Would customized software development be the right choice for the Post- Graduate department of Orthodontics and Dentofacial Orthopedics of a Private Dental college in India – an analysis.

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ABSTRACT:

Background:

The medical and dental teaching institutes have to face critical administrative issues involving staff, faculty, students, patient flow, asset management, stock management etc. and live up to changing government requirements. Today is the era of Artificial Intelligence and Machine Learning. Many sectors of work including healthcare institutes are in the pursuit of restructuring their Information Systems for quality and cost control. Therefore, an analysis by many departments, such as Economics, Engineering, Research and Development and Orthodontics, for the need of an all in one customized software should play an important part in the superior functionality of most departments of Orthodontics of most of the dental colleges.

Aim:

1. To understand the intense pressure that the Department of Orthodontics in a Dental College faces in the enormous data storage and retrieval and the challenges associated with it.
2. To analyse whether there is a scope of developing an all in one customized software or redesigning any existing off the shelf software for the department to meet their specific

needs to nullify the challenges of time, labour and cost and synchronize all allied facets of the department for superior services by the department.

Methodology:

A detailed discussion was held by the authors 1. And 2. with the Head of Department of Orthodontics and all the existing methods of data organization of the department were analysed. It was discovered that their traditional method was a little complex, involving more functional tasks. Therefore, a simpler digital platform could be welcomed to deal with the critical administrative and clinical issues to improve the patient flow and treatment outputs with optimum time, labour, space and cost management.

The market was checked to find out the availability of any already existing off the shelf generic software that would suit the needs of the department to a certain extent. A detailed discussion was held by authors 1., 2. And 4. Along with author 3. – whether it would be possible to get one of the existing software redesigned for the special needs of the department:

Understood from author 4. whether it is possible to make a new customized software for the department to organize and synchronize data at the same time.

Results:

- All four interdisciplinary authors compared and contrasted the available COTS(Commercial Off The Shelf) softwares for the particular needs of the department.
- There was definitely a scope for a customized software programme which was effective in all dimensions of work of the department.

Conclusion:

Some modern COTS softwares can be customized as per special needs.

It was concluded that a customized software can be easily developed to accommodate the preferences of the department within nominal charges and moderate time period by a software developer.

The dental health institutes can resort to typical solutions offered by the customized software.

Keywords:

Artificial Intelligence(AI)

Machine Learning(ML)

Customized Software

COTS(Commercial Off The Shelf) Software

Orthodontics

Economics

Engineering

INTRODUCTION:

The progress and growth of every nation depends upon the ability to raise average human output. The recent wave of technological advancements in Artificial Intelligence provides an optimistic outlook on the opportunities given by Artificial Intelligence and Machine Learning.

If machine learning could mimic human learners they could be used to screen educational innovation quickly.

Artificial Intelligence promises to improve existing services by enabling automation of many tasks. It may have an even larger impact on the economy by serving as a new " **method of invention"** that can reshape the nature of innovation process and the organization of Research and Development.

In the era of Artificial Intelligence and Machine Learning, many sectors of work including healthcare institutions are in the pursuit of restructuring their Information Systems for more productive outputs. The healthcare educational institutes include Medical, Dental, Physiotherapy and Nursing colleges, hospitals and research centers. Healthcare educational institutes in India are facing an extreme pressure to upgrade quality of educational and clinical services that involve critical administrative, academic and clinical issues.

