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Q.1) What is the total no. of attributes present in the data?

Answer:-

There are total 2 sheets:-

a)Tickets sheet:- It has 10 attributes which are id, ticket fecha, employee id ,agent id, request category, issue type, severity, priority, resolution time, satisfaction rate.

b)IT agents sheet:- It has 6 attributes including agent id, full name, email, year of birth, month of birth, day of birth.

Therefore, total no. of attributes present in the data are 16.

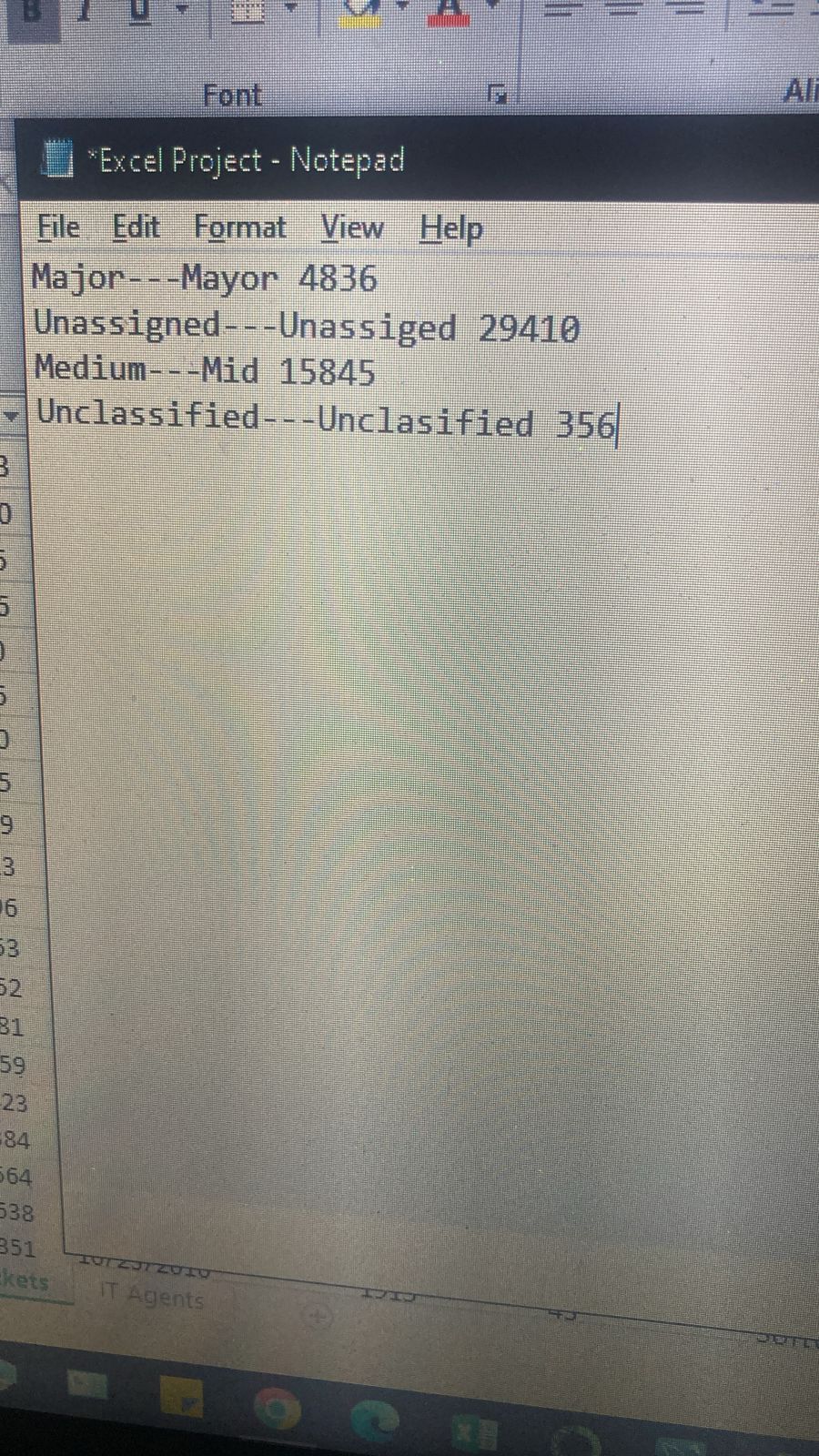
Q.2) Which columns have inconsistent or missing values, and what is the count of such values?

Answer:- a)There are no missing values in data.

b) However, there were some spelling mistakes like ‘Unclasified’ and ‘Unasigned’.

c)Moreover, both the severity type and severity key were in the same column( joined with a ‘-’). Same with the Priority column.

