DEPARTMENTAL DATA ANALYSIS

A PROJECT REPORT

Submitted by

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BONAFIDE CERTIFICATE

Certified that this project report **"DEPARTMENTAL DATA ANALYSIS"** is the bonafide work of **"ALISHA GAKHAR"** and **"RAGHAV DESHWAL"** who carried out the project work under my/our supervision.

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INTERNAL EXAMINER   **EXTERNAL EXAMINER**

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ABSTRACT

The effective analysis of data is crucial for informed decision-making in any department. To develop a robust system for departmental data analysis, it is necessary to follow a structured approach. This abstract outline the steps to be taken for proposing a new system for departmental data analysis. The first step is to define the goals and objectives of the data analysis system, including the type of data to be collected and its expected insights. Next, identifying the data sources, including internal and external sources, is critical. Choosing a suitable data analysis tool, such as a software package or custom-built solution, is essential for efficient analysis of the data. Developing a data analysis process that is flexible and adaptable is the next step, which should guide data collection, cleaning, analysis, and reporting. Finally, providing adequate training and support to staff who will be using the data analysis system is essential for optimal utilization of its capabilities. By following these steps, a department can develop an effective and reliable system for data analysis, enabling them to make informed decisions and gain valuable insights from the collected data. In today's data-driven world, the ability to analyze and interpret data has become increasingly critical for businesses and organizations. By following the steps outlined in the proposed system for departmental data analysis, departments can develop a structured and efficient approach to analyzing data. It is essential to have a clear understanding of what kind of data is required and what insights the department hopes to gain from analyzing it. Ultimately, a reliable data analysis system can help departments achieve their goals and drive organizational success.

CHAPTER 1

INTRODUCTION

Many organizations have large amounts of departmental data that could be used to inform decision-making and drive business growth. However, analysing and interpreting this data can be a complex and time-consuming task, especially when dealing with multiple departments within an organization. The lack of an efficient data analysis process can lead to misleading opportunities, ineffective decision-making, and ultimately, a decrease in productivity and revenue.

Therefore, the problem statement is how to develop an efficient and effective departmental data analysis process that enables organizations to leverage their data to make informed decisions, improve performance, and achieve their analysis goals. This process should consider the various data sources, the complexity of the data, and the different departmental needs while also ensuring data accuracy, consistency, and privacy.

Organizations today generate vast amounts of data across different departments, such as finance, marketing, sales, operations, and human resources. This data can be used to identify patterns, trends, and insights that can inform decision-making, improve performance, and ultimately drive business growth. However, analyzing and interpreting this data can be a challenging task, especially when dealing with multiple departments within an organization. The lack of an efficient data analysis process can lead to missed opportunities, ineffective decision-making, and ultimately, a decrease in productivity and revenue.

1.1 History

The history of departmental data analysis can be traced back to the early days of computerization and the emergence of data processing in organizations. Here is a brief overview of the key milestones and developments in the history of departmental data analysis:

- Emergence of Computers: In the mid-20th century, computers began to be used for data processing tasks in organizations. Initially, computers were large and expensive

machines, limiting their accessibility. However, their ability to handle large volumes of data and perform calculations quickly laid the foundation for data analysis.

- Departmental Systems: As computers became more accessible, organizations started developing departmental systems to automate specific tasks and processes. These systems focused on managing data within individual departments, such as finance, sales, or inventory. This led to the generation of department-specific data, which could be analyzed to gain insights.

- Data Warehousing: In the 1970s and 1980s, the concept of data warehousing emerged. Data warehouses were centralized repositories that integrated data from various sources within an organization. They allowed for a comprehensive view of departmental data, making it easier to perform analysis across different departments.

- Business Intelligence (BI): In the 1990s, the field of business intelligence gained prominence. BI tools and technologies enabled organizations to extract, transform, and analyze data from multiple sources, including departmental data. These tools provided powerful reporting and analytics capabilities, allowing departments to uncover trends, patterns, and key performance indicators.

- Data Mining and Advanced Analytics: In the late 1990s and early 2000s, data mining techniques and advanced analytics started gaining traction. These techniques allowed for the discovery of hidden patterns and relationships within departmental data. Departments could apply predictive analytics and data modelling to make informed decisions and optimize processes.

- Big Data Era: The advent of big data brought about a significant shift in departmental data analysis. With the proliferation of digital technologies and the internet, organizations began generating massive volumes of data. Departments could now

analyze diverse and complex datasets, including structured and unstructured data, to extract valuable insights.

- Data Visualization: The importance of data visualization in departmental data analysis grew over time. Visualization tools and techniques, such as charts, graphs, and dashboards, became instrumental in presenting data analysis findings in a visually appealing and easily understandable format. This enabled departments to communicate insights effectively and facilitate decision-making processes.

- Artificial Intelligence (AI) and Machine Learning (ML): In recent years, AI and ML have transformed departmental data analysis. These technologies have the capability to process vast amounts of data, identify patterns, and make predictions autonomously. Departments can leverage AI and ML algorithms to automate data analysis tasks, enhance accuracy, and uncover deeper insights.

As technology continues to evolve, the field of departmental data analysis is likely to witness further advancements. With the rise of cloud computing, edge computing, and the Internet of Things (IoT), departments will have access to real-time data and advanced analytics capabilities, enabling them to make more informed and proactive decisions.

1.2 Advantages

Departmental data analysis offers several advantages to organizations. Here are some key benefits:

- Informed Decision-Making: Departmental data analysis provides valuable insights that enable informed decision-making. By analyzing departmental data, organizations can identify trends, patterns, and correlations that influence departmental performance. This information helps managers and decision-makers understand the impact of their decisions and make data-driven choices that lead to better outcomes.

- Performance Optimization: Analyzing departmental data allows organizations to identify areas for improvement and optimize performance. By evaluating key performance indicators (KPIs) and metrics specific to each department, organizations can pinpoint bottlenecks, inefficiencies, and areas of underperformance. This insight helps in implementing targeted strategies to enhance productivity, efficiency, and effectiveness within departments.

- Resource Allocation: Departmental data analysis helps organizations optimize resource allocation. By understanding resource utilization patterns, organizations can allocate budgets, personnel, and other resources more effectively. This ensures that departments have the necessary resources to meet their objectives while minimizing waste and inefficiency.

- Process Improvement: Analyzing departmental data provides insights into existing processes and workflows. By identifying inefficiencies, redundancies, or bottlenecks in departmental operations, organizations can implement process improvement initiatives. This leads to streamlined processes, reduced costs, and enhanced productivity.

- Targeted Interventions: Departmental data analysis allows organizations to identify specific areas that require intervention or corrective action. By analyzing performance metrics and identifying outliers or underperforming areas, organizations can implement targeted interventions to address issues and improve results. This proactive approach helps in minimizing risks and mitigating potential problems before they escalate.

- Alignment with Organizational Goals: Departmental data analysis helps align departmental objectives with the broader organizational goals. By analyzing departmental data in the context of organizational objectives, organizations can ensure

that departments are working towards common goals and contributing to overall success. This alignment enhances organizational cohesion and efficiency.

- Continuous Improvement: Departmental data analysis supports a culture of continuous improvement within organizations. By regularly analyzing departmental data, organizations can track progress, measure the impact of initiatives, and refine strategies over time. This iterative approach enables organizations to adapt to changing conditions and stay competitive.

- Enhanced Collaboration: Analyzing departmental data encourages collaboration and cross-departmental cooperation. Sharing insights and findings derived from data analysis promotes knowledge exchange, encourages teamwork, and fosters a culture of data-driven decision-making. This collaboration enhances communication and coordination among departments, leading to improved organizational performance.

1.3 Disadvantages

While departmental data analysis can offer valuable insights and benefits, it also has its disadvantages. Here are some potential drawbacks:

- Lack of holistic perspective:
When data analysis is conducted within individual departments, it often leads to a siloed approach. Each department focuses on its own data and metrics, which may result in a fragmented view of the organization. Important connections and interdependencies between departments may be overlooked, leading to suboptimal decision-making.

- Incomplete picture:
Departmental data analysis may provide a limited view of the overall operations and performance of an organization. Without considering data from other departments or cross-functional analyses, it becomes challenging to identify systemic issues or uncover

hidden opportunities. This can lead to suboptimal solutions or missed potential for improvement.