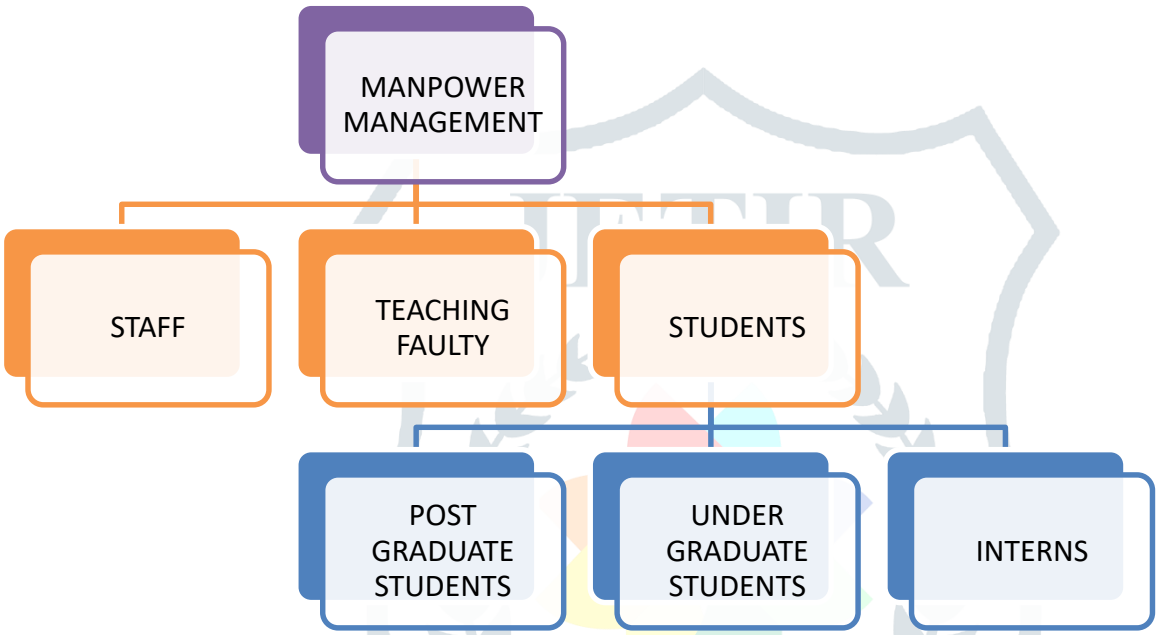
An insight into the environment of dental colleges explores that the department of Orthodontics has an enormous size of information to be stored and worked upon which brings out challenges of labour, time, space and human error. Therefore, an analysis of the department of Orthodontics and Dentofacial Orthopedics in a Private Dental college for the need of a customized all in one software programme should play an important part for superior functionality of this and most of the departments of Orthodontics in various dental colleges.

METHODOLOGY:

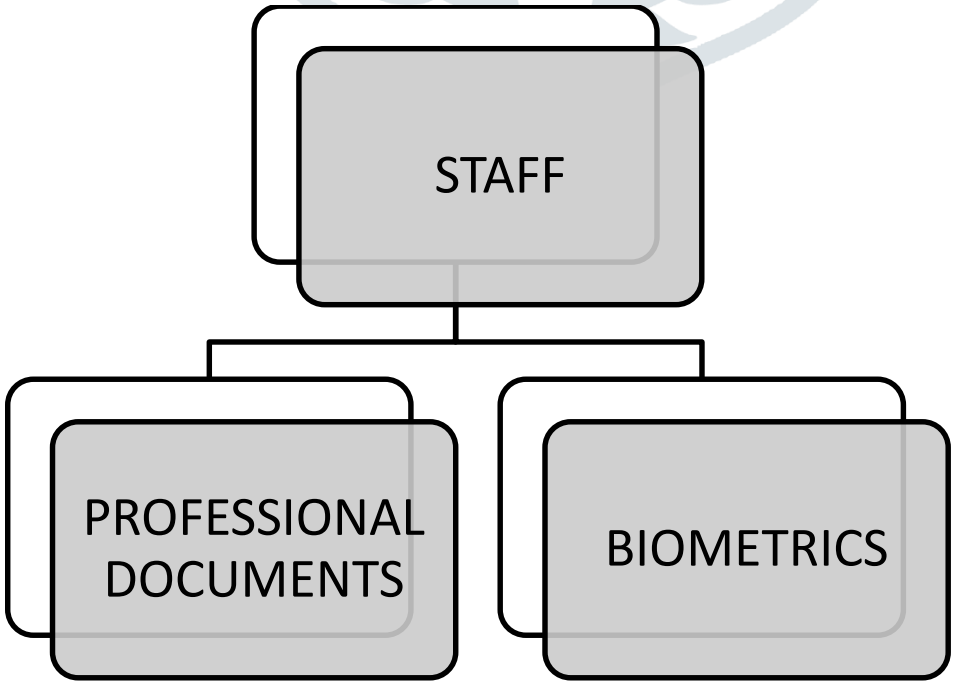
1. An in-depth analysis of the typical needs and existing methods of functioning and data organization of Department of Orthodontics and Dentofacial Orthopedics, Private Dental College, India was done through a detailed discussion by author 1. and 2. with the Head of Department of the concerned dental department.

