology information system, 37 issues were that of user training issues. This constitutes 25% of the total issues.this suggests that majority of issues can be resolved by merely training the users before they start

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working on the application , any change in the workflows in the application or any upgradation in the application.

- It was also analysed that 28 of the user training issues were of medium priority, 1 was of critical priority, 4 were that of high priority and rest 4 were of low priority.

- On analyzing the user service restoration issues, which are build – fix issues, it was noticed that out of 138 user restoration issues, 37 issues were that of user training issues. This constitutes 27% of all the user restoration issues.

- Interface issues: the radiology information system can be interfaced with many ancillary systems or applications like Muse, Observer, Syngo, Powerscribe, other RIS, PACS modalities.sometimes the messages or the information sent across the interface doesn't reach the destination ancillary application completely or correctly.there can be a number of reasons for the issue. Sometimes the users are not trained properly regarding sending across the information or the message or the mapping could not be done properly due to insufficient information at either of the ends, etc.in such conditions the messages are send again with complete and correct details or the manual mapping is done and then integrated.

  - The analysis of the issues reveal that out of 150 issues raised by the end users , after the implementation of the radiology information system, 31 issues were that of interface issues. This constitutes 21% of the total issues.so again if the users are properly trained on sending the information or messages correctly , a large number of issues can be avoided.

- It was also analysed that 31 of the interface issues were of medium priority, 9 were of critical priority, 7 were that of high priority and 1 was of low priority and 14 were of medium priority.

- On analyzing the user service restoration issues, which are build – fix issues, it was noticed that out of 138 user restoration issues, 31 issues were that of interface. This constitutes 22 % of all the user restoration issues.

- On analyzing the user service request issues, which are upgradation issues, it was noticed that out of 12 user request issues, 2 issues were that of interface. This constitutes 17% of all the user request issues.

## CONCLUSION

The analysis of the issues reveal that out of 150 issues analyzed, 138 were about the broken functionalities, i.e they were user service restoration issues and 12 issues were where the end user required additional options or an upgrade in the existing functionality. So the user service restoration accounts for 92% of the issues after the implementation of the radiology information system, and rest 2% is user service request. This exhibits that it is quite rare that users require an added feature, they have sufficient features for their scope of work.

The analysis of the issues reveal that out of 150 issues analyzed 25 were critical, 20 were high priority issues, 87 were that of medium priority and remaining 15 were that of low priority. So the critical issues accounts for 17% of the issues after the implementation of the radiology information system, high issues accounts for 14% of the issues, medium issues being the maximum of all accounts for 59% of the issues and issues with low priority accounts for 10% of the issues. This exhibits that in the radiology departments of the clinics or the hospitals most

of the issues can be resolved easily within a relaxed time frame, but there can be issues at times where the patient care is at halt because of some issue.

## RECOMMENDATIONS

1.      User training issues: one of the most common root for majority of the issues is that the users are not properly trained. Some of the guidelines to for an effective user training sessions are listed below:

a.      Users should be communicated about all kinds of changes in the application or ancillary systems that may affect their scope of work in any way. If the application is getting up dated then the change in the workflow must be communicated through tip sheets or demos.

b.      The trainings have to be specific to users. The hospital staff already has so much on their plate that it if any material which is beyond their scope of work is discussed with them, they will not be interested. They should always begin with a set agenda and determine what has to be achieved by the end of the session and communicate the same to the users. Trainers should always use examples or case studies to clarify the workflow or the change.If time permits use the show – tell technique.

c. In case of change in the workflows a clear comparison should be made between the new workflow and the old workflow.

2.      Security issues: these also contribute a lot to the issues raised by the users.

a.      Security issues arise when the users demand for extra options which they do not have access to. The support takes the call on whether the user should be provided the access or not.

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They need to do an impact analysis to determine if all the users with the same role needs the same change or it is only one user that needs the extra access or the option. The support team should track all the changes made at the security level by the team after the implementation.

b.        The implementation team can however, do a complete analysis of the profile of the radiology setup of the client clinic or hospital, and note the stated roles and actions performed to the finest detail.