- Duplication of efforts:

Different departments within an organization may collect and analyze similar or overlapping data sets independently. This duplication of efforts can be inefficient, time-consuming, and costly. It may also result in inconsistencies, as different departments may interpret and analyze the data differently, leading to conflicting conclusions.

- Data quality and consistency:

In a departmental data analysis approach, there is a risk of inconsistencies and variations in data quality. Each department may have different data collection methods, data storage systems, and data quality standards, making it difficult to ensure consistent and reliable data across the organization. Inaccurate or incomplete data can significantly impact the accuracy and reliability of analysis outcomes.

- Limited cross-functional collaboration:

Departmental data analysis can hinder collaboration and communication between different departments. Teams may be reluctant to share data or insights with others due to competition, lack of trust, or organizational barriers. This can result in missed opportunities for cross-functional learning, innovation, and synergistic problem-solving.

- Missed strategic alignment:

Focusing solely on department-specific data analysis may cause misalignment with broader organizational strategies and goals. Without considering the bigger picture, departments may make decisions that optimize their own performance but fail to contribute to the overall strategic objectives of the organization.

To mitigate these disadvantages, organizations should consider adopting a more integrated and cross-functional approach to data analysis. Encouraging collaboration, establishing data governance frameworks, and investing in centralized data platforms can help address these challenges and unlock the full potential of data analysis in driving organizational success.

1.4 Challenges

- One of the main challenges of departmental data analysis is the complexity of the data. Data may come from various sources, such as databases, spreadsheets, customer relationship management (CRM) systems, and enterprise resource planning (ERP) software. Each source may have different formats, structures, and levels of granularity, making it difficult to integrate and analyze the data effectively. Additionally, the data may contain errors, inconsistencies, and duplicates that can affect the accuracy and reliability of the analysis.

- Another challenge is the different departmental needs and priorities. Each department may have specific data requirements and analysis goals, such as forecasting sales, optimizing inventory levels, or tracking employee performance. Therefore, the data analysis process should be flexible enough to accommodate different departmental needs while ensuring consistency and accuracy.

- Moreover, the data analysis process should comply with data privacy and security regulations. Organizations must protect sensitive information, such as employee data, customer information, and financial records. Therefore, the data analysis process should consider data privacy and security regulations, such as General Data Protection Regulation (GDPR) and Health Insurance Portability and Accountability Act (HIPAA).

Therefore, the problem is how to develop an efficient and effective departmental data analysis process that enables organizations to leverage their data to make informed decisions, improve performance, and achieve their business goals. This process should consider the various data sources, the complexity of the data, and the different departmental needs while also ensuring

data accuracy, consistency, and privacy. Additionally, the process should be scalable, transparent, and easy to use by stakeholders across different departments.

1.5 Future Scope

The future scope of departmental data analysis is promising, as advancements in technology and the increasing availability of data continue to shape the field. Here are some key areas that highlight the future potential of departmental data analysis:

- Artificial Intelligence and Machine Learning: The integration of artificial intelligence (AI) and machine learning (ML) techniques will significantly impact departmental data analysis. AI and ML algorithms can analyze large volumes of data, uncover complex patterns, and make predictions. This enables departments to automate data analysis tasks, gain deeper insights, and make more accurate decisions.

- Predictive Analytics: The future of departmental data analysis lies in predictive analytics. By leveraging historical data and applying predictive modeling techniques, departments can anticipate future outcomes and trends. This enables proactive decision-making, risk mitigation, and the identification of opportunities for improvement before they arise.

- Real-time Data Analysis: With advancements in technology and the growth of the Internet of Things (IoT), departments will have access to real-time data streams. Real-time data analysis enables immediate insights and timely decision-making. It allows departments to monitor performance, respond to issues quickly, and optimize processes in real time.

- Data Visualization and Interactive Dashboards: Data visualization techniques will continue to evolve, enabling departments to communicate insights more effectively. Interactive dashboards and immersive visualizations will provide intuitive ways to

explore and understand complex departmental data. This empowers decision-makers at all levels to interact with the data, gain insights, and make informed decisions.

- Integration of Multiple Data Sources: The future of departmental data analysis involves integrating data from various sources, both internal and external to the organization. Departments can leverage data from social media, customer feedback, market trends, and other sources to gain a comprehensive view of their operations. Integrating diverse datasets provides a holistic understanding of departmental performance and facilitates better decision-making.

- Privacy and Ethical Considerations: As data analysis becomes more advanced, privacy and ethical considerations will become increasingly important. Organizations will need to ensure the responsible use of data, comply with regulations, and protect sensitive information. Ethical frameworks and guidelines will be developed to govern the collection, analysis, and use of departmental data.

- Collaboration and Interdepartmental Analysis: Collaboration across departments will play a vital role in the future of departmental data analysis. Interdepartmental analysis allows for a more holistic understanding of organizational performance. Sharing insights, data, and analytical techniques across departments fosters a culture of collaboration and helps identify synergies and opportunities for optimization.

- Data-Driven Decision-Making Culture: The future of departmental data analysis is a data-driven decision-making culture. Organizations will increasingly recognize the value of data and make it an integral part of their decision-making processes. Departments will invest in data literacy programs and cultivate a data-driven mindset among employees to effectively leverage departmental data for decision-making.

In conclusion, the future of departmental data analysis is characterized by advanced analytics techniques, real-time data analysis, integration of multiple data sources, improved data visualization, and a strong focus on ethics and privacy.

1.6 Applications

Departmental data analysis finds applications across various departments within an organization. Here are some key applications in different areas:

1. Sales and Marketing:

- Customer Segmentation: Analyzing sales data helps identify customer segments based on purchasing behavior, demographics, or preferences. This enables targeted marketing campaigns and personalized messaging.
- Sales Forecasting: By analyzing historical sales data and market trends, organizations can forecast future sales, set realistic targets, and optimize inventory management.
- Campaign Performance Analysis: Evaluating marketing campaign data helps assess the effectiveness of different marketing initiatives and identify strategies that yield the best return on investment.

2. Finance and Accounting:

- Financial Performance Analysis: Analyzing financial data enables organizations to assess profitability, identify cost-saving opportunities, and optimize financial processes.
- Budgeting and Forecasting: Data analysis assists in budget planning, tracking expenses, and forecasting financial outcomes.
- Fraud Detection: By analyzing financial transactions, patterns, and anomalies, organizations can identify potential fraud or irregularities in financial operations.

3. Human Resources:

- Workforce Analytics: Analyzing employee data helps identify trends in employee performance, engagement, and retention. It enables organizations to optimize workforce planning, identify training needs, and improve employee satisfaction.

- Recruitment and Talent Management: Data analysis supports the identification of recruitment sources, assessment of candidate profiles, and evaluation of employee performance for effective talent management.

- Diversity and Inclusion: Analyzing demographic data helps organizations track diversity and inclusion metrics, identify disparities, and implement strategies for a more inclusive workplace.

4. Operations and Supply Chain:

- Inventory Management: Analyzing inventory data helps optimize stock levels, minimize stockouts, and reduce carrying costs.

- Supply Chain Optimization: Data analysis enables organizations to identify bottlenecks, streamline processes, and enhance supply chain efficiency, ensuring timely delivery and reducing costs.

- Quality Control: Analyzing quality data helps identify trends, defects, and areas for improvement in the production process to maintain and enhance product quality.

5. Customer Service:

- Customer Satisfaction Analysis: Analyzing customer feedback and support data helps assess customer satisfaction levels, identify pain points, and improve the overall customer experience.

- Service Level Monitoring: Analyzing service metrics, such as response time and resolution rate, helps monitor service levels, identify areas for improvement, and optimize resource allocation.

6. Research and Development:

- Product Development and Innovation: Analyzing market data, customer feedback, and research findings help drive product development and innovation strategies.

- Research Trends and Insights: Analyzing research data and industry trends helps identify emerging technologies, market opportunities, and areas for research focus.

These are just a few examples of the diverse applications of departmental data analysis. In each department, data analysis helps drive informed decision-making, optimize processes, and achieve departmental goals, ultimately contributing to the overall success of the organization.

CHAPTER 2

LITERATURE SURVEY

An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

2.1 EXISTING SYSTEM

Many existing systems for departmental data analysis work on Android/web. They have many features including registrations/logins-logouts. The complexity of these systems makes it difficult to work on them and simply perform analytical operations using them. An existing system for departmental data analysis might involve the use of a combination of software, tools, and processes to collect, clean, analyze, and report on data from various sources within the organization.