2. It was discovered that the patient flow is heavy and the orthodontic treatment duration of each patient is long. Also, diagnosis and treatment planning requires a lot of pre-treatment, mid-treatment, and post-treatment records which were stored and retrieved through traditional methods.
3. The department comprises of undergraduate students, postgraduate students, interns, staff and faculty.

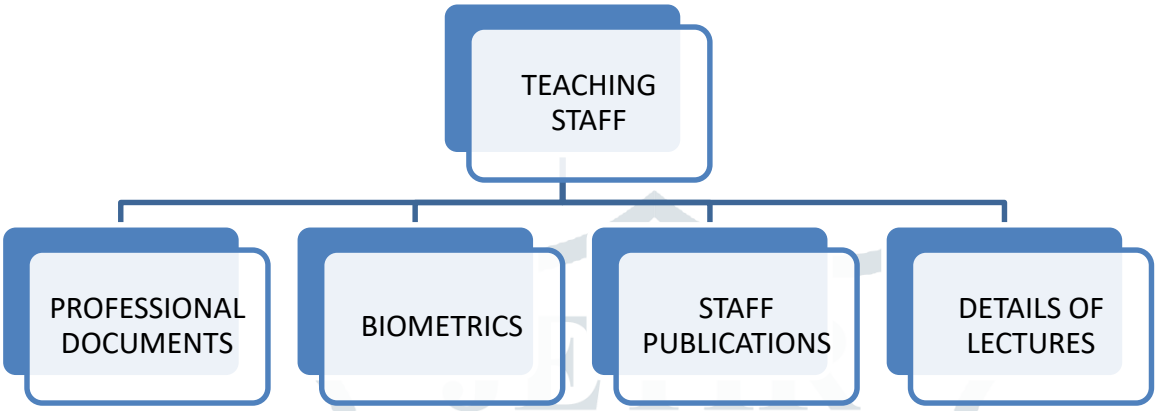
❖ MANPOWER MANAGEMENT



I. STAFF



II. TEACHING FACULTY



III.a. Post Graduate Students

- Professional Documents
- Attendance records and Leave applications
- Academic Presentations
- Books and Journals referred
- Books and Journals issued from library
- Number and details of Self-Started and Transferred Cases
- Patient Appointments and Referrals to various other departments and Recalls
- Physical and Digital Pre-treatment, Mid-treatment and Post-treatment records like study models, Intraoral and Extraoral multiple photographs and radiographs
- Attendance records of Conferences and Paper Presentations
- Dissertations, Research Data Collections, Methodology and Progress Data storage
- Short Researches and Studies
- Details, Interdisciplinary Discussions, Referrals and Field Visits of **Special Cases**
- Test and Exam paper correction records

III.b. Under Graduate Students

- Attendance of Lectures
- Attendance of clinical postings

- Timetable of lectures of different batches
- Timetable of clinical postings in batch-wise rotation
- Leave Application Record
- Records of Pre-clinical and Clinical work done
- Record of examinations at various intervals

III.c. Interns

- Attendance
- Posting Schedule
- Record of Work Done
- Record of Academic presentations
- Leave Application Record

❖ PATIENTS

Records of:

- Central OPD Number
- Orthodontic OPD Number
- Classification of Male or Female, New or Old Patients
- Allotment for treatment: Pre-treatment, Mid-treatment, Post-treatment data
- Diagnostic reports and Treatment Planning
- Recalls and Follow up Treatment Schedules and Treatment Progress

❖ INFRASTRUCTURE MANAGEMENT

- Layout Plan

❖ ASSET MANAGEMENT

- Library Details –
  - Books and Journals present
  - Record of New and Old Books
  - Issue Record
- Clinical and Lab equipment list

- Stock register for such Non-consumable equipments
- Stock details of Consumable Items and Monthly details of Maintained Manuals
- Mandatory Government Documents and Council Proformas
- Records of the Diagnostic Software – Nemoceph

4. Therefore, it was discovered that the Department of Orthodontics was not using any software that would digitally organize and synchronize all the multifaceted data. The traditional method was a little complex involving more functional tasks. Hence, a simpler digital platform would be ideal to optimize the productivity and minimize the challenges of time, labour, space, expense and human error.
5. The market was surveyed to find out the availability of already existing off the shelf generic software that would suit the departmental needs to a certain extent. These are called COTS i.e. `**Commercial Off The Shelf**' software. Popular Dental practice management softwares were studied upon like :

   DENTRIX, CS SOFTDENT, OPEN DENTAL, ABELDENT, CURVE DENTAL, ACE DENTAL, MAXIDENT etc. These softwares offer many Dental practice management solutions.