3.        Interface issues: since the radiology information system is integrated with many ancillary applications like muse, observer, PACS modalities, etc. the interface issues are common.

a.        Most of the interface issues originated because the end user did not enter the complete details comprising the message.so if the end user can be train and provided with the check list to tally the message before sending it, then majority of them can be controlled.

b.        For issues where the other ancillary systems send across incomplete message, the users can be communicated about the limitations of the ancillary systems.

4.        Data migration issues: this kind of issues are rare but can impact the patient care.

a.        The task of migrating the data from one application to another is that of implementation team, so the support team cannot do anything about it except for raising the issue with the implementation team whenever such an issue arises.

b.        The implementation team should be extra careful while transferring the data across applications. The migration should be complete and accurate.

5.        Incorrect build: these are the issues regarding the improper functioning of the application. when the application does not work the way it is supposed to.

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a.      Such issues cannot be avoided especially once a successfully tested application has been implemented.

b.      They have to be resolved by the support team whenever they are brought to picture by the end user.

c.      The maximum that can be done to avoid such issues is that the application should be thoroughly tested for all the system and functional requirements.

BIBLIOGRAPHY

# CASE STUDY

## PERSPECTIVES ON USING SOCIAL MEDIA FOR ORAL HYGIENE PROBLEMS AMONG SCHOOL CHILDREN

**Background** : Oral  health problems is one of the major problems among children globally.

According to a survey conducted by WHO , 60%-90% of school children worldwide, have dental cavities. Developing countries like India are not exempted from this. There are numerous studies which indicate high prevalence of oral health problems among children between 5-15 years. Oral hygiene can be the major cause of non communicable diseases like () which is a major concern in India.

Portable computing devices and internet have become widely accessible and provide entirely new avenues to learn, create awareness, connect and communicate. In order to create awareness about the oral health, we need to select a platform which can be both educational, interesting or in other words a mode with deep proliferation, speed connectivity and has reflexivity of knowledge. Considering the statistics social networking provide a luring mode to create awareness among children about oral hygiene. Statistics suggest that 5 million facebook users are children. Social networking sites can prove to be extremely useful in creating awareness among children about oral health

So the study identifies that a framework where social networking can be used to create awareness among children can be extremely in fulfilling in agenda of creating awareness. An online game on the popular social networking sites like facebook, can be extremely helpful in educating children about oral hygiene.

**OBJECTIVE:** Perspectives on using social media for oral hygiene problems among school children

**Situational analysis:**

A situational analysis was done to understand the current level of awareness among school going children, between age group of 7-18 years, the extent to which they use social networking sites and the level of interest they have in gaining knowledge about oral hygiene through social networking sites. It revealed that- about 60% of children were aware that poor oral hygiene can lead to non-communicable disease and tooth loss, 94% of children were interested in knowing about how to maintain good oral health. About 84% of school going children use social networking sites and from that 75-80% children played online games and were interested in knowing about oral hygiene through social networking sites.

**Methodology:**

a) Primary study

b) Secondary study

**a) Primary study-**

i) Study area- Pune and New Delhi

ii) Study population- Student from Bhartividyapeeth English School, Pune.

iii) Sample size- 30

iv) Sampling method- Random sampling

v) Study-design- Descriptive Cross-sectional

vi) Tools- Semi structured questioner

vii) Techniques- Online survey and face to face interview

**Result (of the survey)**

1) We considered 3 age groups and total 30 people-

In 7-10 years age group= 9 people (30%)

In 10-15 years age group= 14 people (46.6%)

In 15-18 years age group= 7 people (23.3%)

2) Out of 30 people there were-

13 female (43.33%)

17 male (56.66)

3) All 30 people brush but number of times and brushing duration were different

In terms of time

1 time- 12 people (40%)

2 time- 16 people (53.33%)

More than 2 times- 2 people (6.6%)

In terms of duration-

1-2 min- 16 people (53.33%)

1 min or less than that- 14 people (46.66)

4) 20 people (66.66%) wash their mouth after meal and 10 people (44%) do not.