For example, the system might involve the use of software such as Microsoft Excel or Google Sheets to collect and analyze data from various sources, including financial data, customer data, and sales data. Additionally, the system may use specialized data analysis software such as Tableau or Power BI for more complex analysis and visualization.

- The existing system may also include processes such as data cleaning and transformation, where data is checked for accuracy, completeness, and consistency, and then transformed into a format that can be used for analysis.
  The system may also include data modeling, where relationships between data are identified and used to build predictive models.

- Data governance and security may also be important aspects of an existing departmental data analysis system.
  This could include the use of access controls to ensure only authorized users have access to sensitive data, as well as the use of encryption and other security measures to protect data from unauthorized access or theft.

Finally, an existing system for departmental data analysis may involve using various reporting tools to generate reports and visualizations that communicate insights and findings to stakeholders.

These reports may include dashboards, scorecards, and other types of visualizations that make it easy for stakeholders to understand the data and make informed decisions. Some of them are:

2.1.1   Information management system for managing student attendance online:

It included features like Prevent Time Theft, Increase Productivity, and Improve Efficiency. The database, object-oriented programming, and networking methodologies form the foundation of UTB-SAMIS. The front-end software for this system is PHP, an object-oriented programming language with connectivity to MySQL, the back-end software, and a few cutting-edge client-side technologies. The student-side DFD of this system is shown in the given figure:
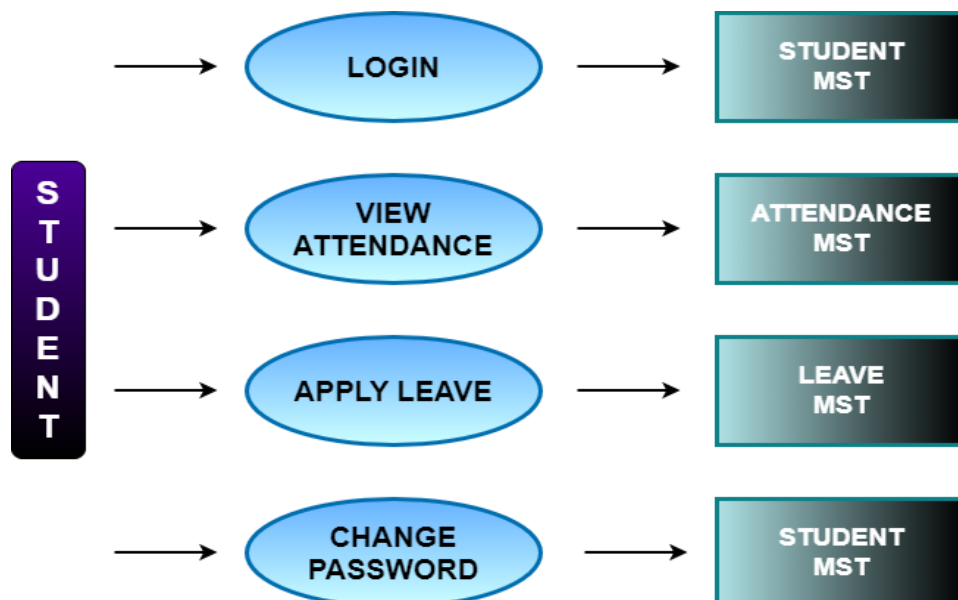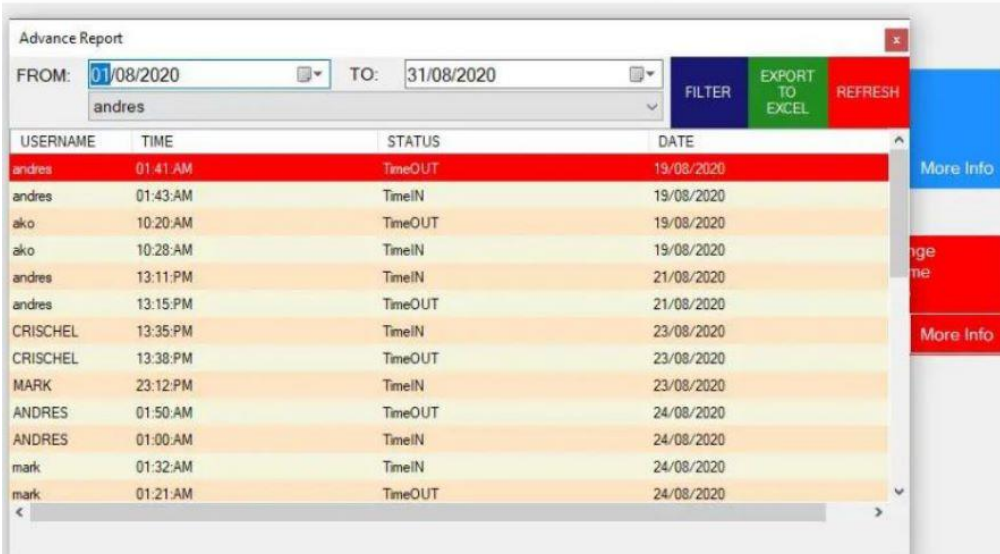

Figure1. Student-Data flow Diagram

2.1.2   Attendance Management System:

It used an Android app, a database, GUI, and an API with Microsoft SQL as a query language and ASP.NET framework for the backend as it is capable of handling web applications, dynamic websites, and mobile applications effectively. In this system, users are categorized as nonmanagerial employees, Managers, and HR admin. The checking and check-out times of employees are tracked using fingerprint scanners and that data is used in the proposed system. Mainly using that data, the working hours of the employees are calculated. This proposed system allows each employee to view his/her attendance for a desired time period. Managers and HR admin can view the attendance of all employees. By analyzing these data reports are generated. Other than that, employees are allowed to apply for leaves using this system. Here leaves are categorized and employees can view their leave balance in each category.

Figure2. Attendance Record and Management System

2.1.3   Fingerprint-based attendance system using an Arduino board:

The attendance module, report module, fingerprint module, schedule module, lecturer module, and student module are the main modules of the fingerprint

attendance system. Figure 1 depicts the designed block diagram in the portable attendance system. In the hardware implementation, Arduino Mega was attached to the SD card and the Fingerprint scanner. As for the software, the code was compiled using the Arduino compiler IDE.
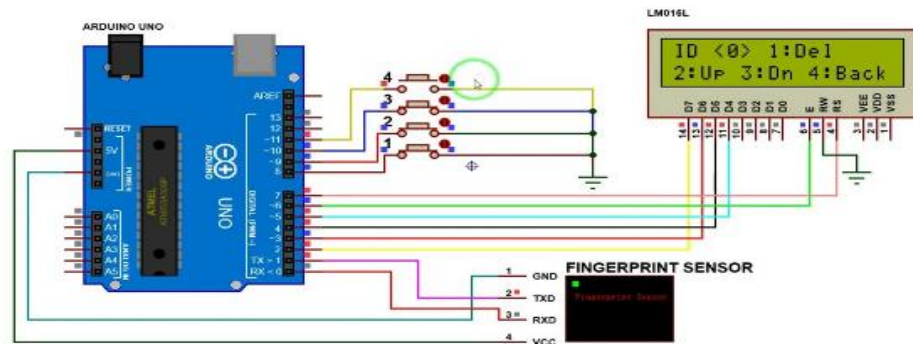
Figure3. Fingerprint-based attendance system
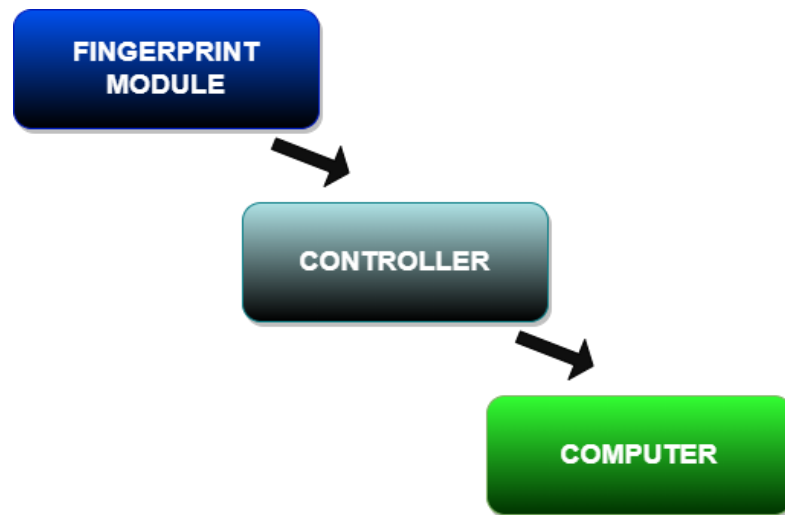
Figure4. Overall Block Diagram

2.1.4   Attendance Management System from Islamic University of Technology (IUT):

This system had concrete functionalities, efficiency, accuracy, framework, web services, and availability of both computer and Android versions. This

attendance management system was created with the intention of computerizing the conventional method of taking attendance. The software's automatic report generation at the end of the semester is another reason for its development.