The count of values with incorrect spelling are:-(Next page)



Q.3)What is the average daily ticket volume over time?

Answer:-

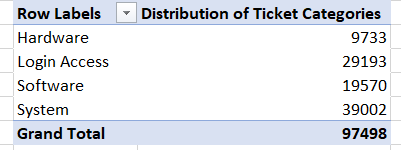
Approach:- There are total of 97498 tickets and total 1827 different date values. So average daily ticket volume=97498/1827 = 53 tickets approx.

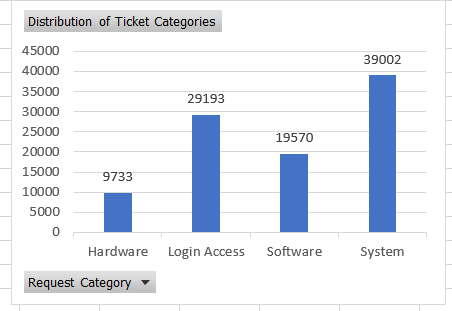


Q.4) What is the distribution of ticket categories (e.g., Login Access, System, Software)?

Answer:-

Approqach:- The approach is aggregate ticket count by category using pivot table and then visualising them.



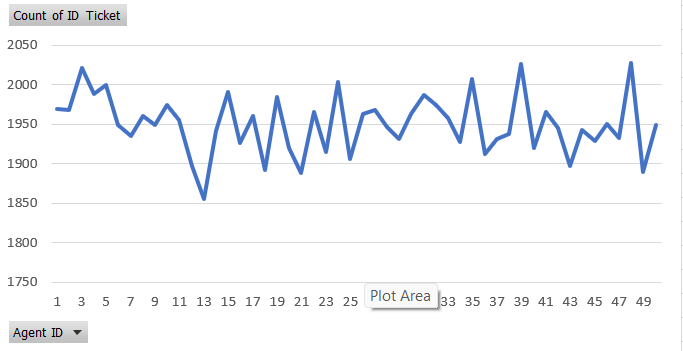


Conclusion:- From the pivot table and the above graph, we can say that maximum tickets are for ‘System’ category and minimum were for Hardware.

Q.5) How many tickets has each agent handled?

Answer:- Approach:- Approach is to aggregate count of tickets handled by each agent using a pivot table.

|  |  |
| --- | --- |
| **Agent Name** | **Count of ID Ticket** |
| **A. Trejo** | **1949** |
| **Alberto Casillas** | **1974** |
| **Alberto Gastelum** | **1889** |
| **Aldo Carrillo** | **1966** |
| **Alfonso Barraza** | **1984** |
| **Alfredo Barreras** | **1920** |
| **Armando Sierra** | **1890** |
| **Aurelio Tanori** | **2027** |
| **Barbara Grijalva** | **2003** |
| **Barraza Alberto** | **1988** |
| **Darwin E.** | **1945** |
| **Diana Rojo** | **1927** |
| **Eduardo Luna** | **1920** |
| **Elena Velez** | **2021** |
| **Enrique Montiel** | **1938** |
| **Estuardo Ocaño** | **1935** |
| **EstuardoTorres** | **1942** |
| **Eva Cardenas** | **1943** |
| **Flores Sierra** | **1963** |
| **Galindo Guadalupe** | **1991** |
| **Griselda Galindo** | **1856** |
| **Guadalupe Hernandez** | **1915** |
| **Guadalupe Torrico** | **1987** |
| **Guadalupe Villanueva** | **1958** |
| **Isela Leyva** | **1968** |
| **Javier D.** | **1897** |
| **Jesus Contreras** | **2026** |
| **Jesus Pacheco** | **1931** |
| **JesusGrajeda** | **1968** |
| **Leon Lourdes** | **1961** |
| **Lopez Moran.** | **1956** |
| **Lorena** | **1966** |
| **Luis Arguello** | **1929** |
| **Luis Torres** | **1913** |
| **Marisol Piedrahita** | **1960** |
| **Mata Lucero** | **1969** |
| **Melinda** | **2007** |
| **Miller Gaviria** | **1892** |
| **Nurio Zepeda** | **1946** |
| **Orci Carlos** | **1926** |
| **Parra Luna** | **1963** |
| **Ramon Macias** | **1949** |
| **Reyna Santacruz** | **1897** |
| **Rosa Olguin** | **1950** |
| **Sandra Lujan** | **1906** |
| **Segura Garcia** | **1931** |
| **Silvia Morales** | **1974** |
| **Velasquez Jose** | **1949** |
| **Willyberto Gonzales** | **2000** |
| **Yomaira Agudelo** | **1933** |
| **Grand Total** | **97498** |

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Maximum no of tickets were held by agent id 48 which is equal to 2027 tickets.