5) 11 people ( 36.6%) visit their dentist once in a 6 months

12 people (40%) visit their dentist when required

4 people (13.3%) visit their dentist once in a year

3 people (10%) visit their dentist once in a 3 months

6) 16 people ( 53.3%) clean their tongue daily

   11 people (36.6%) not clean their tongue daily

   03 people (10%) people clean their tongue sometime

7) 90% people aware about the factor like food and bacteria combination, poor oral hygiene, smoking causes tooth decay.

8) 90% people aware about poor oral hygiene, gingivitis, non-nutritious diet, bleeding disorder leads to bleeding gums.

9) 18 people (60%) aware about poor oral hygiene can lead to non-communicable diseases and tooth loss

10) 28 people (93.33%) were interested in knowing about how to maintain good oral health

11) 25 people (83.33%) use social networking sites

12) 5 people (16.6%) spend 10-15 hrs on facebook in a week

11 people (36.6%) spend 0-5 hrs on facebook in a week

5 people (16.6%) spend more than 20 hrs on facebook in a week

4 people (13.3%) spend 6-10 hrs on facebook in a week

13) 23 people (76.6%) playing online game

14) 24 people (80%) were interested in knowing the oral hygiene through social networking sites

15) 23 people (76.6%) were interested in playing a free downloadable game related to oral hygiene

## Review Of Literature

### Social networking sites : Emerging and essential tools for communication in dermatology

The use of social media by dermatology journals and professional and patient-centered dermatology organizations remains largely unknown and, to our knowledge, has yet to be fully evaluated.

OBJECTIVE- To evaluate and quantify the extent of involvement of dermatology journals, professional dermatology organizations, and dermatology-related patient advocate groups on social networking sites.

### Parents of adolescents with type 1 diabetes- their views on information and communication needs and internet use. A qualitative study

Little is known about parents' views on the use of online resources for information, education and support regarding childhood type 1 diabetes (T1DM). Considering the rapidly evolving new communication practices, parents' perspectives need to be explored. The main purpose of this paper was to explore parents' perceptions of their information-seeking, Internet use, and social networking online. This applied to their everyday life, including the contexts of T1DM and

contact with peers. A second aim was to identify implications for future development of Internet use in this respect.

## Facebook as a platform for health-information and communication a case study of a diabetes group

As one of the largest social networking sites in the world, Facebook holds a great potential for promoting health. In this exploratory study, we analyzed 1352 messages posted to an active Facebook diabetes group to identify the characteristics of the group. The results revealed that the group was international in nature. Users overcame language barriers to communicate with people with similar conditions. Users' interactions were structured around information, emotion, and community building. They exchanged medical and lifestyle information, and highly valued their peers' personal experiences, opinions, and advice. They also demonstrated a positive attitude toward the reality of living with diabetes and generously provided encouragements and affirmations to one another. Great efforts were made to maintain the proper operation of the community by the administrator and a group of core members. As a result, the group was shaped as a social network where peer users share social support, cultivate companionship, and exert social influence. Based on the results, we discussed future directions for research of health communities in a highly connected world.

**Social networking and understanding alcohol associated risk for people with type 1 diabetes: friend or foel**

Online communication has become popular in recent years, especially for young people. Limited research exists into how people with type 1 diabetes mellitus (T1DM) discuss risks about diabetes. Alcohol use by people with T1DM, as in the rest of society, is common and may adversely affect diabetes management. This study reviewed the literature on social networking as a communication tool and conducted a systematic search of social networking sites to determine whether people with T1DM use them to discuss risks associated with diabetes and alcohol consumption.