2.2 PROPOSED SYSTEM

The Departmental Data Analysis System is a software tool that enables the collection, analysis, and reporting of data from various sources to support informed decision-making within an organization. With the help of this system, company operations may be enhanced, resource allocation can be optimized, and overall performance can be improved.

This analysis project will introduce management software to digitize departmental data management, which now requires manual, paper-based procedures. Users of the software will also receive analysis attendance reports with varying levels of access (for instance, faculties can examine all student attendance reports). The program will maintain a record of the departmental divisions' timetables.

Additionally, the software will offer an E-Noticeboard service that will be used to distribute announcements to department members. The instructors will be able to initiate a communication session with students using the program.

2.2.1 Data Sources:

The data source for the Departmental Data Analysis System may include a self-made dataset.

The following dataset has been used:

S.NO	UID	Student Name	Gender	Section	Attendance	State	Language	Hosteller/Day-Scholar
72	21BCS4043	MOHAMMAD HANEEF PAZHWAK	M	21BCS-1	65.3628985507232	Gujarat	English	Day-scholar
74	21BCS3689	ABBISATTY TARUN SRI	M	21BCS-1	66.3559420289842	Himachal Pradesh	English	Day-scholar
76	21BCS11630	AJIT SINGH	M	21BCS-1	67.3489855072452	Karnataka	English	Day-scholar
78	21BCS11125	ASHISH KUMAR	M	21BCS-1	68.3420289855062	Madhya Pradesh	English	Day-scholar
80	21BCS4045	SAJAL KUMAR	M	21BCS-1	69.3350724637672	Manipur	English	Day-scholar
82	21BCS4048	TUSHANT BHARDWAJ	M	21BCS-1	70.3281159420282	Mizoram	English	Day-scholar
84	21BCS6844	RAMANDEEP	M	21BCS-1	71.3211594202892	Odisha	English	Day-scholar
86	21BCS11575	SANKET SHARMA	M	21BCS-1	72.3142028985502	Rajasthan	English	Day-scholar
88	21BCS4037	AKSHAT BHAKUNI	M	21BCS-1	73.3072463768112	Tamil Nadu	English	Day-scholar
90	21BCS10256	AKASH SIKARWAR	M	21BCS-1	74.3002898550722	Tripura	English	Day-scholar
92	21BCS4017	HANSIKA SHARMA	M	21BCS-1	75.2933333333332	Uttar Pradesh	English	Day-scholar
94	21BCS9820	MOHAMMAD ISHAN ANWAR	M	21BCS-1	76.2863768115942	Andaman and Nicobar Islands	English	Day-scholar
95	21BCS11465	Shishir Kumar	M	21BCS-1	46.35489456	Chandigarh	English	Day-scholar
97	21BCS11301	SOURABH KUMAR	M	21BCS-1	33.45435465	Jammu & Kashmir	English	Day-scholar
98	21BCS4039	SAHIL	M	21BCS-1	29.54673456	Ladakh	English	Day-scholar
100	21BCS4067	ARIJIT DEY	M	21BCS-1	51.54015244	Puducherry	English	Day-scholar
101	21BCS4065	ARJUN SAROHA	M	21BCS-1	62.53686138	Andhra Pradesh	English	Day-scholar
104	21BCS4285	AAYUSH GUPTA	M	21BCS-1	95.5269882	Bihar	English	Day-scholar
106	21BCS4219	NITIN SHARMA	M	21BCS-1	66.986996	Goa	English	Day-scholar
107	21BCS4009	ANUP KUMAR BHADRA	M	21BCS-1	68.20548897	Gujarat	English	Day-scholar
109	21BCS4011	AMIYA KUMAR NAYAK	M	21BCS-1	70.64247491	Himachal Pradesh	English	Day-scholar
112	21BCS4315	SRI PERAMBUDURI MARAN SURI	M	21BCS-1	74.29795382	Kerala	English	Day-scholar
113	21BCS4068	ROHIT JOSHI	M	21BCS-1	75.51644679	Madhya Pradesh	English	Day-scholar
115	21BCS4774	DUSHALI GARG	M	21BCS-1	77.95343273	Manipur	English	Day-scholar
116	21BCS5103	HARSH VIJAY	M	21BCS-1	79.1719257	Meghalaya	English	Day-scholar
118	21BCS5490	DARSHIL VIJAYVARGIYA	M	21BCS-1	81.60891164	Nagaland	English	Day-scholar
119	21BCS4577	Himanshu Arora	M	21BCS-1	82.82740461	Odisha	English	Day-scholar

S.NO	UID	Student Name	Gender	Section	Attendance	State	Language	Hosteller/Day-Scholar
1197	21BCS5412	MS.MITUSHI ARORA	F	21BCC-1	68.20548897	Uttar Pradesh	English	Hosteller
1198	21BCS5273	KANISHKA	F	21BCC-1	69.42398194	Uttar Pradesh	English	Hosteller
1224	21BCS6381	GRACY SEJWAL	F	21BCC-1	80.3703226234744	Uttar Pradesh	English	Hosteller
1238	21BCS4903	VASHITA RAHEJA	F	21BCC-1	100	Uttar Pradesh	English	Hosteller
1239	21BCS4498	MS. RIMJHIM	F	21BCC-1	87.6331365316599	Uttar Pradesh	English	Hosteller
1248	21BCS6468	SANCHI AGARWAL	F	21BCC-1	88.7759913815544	Uttar Pradesh	English	Hosteller
1249	21BCS10831	DIVYANSHI BHATIA	F	21BCC-1	88.9029752537649	Uttar Pradesh	English	Hosteller
1253	21BCS6692	Navneet	F	21BCC-1	89.4109107426069	Uttar Pradesh	English	Hosteller
1257	21BCS6285	SHIVANI	F	21BCC-1	89.9188462314488	Uttar Pradesh	English	Hosteller
1258	21BCS6308	TISHA	F	21BCC-1	90.0458301036593	Uttar Pradesh	English	Hosteller
1284	21BCS6154	SAVINAYA BHALLA	F	21BCC-2	93.3474107811322	Uttar Pradesh	English	Hosteller
1294	21BCS6672	ANSHMITA KELODIA	F	21BCC-2	72.3142028985502	Uttar Pradesh	English	Hosteller
1302	21BCS8619	Vanshika Vashishth	F	21BCC-2	76.2863768115942	Uttar Pradesh	English	Hosteller
1309	21BCS10423	Subhadeep Dutta	F	21BCC-2	62.53686138	Uttar Pradesh	English	Hosteller
1347	21BCS4554	Kalpana Kumari Singh	F	21AML-1	90.1230913611705	Chandigarh	English	Hosteller
1348	21BCS8573	SOUMYA SEKHAR MAHANTI	F	21AML-1	90.6030078059356	Chandigarh	English	Hosteller
1354	21BCS8927	ANNU AGGARWAL	F	21AML-1	93.4825064745262	Himachal Pradesh	English	Hosteller
1362	21BCS11369	Kanishika Bhatia	F	21AML-1	88.9029752537649	Himachal Pradesh	English	Hosteller
1368	21BCS4638	ASMI MANHAS	F	21AML-1	89.6648784870278	Himachal Pradesh	English	Hosteller
1377	21BCS5948	Riya kumari	F	21AML-1	90.8077333369223	Himachal Pradesh	English	Hosteller
1387	21BCS5718	Eitika Yadav	F	21AML-1	92.0775720590272	Himachal Pradesh	English	Hosteller
1399	21CBT1094	B DEVI	F	21CBT-1	93.6013785255531	Himachal Pradesh	English	Hosteller
1434	21CBT1073	MS KIRTI KHANDELWAL	F	21CBT-1	75.51644679	Tamil Nadu	English	Hosteller
1443	21CBT1098	SANYA	F	21CBT-1	63.8379919720508	Andaman and Nicobar Islands	English	Hosteller
1470	21CDO1037	PARKHI RANA	F	21CDO-1	53.8876022638586	Chhattisgarh	English	Hosteller
1476	21CDO1034	DEEPANSHI TOMAR	F	21CDO-1	51.676404550927	New Delhi	English	Hosteller
1488	21CDO1059	SEJAL SEEPAL	F	21CDO-1	47.2540091250639	West Bengal	English	Hosteller

Figure5. AIT-CSE Dataset

2.2.2 Data Analysis Tool:

The Departmental Data Analysis System will utilize a data analysis tool to analyze and visualize data effectively. The chosen tool should be user-friendly, scalable, and able to integrate with various data sources. Here, we will be using Power BI for performing analysis on this data.