Minimum no of tickets were held by agent id 13 which is equal to 1856 tickets.

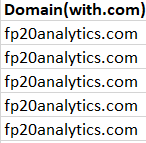
Q.6) How can you extract the domain from the email addresses in the IT Agents sheet?

Answer:-

Approach:- I broke this question into 2 steps. Firstly, I extracted the domain with .com in it using right function and then using the left function , I extracted the domain name.

**Step 1 :-**

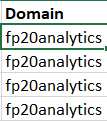
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**Step 2:-**

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**Final Answer:-**

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Q.7)How can you find the full name of an agent given their Agent ID?

Answer:-

Approach:-We can find full name of an agent through their agent id by using the VLOOKUP function.



**Note:-** The answer is in the O column of Tickets sheet.

**Final Answer:-**

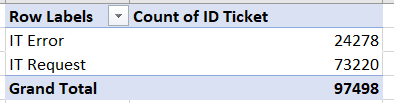
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Q.8)What is the count of each issue type (e.g., IT Error, IT Request)?

Answer:-

Approach:- Approach is to aggregate count of tickets by issue type using pivot table.

The count of IT Error is 24278 and IT Request is 73220.



Q.9)What is the daily average resolution time for tickets?

Answer:-

**9.What is the daily average resolution time for tickets?**

**Answer:**

**We can find using pivot table:**

**Daily average resolution time over the years is:**

|  |  |
| --- | --- |
| **Year** | **Average of Resolution Time (Days)** |
| **2016** | **4.551758486** |
| **2017** | **4.530070399** |
| **2018** | **4.558668355** |
| **2019** | **4.520800372** |
| **2020** | **4.585911716** |

**Conclusion:**

**According to request category hardware Issues have maximum resolution time and login Issues have minimum resolution time and average resolution of agents across the years is 4.5 days.**

Q.10)How has the volume of tickets changed over time?

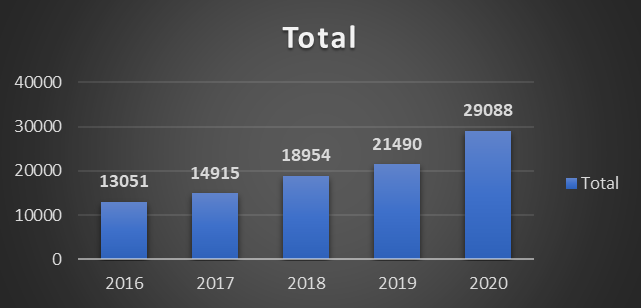
Answer:-

Approach:- Approach is to count total tickets per year using pivot table to see how ticket volume has changed.

Below is the chart showing variation of volume of tickets with time.

**Volume of tickets is Increasing over time from year 2016-2020 as per data.**

|  |  |
| --- | --- |
| **Year** | **Count of ID Ticket** |
| **2016** | **13051** |
| **2017** | **14915** |
| **2018** | **18954** |
| **2019** | **21490** |
| **2020** | **29088** |

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Q.11)What is the average age of the IT agents?

Answer:- Approach:- Approach is to use the average function on the age column. But first we have to calculate the age column form DOB using

DATEDIF function.

The average age of the IT agents is approx 39 years.Age is in H column.

Q.12)Is there a correlation between the severity of issues and the resolution time?

Answer:-

Approach:- Using the CORREL formula to get correlation.

I used the CORREL formula to get correlation between severity and resolution time and the value was -0.04.

=CORREL(I2:I97499,M2:M97499)

Since the value is slightly negative, it means that, in general, as the severity increases, the resolution time might slightly decrease.  
  
"There is almost no correlation between the severity of issues and the resolution time. This indicates that the severity of a ticket has little to no impact on how long it takes to resolve the issue, meaning resolution time is likely influenced by other factors beyond severity."

Q.13)How many categorical columns are there in the data? [Search about categorical and continuous data, and try to answer this question]

Answer:-

In Tickets sheet there are 7 categorical columns:- id, employee id, agent id, request category, issue type ,severity ,priority, satisfaction rate.

And in agents sheet there are 3 categorical columns:- agent id, full name, email.

So therefore, there are total 10 categorical columns in the data.

SUBJECTIVE QUESTIONS

Q.1)If there is an investment, should it be used to hire more IT agents, improve training programs, or upgrade ticket management software?