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**Aratars using computer / smart-phone mediated communication and networking in prevention of sexually transmitted diseases among North-Norwegian youngsters**

Sexually transmitted diseases (STDs), especially the Chlamydia trachomatis bacterial infection, a common cause of infertility, are highly prevalent in developed countries, and a worrying problem in North Norway, where the incidence of chlamydia twice the Norwegian average. Seventy percent of reported chlamydia cases are found in people below 25 years of age, and although its spread could be controlled with proper prevention, young people are more aware of the risks of unwanted pregnancy than their risk of acquiring a STD. Information and Communication Technologies, including, the Internet, social media and/or smartphones, should be valued for sexual health promotion for their potential to engage young audiences. And in these media, avatars guarantee anonymity to users when handling sensitive information. The

main objective of this project is to achieve that North Norwegian youngsters become more aware of STDs through the use of popular technologies among young people.

## **Online social networking by patients with diabetes: a qualitative evaluation of communication with facebook**

Several disease-specific information exchanges now exist on Facebook and other online social networking sites. These new sources of knowledge, support, and engagement have become important for patients living with chronic disease, yet the quality and content of the information provided in these digital arenas are poorly understood.

OBJECTIVE: To qualitatively evaluate the content of communication in Facebook communities dedicated to diabetes.

## **Social media technologies for HIV prevention study retention among minority men who have sex with men**

This brief report describes results on study retention among minority men who have sex with men (MSM) from a 12-week, social networking-based,HIV prevention trial with 1-year follow-up. Participants, primarily minority MSM, were recruited using online and offline methods and randomly assigned to a Facebook (intervention or control) group. Participants completed a baseline survey and were asked to complete two follow-up surveys (12-week follow-up and 1-year post-intervention). 94 % of participants completed the first two surveys and over 82 % completed the baseline and both post-intervention surveys. Participants who spent a greater frequency of time online had almost twice the odds of completing all surveys. HIV negative participants, compared to those who were HIV positive, had over 25 times the odds of

completing all surveys. HIV prevention studies on socialnetworking sites can yield high participant retention rates.

**Lessons learned from use of social network strategy in HIV testing programs targeting African American men who have sex with men**

We report lessons derived from implementation of the Social Network Strategy (SNS) into existing HIV counseling, testing, and referral services targeting 18- to 64-year-old Black gay, bisexual, and other men who have sex with men (MSM).

**Care net: A solution for non-communicable diseases prevention through the use of social marketing**

We report lessons derived from implementation of the Social Network Strategy (SNS) into existing HIV counseling, testing, and referral services targeting 18- to 64-year-old Black gay, bisexual, and other men who have sex with men (MSM).

The SNS procedures used in this study were adapted from a Centers for Disease Control and Prevention-funded, 2-year demonstration project involving 9 community-based organizations (CBOs) in 7 cities. Under the SNS, HIV-positive and HIV-negative men at high risk for HIV(recruiters) were enlisted to identify and recruit persons from their social, sexual, or drug-using networks (network associates) for HIV testing. Sites maintained records of modified study protocols for ascertaining lessons learned. The study was conducted between April 2008

and May 2010 at CBOs in Washington, DC, and New York, New York, and at a health department in Baltimore, Maryland.

Conclusion: Social networking can be an extremely useful tool to create awareness among children regarding oral hygiene considering the level of engagement of social networking sites with children and the potential of oral health problems to cause non communicable diseases.

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## Appendix

## **Questionnaire Regarding Promotion of Oral Hygiene through Social Network Media**

**The following survey is being done to gather your inputs regarding use of social network for creating awareness regarding oral hygiene. Kindly provide your responses with appropriate choice**

**Note : Place a tick on your choice**

1. How old are you?

    a. 7-10  years   b. 10 – 15  years   c. 15- 18 years

2. Gender

    a. Male

    b. Female

3. Are you school going boy/girl?

    a. Yes

    b. No

4. Do you brush your teeth daily?

    a. Yes     Skip to **Q.No 6**

    b. No    Reason _____

    c. Sometimes

5. Do your parents say anything to you regarding your poor oral hygiene?

    a. Yes, but I do not listen to them     b. No, they do not    **Skip to Q.No 16**