Figure6. Power BI tool for Data Analysis

2.2.3 Data Analysis Process:

The Departmental Data Analysis System will follow a normally defined data analysis process that includes:

• Data collection and cleansing

Figure7. Data Collection and Cleaning

• Data analysis and modelling

Figure8. Data Analysis and Modelling

• Data visualization and reporting

Figure9. Data Visualization and Reporting

• Ongoing monitoring and optimization.

Figure10. Data Monitoring and Optimization

2.2.4 Training and Support:

The Departmental Data Analysis System may or may not provide training and support to users to ensure they can effectively use the system. This might include:

• User manuals and documentation

• Training sessions and workshops

• Technical support for system issues

2.2.5 Literature Review Summary:

Year and Citation	Article/ Author	Tools/ Software	Technique	Source	Evaluation Parameter
Year: 2022 Citation: GATETE Marcel, HARUBWIRA Flaubert, "A Development of an Online Student Attendance Management Information System: Case Study "University of Tourism, Technology, and Business Studies"," *International Journal of Scientific Research in Computer Science and Engineering*, Vol.10, Issue.1, pp.32-48, 2022.	A Development of an Online Student Attendance Management Information System: Case Study "University of Tourism, Technology, and Business Studies" -GATETE Marcel1*, HARUBWIRA Flaubert2	PHP, MySQL	It was based on database, object-oriented programming language, and networking techniques.	International Journal of Scientific Research in Computer Science and Engineering Vol.10, Issue.1, pp.32-48, February (2022)	-
Year: 2019 Citation: K.J.H.D. Asiri, K.S. Rishan, U.A. Hewage., U.K.T. Prasadika, K.A. Dilini T. Kulawansa " Attendance Management System"," 8th International Conference on Advances in Computing, Electronics and Communication – ACEC"	Attendance Management System -K.J.H.D. Asiri1, K.S. Rishan1, U.A. Hewage1., U.K.T. Prasadika1, K.A. Dilini T. Kulawansa2	ASP.NET, Microsoft SQL, Bootstrap and Android	The main task of the research was to gathering the information and identifying the correct requirements of the end user. With the help requirements identified the system was designed according to that [12]. We decided that our system should have a web app and a mobile app. Our mobile app is developed using android. The implementation was done mainly based on four sections; front end, android app, database and the	https://www.seekdl.org/ conferences /paper/details/10038.html	System availability of the application obtained 3.98 rating while the performance of the application obtained 3.98 rating. And 3.86 for the adaptability of changes. Since the location tracking is a unique feature that can be seen in the system effectiveness of the system obtained a 3.89 rating. So through the feedback of average value of 4, the research can be said to have a positive outcome.

			backend. The implementation of the database using Microsoft SQL was done prior to all the other takes. We started to develop the web and android interfaces also at the same time. The initiation of the development of the API was also conducted simultaneously.		
Year: 2020 Citation: Ekhlas Ghaleb Abdulkadhim 2021 J. Phys.: Conf. Ser. 1804 012011	Design and Develop an Attendance System Based on Fingerprint and Arduino Board -Ekhlas Ghaleb Abdulkadhim	Arduino Mega microcontroller, fingerprint module, MySQL, PHP, XAMP	The proposed system was composed of three segments of enrollment, search, and attendance display. The device had a simple design and functioned by attaching the fingerprint sensor and	https://iopscience.iop.org/article/10.1088/1742-6596/1804/1/012011	In this study, fingerprint-based student attendance management system was accomplished, which able to address the following issues: 1) Fingerprint identification in the attendance system using Arduino was performed effectively with the success rate of 98.833 % as the centralized server recording; 2) No time waste by checking attendance during
			Arduino to the computer for enrollment. As for the search segment, the user's fingerprint would be read immediately after pressing the fingerprint sensor by the user, and the user data would be displayed on the computer based on the provided instructions. The displayed data on the computer included the scanning time, date, and user's name and ID number, and the information were shown by the MySQL .		lectures without the involvement of the instructor; 3) Automated attendance management; 4) No opportunity of simulate attendance marking.

Year: 2020 Citation: Abdoulrahmaine Mohammad-134301 Mohammad Elmi Hassan-134304 Muslim Musa-134306 2020 IUT DHAKA 123456789/92	Attendance Management System - Abdoulrahmaine Mohammad-134301 Mohammad Elmi Hassan-134304 Muslim Musa-134306	Sublime Text 3 editor, MySQL Database, Chrome Browser, Photoshop, CSS, PHP, J-QUERY, FRAMEWORK, Javascript, HTML	-	http://103.82.172.44:8080/xmlui/handle/123456789/92	-
Year: 2011 Citation: Mrs Dhanashree Amit Gupta " Student Attendance Software"," IJSER VOLUME 2, ISSUE 11, NOVEMBER 2011"	Student attendance Management - Mrs.Dhanashree Amit Gupta	ASP.NET, SQL	It has two main modules for proper functioning-1-Admin module: has right for creating space for new batch. Any entry of new faculty, updating in subject if necessary, and sending notice. 2- handled by the user which can be faculty or an operator. User has a right of making daily	https://www.ijser.org/viewPaperDetail.aspx?NOV1167	The Attendance Management System is developed using ASP.NET with C# fully meets the objectives of the system which it has been developed. The system has reached a steady state where all bugs have been eliminated. The system is operated at a high level of efficiency and all the teachers and user associated with the system understands its advantage. The system solves the problem. It was intended to solve as requirement specification
			attendance, generating report. Attendance can be taken in two ways: on the basis of subject and month or on the basis of class.		
Year: 2017 Citation: S. Y. Inamdar1, Vishal V. Suryawanshi2 "Student Attendance System based on Data Analytics ", "IARJSET VOL. 4, Special Issue 4, January 2017"	Student Attendance System based on Data Analytics -S. Y. Inamdar1, Vishal V. Suryawanshi2	RFID chips, RFID reader	we have two main modules: admin and faculty. Admin module does the work of registering the faculty members so as to avoid any unauthorized registration access to the system. The registered faculty signup to the system using mobile application with its unique sername and password to	https://iarjset.com/upload/2017/si/NCIARCSE-2017/IARJSET-NCIARCSE%2028.pdf	Now a day's attendance is mandatory but it requires lot of paper work and tedious calculations and time consuming paper work, with this project we have concluded that all the attendance taken in college will get easier by just few clicks. As data analysis is wide area of research we have tried to implement this tool and perform analysis of attendance data, to avoid cumbersome work of faculty.

			mark the attendance of students and submits it to the database. The attendance can also be stored in phone's internal or external memory in case of server failure. Faulty can view the attendance date wise, subject wise, session wise. Admin can view and also can edit the attendance. Reports can be generated here by only admin in just single clicks. Admin uses the web interface and faculty uses mobile application.		

			This web interface is developed to run on different platforms and the application provided can be installed and run on all Smartphone		

CHAPTER 3

DESIGN FLOW/PROCESS

A general methodology for conducting departmental data analysis:

3.1 Define the objective:

Start by identifying the objective of the analysis. Ask yourself what problem you are trying to solve or what question you are trying to answer. This will help you stay focused throughout the analysis. Some common objectives of department data analysis may include:

Performance Evaluation:

One objective of department data analysis may be to evaluate the performance of the department against key performance indicators (KPIs). This can help to identify areas that are performing well and areas that need improvement.

Root Cause Analysis:

Another objective of department data analysis may be to identify the root cause of a problem or issue. By analyzing data related to a specific issue, the department can identify the underlying causes and take corrective action to address the issue.