   - Also, **ORTHO 2- EDGECLOUD –** has great facility of flexibility, integrations, organization, interaction with patients etc.
   - **DOLPHIN IMAGING AND MANAGEMENT SOLUTIONS –** Dolphin Imaging PlusTM 11.95 – was also taken into consideration. It provides Imaging of X-Rays, Pictures and Cephtracing treatment solutions.
   - **ORION –** A Dental college management system software is fully customizable to a Dental College's particular needs to enhance their bottom line. Some of it's special features are:
     - Patient Management
     - OPD Management
     - Department Management
     - Case Sheets
     - Clinical Research Laboratory Management
     - Central Store Billing Management
     - Student posting target management etc.

Therefore, many such softwares are available in the market.

6. Found whether Modern COTS softwares may have the "**Application Programming Interfaces" (APIs)** for extensibility and customization.
7. Understood whether it was possible to make a new customized software for the department to organize and synchronize data at the same time.

RESULTS:

1. There was a large amount of information in the Department of Orthodontics that needed to be organized and synchronized.
2. Existing methods used for the same faced challenges of time, labour, space, cost and human error. So, the idea of a digital platform was welcomed for optimization.
3. Software development is a process that requires a lot of research by many involving departments, such as Engineering, Economics, Business Administration, Content Management and Research and Development.
4. Most of the Dental office softwares are versatile, integrated and most of them have features of Reminders, Client Management, Imaging X-Rays, Patient Records, Treatment Planning, Interaction with patients, Billing etc. Most of them are extremely ideal mainly for a Private Dental Office to enhance the Dental Office System.
5. The ORION Dental College Management System Software can be a good choice for most of the dental colleges.
6. As per the needs of the Department of Orthodontics in concern, customized software development specifically conceived and designed only for that department would be a wonderful option which would be apt in terms of easy accessibility, more storage capacity, efficient categorization and organization, synchronized features and feasibility.

DISCUSSION:

Keeping in mind the advantages of customization to suit the distinctive and intensive needs of the department, it would be fair enough to analyse how the customization would take place and what type of software would be apt for the department. As far as **easy accessibility** is concerned, **Cloud based database** remains an ideal choice which is accessed through the internet and not through a Local Area Network(LAN). The worth of a Cloud Database lies in its enabling of great accessibility from anywhere in the world and high storage capacity it lends to the software.

Addressing the question of how the customization would take place, one may take into account the several programming languages that can be used to develop the software including **JAVA, ASP Net., PHP, Python** and the like. For the huge departmental data it is important to **categorize, classify and organize** for the purpose of hassle-free retrieval and faster comprehension of data.

To meet this requirement, **Data Mining technique**can be employed. This technique inspects and examines the hidden patterns of data as per the various categories in order to make the information understandable and user- friendly. **Categorization** in the customized software can take place by providing a **Unique ID** to each faculty, student an patient and by creating **Blocks** (sequences of bits and bytes) in order to store the multiple information pertaining to different individuals and items using their unique IDs.

The various blocks can be assigned a **class** to make its features clear and interpretable. Records including that of Material, Equipment etc. can be traced according to their features. Thus, a smooth, trouble-free access to the data can be achieved using a customized software that can be developed by a software programmer after a detailed interdisciplinary interactive session.

CONCLUSION:

1. One of the commercially available softwares for Dental College Management which guarantees to be fully customizable could be a good option for various departments of dental colleges, including the Department of Orthodontics.
2. Keeping in mind the advantages of customization to suit the needs of the department, it would be fair enough to develop a customized software that is apt for the department in terms of easy accessibility, more storage capacity, efficient categorization, synchronized organization and hassle-free retrieval.
3. This kind of software can be easily developed by an efficient software programmer, after interdisciplinary interactive sessions within nominal limits of time, money and effort.

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