6. How many times do you brush your teeth, in a day?

    a. 1 time

    b. 2 times

    c. More than 2 times

7. What is the duration of brushing, on average?

    a. <1 min

    b. 1 min

    c. 1-2 min

    d. >2 min

8. What are the brushing aids do you use for oral hygiene?

    a. Toothbrush

    b. Toothpaste

    c. Dental floss

    d. Toothpick

9. From which sources do you get to know about oral hygiene?

    a. Parents

    b. Teachers

    c. Friends or classmates

d. Advertisements

e. Social media

f. Other( specify)

10. Do you wash your mouth after meals?

a. Yes    b. No

11. How often do you visit your dentist?

a. Once a  month

b. Once in 2 months

c. Once in 3 months

d. Once In 6 months

e. Once in year

f. Only when required

12. What is the reason behind your visits to the dentist?

a. Any dental problem( eg. Tooth decay, bleeding gums,etc.)

b. Regular check up

c. Any tooth treatment

d. Other( specify)

13. Do you fear before visiting dentist?

a. yes    b. no

14. What are your feelings about your dentist?

a. On providing oral knowledge

b. Regarding the treatment

15. Do you clean your tongue?

a.   Yes     b. No     c. Sometimes

16. How is your parents' attitude towards your oral hygiene?

    a.   Casual     b.   Strict

17. Do your parents say anything to you regarding your poor oral hygiene?

    a.   Yes, but I do not listen to them

    b.   No, they do not

18. Are you aware of the factors that cause tooth decay?  **(Pick all that apply)**

    a.   Food and Bacteria Combination   b.  Poor Oral Hygiene    c.  Smoking     d. Dry

       mouth

    e.    High Carbohydrates and starchy food  f. Don't Know

19. Do  you know what causes bleeding gums? **(Pick all that apply)**

    a.   Poor Oral Hygiene/ Plaque     b. Gingivitis / Inflamed Gum   c. Periodontal

       Disease

    d.    Bleeding Disorder   e. Non Nutritious Diet   f. Stress   g. Family History of

   Bleeding

    h.    Sharing tooth brush   i. Medication   j. Grinding habit  k. Don't Know   l. other

    _____

20. Do you know that having lots of sweets and soft drinks can lead to tooth problems?

    a.   Yes     b.   No

21. Are you aware that poor oral hygiene can lead to non-communicable diseases and tooth

   loss?

    a.   Yes     b.   No  **(Skip to Q.No 23)**

22. What are the diseases that are susceptible to poor oral hygiene **(Pick all that apply)**

a. Heart    b. Diabetes    c. Stroke    d. Systemic Inflammation    e. HIV/AIDS    f. Other

23. Do you know the measures you should take to maintain good oral health?

   a. Yes    b. No   **(Skip to Q.No  25)**

24. Can you name the measures to be adopted to maintain good oral health? **(Pick all that apply)**

   a. Brush your teeth at least twice a day.

   b. Use the proper equipment.

   c.  Practice good technique.

   d. Keep your equipment clean.

   e. Know when to replace your toothbrush.

   f. Flossing

   g. Other _____

25. Are you interested in knowing about oral hygiene and how to maintain good oral health?

   a. Yes    b.  No

26. Do you use social networking sites ( eg. Facebook)?

   a. Yes    b. No

27. Roughly how many hours a week do you spend on facebook?

   a. 0-5 hrs    b. 6-10 hrs   c.  11-15 hrs   d.  More than 20 hrs

28. What is your main purpose of using Facebook? (can choose more than 1 choice)

   a. Playing online games

   b. Make new friends

   c. Messaging

d. Health information

e. Update events

f. Others

29. What type of social networking sites do you use? (can choose more than 1 choice)

a. Facebook   b. Twitter  c. Gmail   d. other    specify _____

30. Will you be interested in knowing about oral hygiene through social network sites?

a. Yes        b. No

31. Will you be interested in receiving messages through social network sites?

a. Yes        b. No

32. Will you be interested in playing a free downloadable game related to  oral hygiene?

a. Yes        b. No

33. Will you suggest to friend information regarding oral hygiene like messages/ mailers/

games if you come across them in social networking sites?

a. Yes        b. No

Thank you for participating in the survey. All information will be kept confidential. It is for research purposes only.