Identification of Opportunities:

Department data analysis can also help to identify opportunities for improvement or growth. By analyzing data related to the department's operations, the department can identify areas where it can optimize its processes, reduce costs, and improve customer satisfaction.

Market Research:

Department data analysis may also be used to conduct market research and analyze customer behaviour. This can help the department to better understand its customers, identify new customer segments, and develop strategies to increase customer satisfaction and loyalty.

Forecasting:

Finally, department data analysis may be used to forecast future trends and make predictions about the department's future performance. This can help the department to develop strategies to capitalize on future opportunities and mitigate potential risks.

3.2 Identify the data sources:

Next, identify the data sources that you will need to collect or access. This may include internal databases, external sources, or surveys that need to be conducted. There are many possible data sources for department data analysis, depending on the specific department and its operations. Here are some examples:

Internal databases:

Many departments maintain their own databases to track various metrics, such as sales data, customer information, employee performance, and inventory levels. These databases can be a valuable source of data for analysis.

Customer surveys:

Departments that deal with customer service or sales may conduct surveys to gather feedback from customers. This data can be analyzed to identify trends and patterns in customer behaviour and preferences.

Financial reports:

Departments responsible for financial management may collect and analyze data from financial reports, such as income statements, balance sheets, and cash flow statements.

Social media analytics:

Departments that engage with customers on social media can use analytics tools to track metrics such as engagement rates, follower growth, and sentiment analysis.

Industry data:

Some departments may use industry data to compare their performance to industry benchmarks and identify areas for improvement.

Employee surveys:

Departments that manage employees may conduct surveys to gather feedback on job satisfaction, work-life balance, and other topics.

Government data:

Depending on the department's area of focus, they may be able to use government data sources, such as census data or labour market statistics, to inform their analysis.

3.3 Collect the data:

Once you have identified the data sources, collect the data needed for the analysis. This may involve cleaning and transforming the data, such as removing duplicates or missing values. To collect data for department data analysis, there are several steps that need to be followed. Some steps that can be taken to carry data collection process are as follows:

Define the research question:

Before collecting data, it is important to define the research question that you want to answer. This will help you to determine what data you need to collect and how to collect it.

Determine data sources:

Based on the research question, you will need to identify the data sources that are relevant. These sources can include internal databases, customer surveys, financial reports, social media analytics, industry data, website analytics, employee surveys, or government data.

Select data collection methods:

Once you have identified the data sources, you need to determine the most appropriate methods to collect the data. For example, surveys can be conducted through phone calls, online forms, or in-person interviews. Website analytics can be collected using software tools such as Google Analytics.

Create a data collection plan:

It is important to develop a plan that outlines the specific steps to collect the data. This plan should include a timeline, a list of data collection methods, and the roles and responsibilities of the individuals involved.

Collect the data:

Once the data collection plan is developed, it is time to collect the data. This may involve sending out surveys, conducting interviews, or gathering data from other sources.

Verify the data:

After collecting the data, it is important to verify that it is accurate and complete. This can involve checking for errors or inconsistencies in the data.

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Clean and organize the data:

The data collected may need to be cleaned and organized before analysis can begin. This can involve removing duplicates, filling in missing values, or converting data into a common format.

3.4 Analyze the data:

Use statistical techniques, charts, and other tools to analyze the data. You may want to segment the data by different categories, such as time periods, customer segments, or products. Here are some general steps to analyze data in a dashboard:

Understand the dashboard:

Before starting the analysis, it is important to understand what data is being displayed in the dashboard and what each metric represents. This can involve reviewing the key performance indicators (KPIs) that are being tracked and understanding how they relate to the department or business goals.

Identify patterns and trends:

Once you understand the dashboard, you can begin to identify patterns and trends in the data. This may involve looking for changes over time, comparing different metrics, or identifying outliers.

Drill down into the data:

Most dashboards allow you to drill down into the data to see more detailed information. This can be helpful to identify the root cause of a problem or to get more context around a particular metric.

Filter the data:

Dashboards often allow you to filter the data based on different criteria. This can be useful to isolate specific segments of the data or to focus on a particular time period.

Interpret the results:

After analyzing the data, it is important to interpret the results in the context of the research question or business goals. This may involve identifying areas for improvement, making recommendations based on the findings, or taking action based on the data.

Share the insights:

Once the analysis is complete, it is important to share the insights with stakeholders. This may involve creating a report or presentation that summarizes the findings and includes recommendations for next steps.

By following these steps, you can effectively analyze data in a dashboard and use the insights to make data-driven decisions. The key is to understand the dashboard, identify patterns and trends, drill down into the data, filter the data, interpret the results, and share the insights with stakeholders.

3.5 Interpret the results:

Once you have analyzed the data, interpret the results to draw conclusions and make recommendations. This may involve identifying trends, patterns, or relationships in the data. Here are some general steps to interpret the results in a dashboard:

Understand the data:

Before interpreting the results, it is important to understand the data being displayed in the dashboard. This may involve reviewing the metrics and KPIs that are being tracked, understanding how the data is being collected, and identifying any limitations of the data.

Identify patterns and trends:

Once you understand the data, you can begin to identify patterns and trends. This may involve looking for changes over time, comparing different metrics, or identifying outliers.

Ask questions:

To gain a deeper understanding of the data, it is important to ask questions. This may involve exploring why certain metrics are changing, identifying the root cause of a problem, or understanding how different factors are impacting the results.

Analyze the data in context:
It is important to analyze the data in the context of the research question or business goals. This may involve comparing the results to industry benchmarks, identifying areas for improvement, or making recommendations based on the findings.

Draw conclusions:

Based on the analysis, you can draw conclusions about the data. This may involve identifying areas for improvement, making recommendations, or taking action based on the data.

Communicate the insights:

Once you have drawn conclusions from the data, it is important to communicate the insights to stakeholders. This may involve creating a report or presentation that summarizes the findings and includes recommendations for next steps.

3.6 Communicate the findings:

Finally, communicate the findings to stakeholders in a clear and concise manner. This may include creating visualizations or reports that highlight the key insights and recommendations. Here are some general steps to communicate the findings in a dashboard:

Identify the key takeaways:

Before communicating the findings, it is important to identify the key takeaways from the data analysis. This may involve summarizing the main trends or insights gained from the data.

Create a clear and visually appealing dashboard:

The dashboard needs to look good and be simple to understand. To portray the data in this way, charts, graphs, or other visual tools may be used.

Customize the dashboard for the audience:

The dashboard should be customized to the audience who will be viewing it. This may involve highlighting specific metrics or KPIs that are of particular interest to the audience.

Use plain language:

The language used in the dashboard should be clear and easy to understand. Technical terms and jargon should be avoided or explained in plain language.

Provide context:

It is important to provide context for the findings in the dashboard. This may involve comparing the results to industry benchmarks, identifying areas for improvement, or making recommendations based on the findings.

Include recommendations:

The dashboard should include recommendations for the next steps based on the findings. This may involve identifying areas for improvement, setting goals, or taking action based on the data.

Present the findings:

The dashboard should be presented to stakeholders in a way that is appropriate for the audience. This may involve creating a report or presentation that summarizes the findings and includes recommendations for next steps.

3.7 Take Action:

After communicating the findings, act based on the insights and recommendations. This can entail putting new plans into action or altering current procedures. Monitor the results of these actions and continue to iterate and improve the analysis as needed.

CHAPTER 4

RESULTS ANALYSIS AND VALIDATION

The proposed system for departmental data analysis will provide the following results:

- A clear definition of goals and objectives for the data analysis system, which will help align business goals with data analysis efforts. The proposed system for departmental data analysis will provide more specific results depending on the goals and objectives defined for the system.

  For instance, if the goal is to analyze sales data, the system can provide insights into sales trends, customer behavior, and product performance. This information can be used to identify areas for improvement and to make informed decisions regarding pricing, promotions, and product development.

- Identification of various data sources that can provide valuable insights for decision-making.

  If the goal is to analyze customer service data, the system can provide insights into customer satisfaction levels, common complaints, and areas for improvement. This information can be used to improve customer service processes, identify training needs, and develop strategies to improve customer retention.

- Selection of an appropriate data analysis tool that can effectively analyse and visualize the collected data.

  The selection of an appropriate data analysis tool will also have a significant impact on the results that the system can provide. A good data analysis tool should be able to effectively analyze and visualize large datasets, identify patterns and trends, and provide insights that can inform decision-making.

- Development of a data analysis process that can be adapted to changing needs and requirements, enabling continuous improvement.

  By developing a flexible data analysis process, the system can adapt to changing needs and requirements over time, ensuring that it continues to provide valuable insights to the organization.

- Establishment of a data governance framework that ensures the security and integrity of the data, which is essential for compliance and risk management.

  The establishment of a data governance framework will also help to ensure that the data is used ethically and responsibly and that it is protected from unauthorized access or use. This can help to mitigate the risk of data breaches, which can have significant consequences for organizations.

- Training and support for staff who will be using the data analysis system, ensuring that they can effectively use the system to make informed decisions.

  Finally, providing training and support to staff who will be using the system will help to ensure that the system is used effectively and that staff are able to make the most of its capabilities. This can lead to better decision-making and more efficient use of resources, ultimately contributing to the success of the organization.

Overall, the proposed system will enable better decision-making by providing valuable insights that can help improve business processes, optimize resource allocation, and enhance overall performance. This can increase the organization's efficiency, productivity, and profitability.

In addition to the above results, the proposed system for departmental data analysis can also help organizations to identify new business opportunities and make strategic decisions based on data-driven insights. By analyzing market research reports and industry benchmarks, the system can provide insights into emerging trends and help organizations to stay ahead of the competition.

The system can also help organizations to identify areas for cost savings and process optimization by analyzing financial data and identifying inefficiencies in current processes. This can lead to more efficient use of resources and ultimately contribute to the organization's bottom line.

Another benefit of the proposed system is that it can provide a centralized platform for data analysis, allowing different departments within the organization to share data and collaborate more effectively.

Moreover, the system can also provide real-time data analysis, enabling organizations to make more timely and informed decisions. This can be particularly important in fast-moving industries where decisions need to be made quickly in response to changing market conditions.

Overall, the proposed system for departmental data analysis can provide a wide range of benefits to organizations, including better decision-making, improved efficiency, and a competitive advantage in the marketplace. By following the suggested steps, organizations can develop a robust system that meets their specific needs and enables them to leverage the power of data to achieve their goals.

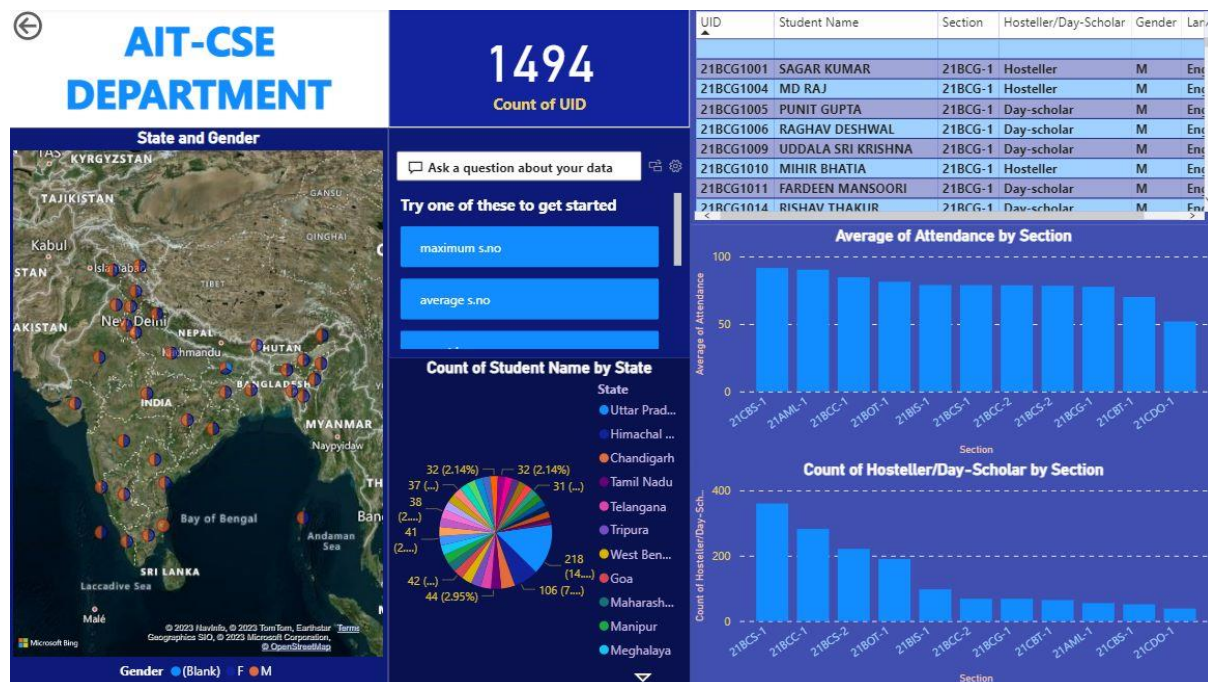The following figures are taken from the proposed system:
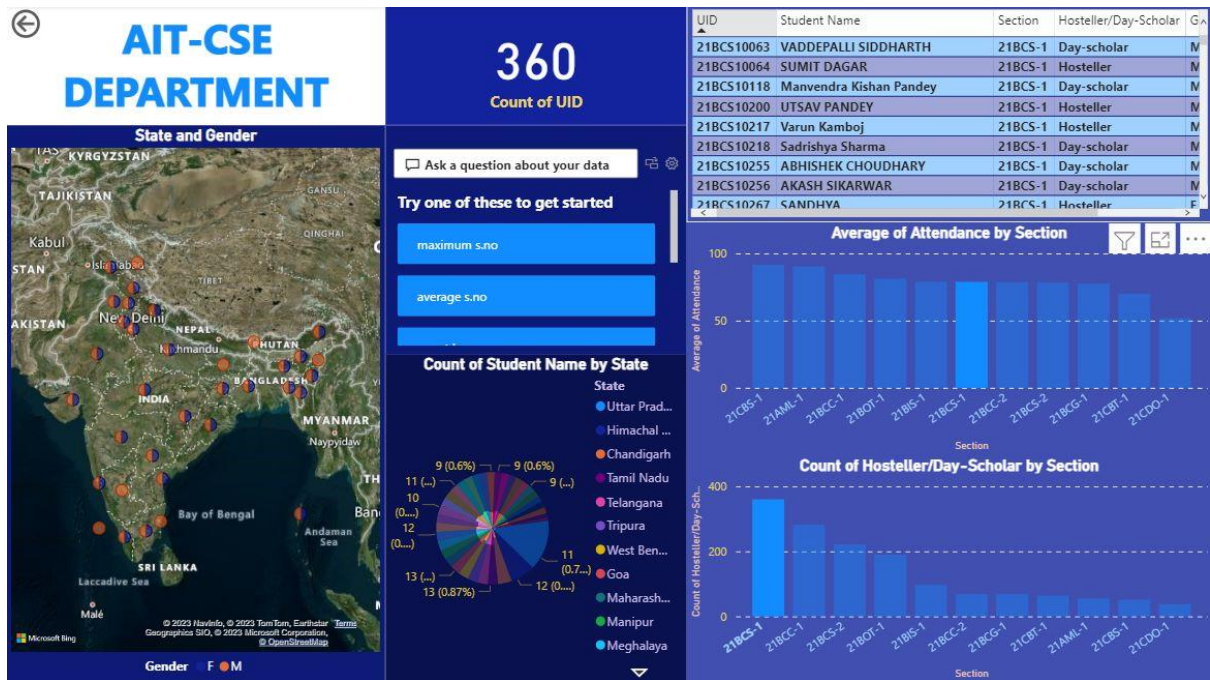

Figure11. Dashboard (Result)
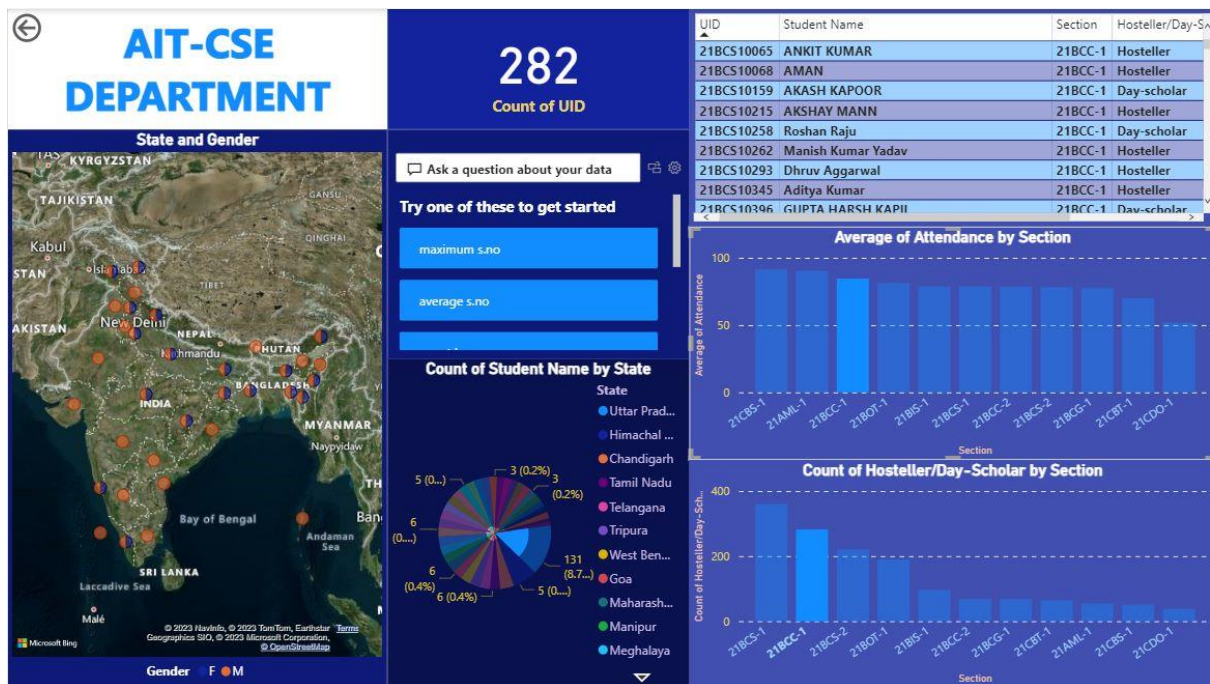
Figure12. Average attendance in 21BCS-1

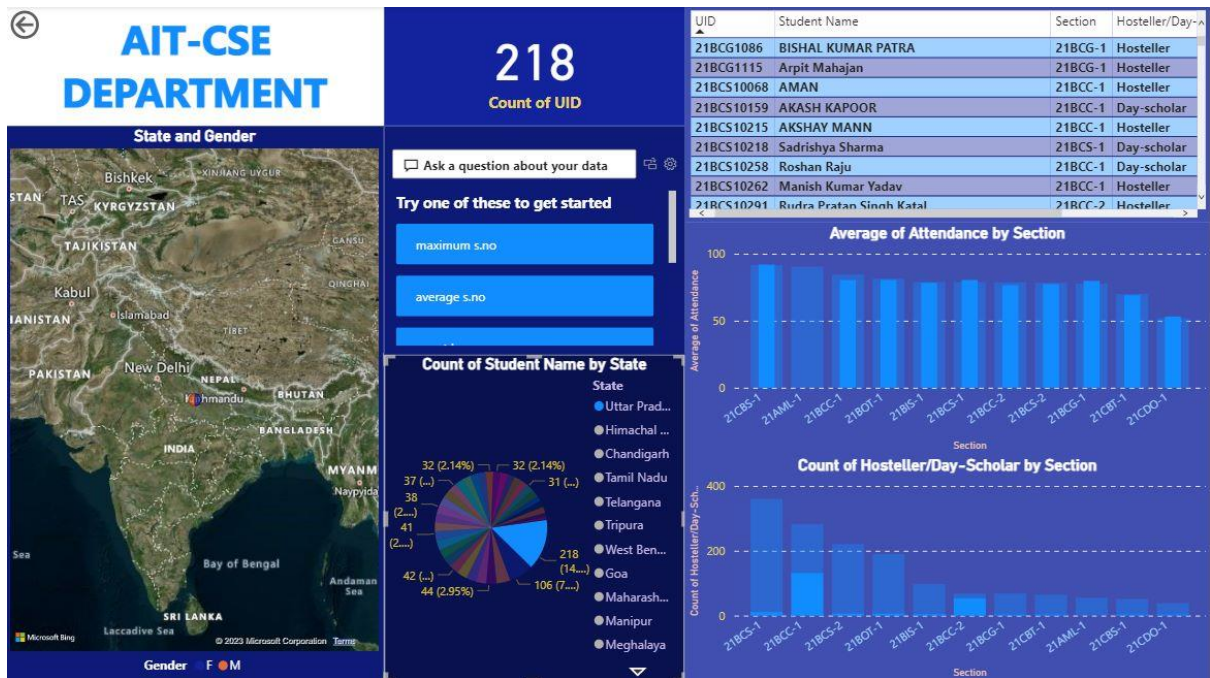Figure13. Count of hosteller/day scholar in 21BCC-1

Figure14. Student count in Uttar Pradesh

Figure15. Maximum student attendance in Chandigarh

CHAPTER 5

CONCLUSION AND FUTURE WORK

The departmental Data Analysis System is designed to support informed decision-making by providing valuable insights from various data sources. By following a defined data analysis process and implementing a data governance framework, this system can ensure the security and integrity of the data while providing accurate and timely information to support business goals.

We propose a departmental data analysis system that may or may not have one or more of the following features-

        a. Attendance Management System

        b. Analysis of the departmental data

        c. Power BI Dashboard.

In conclusion, a departmental data analysis system is an essential tool for organizations to gain insights into their operations and make informed decisions. By following the suggested steps of defining goals and objectives, identifying data sources, choosing a data analysis tool, developing a data analysis process, setting up a data governance framework, and training and supporting staff, organizations can develop a robust system for departmental data analysis.

However, there is always room for improvement and future work. Organizations can continually evaluate their data analysis system to ensure that it is meeting their needs and providing valuable insights. Additionally, advancements in technology and data analysis techniques can be incorporated into the system to improve its effectiveness. Organizations can also explore the use of predictive analytics and artificial intelligence to gain deeper insights into their data.

Overall, implementing a departmental data analysis system is an ongoing process that requires attention and dedication, but the rewards of making informed decisions based on data insights make it a worthwhile investment.

The proposed system for departmental data analysis outlined above is just the first step in creating an effective and efficient data analysis system. Future work could involve:

- Integration with other systems:

  The proposed system could be integrated with other existing systems within the organization, such as ERP, CRM, or HRIS, to provide a more comprehensive view of the organization's data.

- Real-time data analysis:

  With the increasing amount of real-time data available, it is important to consider how the proposed system can incorporate real-time data analysis to provide up-to-date insights.

- Automated data cleaning and analysis:

  Automating the data cleaning and analysis process can reduce the time and effort required to extract meaningful insights from the data.

- Advanced data visualization:

  The system can be improved by incorporating advanced data visualization tools that allow users to easily interpret the data and identify trends and patterns.

- Machine learning and predictive analytics:

  The system can be enhanced by incorporating machine learning and predictive analytics capabilities, allowing the system to identify patterns and predict future trends.

- Regular system evaluation and improvement:

  Regular system evaluation and improvement are crucial to ensure that the system continues to meet the evolving needs of the organization.

- Collaboration and sharing capabilities:

  The system could be enhanced with features such as shared workspaces, collaborative analytics, and reporting to facilitate collaboration among team members.

- Data quality management:

  Data quality management is critical to ensuring accurate and reliable data analysis. Future work could include improving data quality management processes, including data profiling, data cleansing, and data monitoring.

- Integration with external data sources:

  The system could be expanded to integrate with external data sources, such as social media data, weather data, or demographic data, to provide a more comprehensive view of the organization's performance.

- Privacy and security compliance:

  With the increasing focus on data privacy and security, it is essential to ensure that the departmental data analysis system complies with relevant regulations and standards, such as GDPR or HIPAA.

- User-friendly interfaces:

To ensure that the system is accessible and easy to use for all users, future work could include improving user interfaces and providing training to users on how to use the system effectively.

● Feedback and improvement loops:

Incorporating feedback mechanisms into the system can help identify areas for improvement and guide future development.

By continuously improving the system and incorporating new technologies and techniques, the departmental data analysis system can become a valuable tool for decision-making, helping the organization achieve its goals and objectives and by incorporating these future work ideas into a departmental data analysis system, organizations can unlock the full potential of their data, gain valuable insights, and make informed decisions to drive success.

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