Analysis: Perform a cost-benefit analysis using ticket resolution and satisfaction metrics.

Answer:-

**We can consider following criteria to analyze performance of Agents as per given Data:**

**1.Custumer satisfaction score of agents. (CSAT)**

**2.Average resolution time of agents. (ART)**

**1.CSAT:**

**CSAT is a key metric used to measure customer satisfaction with a product, service, or interaction. It is typically captured through surveys where customers rate their satisfaction after an experience, such as resolving a support ticket.**

**1 = Very Unsatisfied**

**2 = Unsatisfied**

**3 = Neutral**

**4 = Satisfied**

**5 = Very Satisfied**

**CSAT Score (%) = (Number of Positive Responses / Total Number of Responses) \*100**

**2.Average Resolution Time (ART)**:

**It refers to the average time it takes to resolve a customer support ticket or issue. It is a crucial metric for understanding the efficiency of a support team in handling customer inquiries**.

**ART (%) = (Total Resolution Time of Agent/ Number of Ticket Resolved) \*100**

**Based on the above formulas, following calculations are done (Sorted on ART).**



**It is observed that there are agents (12%) Who have both, Above Average ART and Below Average CSAT:**

**So, below cost benefit analysis table can be considered for an Action:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Option** | **Costs** | **Expected Improvement in ART** | **Expected Improvement in CSAT** | **ROI Consideration** |
| **Hire More IT Agents** | **High (Salaries, Onboarding)** | **Medium** | **Medium** | **Short-term improvement, scalable** |
| **Improve Training Programs** | **Moderate (Training Costs)** | **Medium** | **High** | **Long-term skills improvement** |
| **Upgrade Ticket Management Software** | **High (Software, Implementation)** | **High** | **High** | **Long-term efficiency and scalability** |

**Actionable Insights:**

1. **As volume of tickets is increasing yearly, so we should hire more agents.**
2. **Low performing agents should be recommended for training program.**
3. **We can upgrade ticket management software’s to reduce ART.**

Q.2)Which agents need additional training based on their performance metrics?

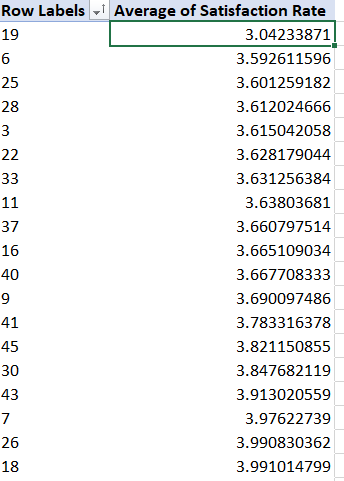
Analysis: Identify agents with the lowest satisfaction ratings and longest resolution times.

Answer:-

Approach:- I found agents which require training by considering agents having satisfaction rate<=4 and resolution time>= 5 days.

1. Agents with lowest satisfaction rates:-

These are the agents which have satisfaction rate<=4.



2)Agents with longest resolution time:-

These are the agents having resolution time>=5 days

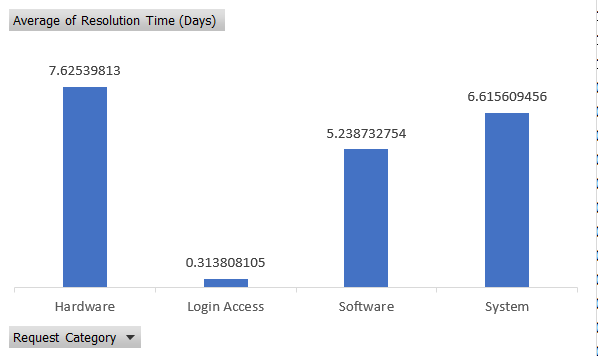
Conclusion:- From both the tables, we can see that agents with agent id 19,22,25,28,3,22, 7 have satisfaction rate <=4 and resolution time>=5 days. These are the agents which need training.

Q.3) Do certain categories of requests have longer resolution times?

Analysis: Analyze the resolution times by request category.

Answer:-

Approach:- In this I pivot table to aggregate average of resolution time by category.



**Insights:**

1. **High Resolution Time for Hardware Issues (7.63 days):**
   * Hardware problems are taking the longest to resolve. This could indicate challenges such as delays in part replacements, limited stock, or coordination issues with external vendors.
2. **Quick Resolution for Login Access Issues (0.31 days):**
   * Login-related issues are resolved the fastest, suggesting that either these issues are simple to fix or there is an efficient process in place for handling them (e.g., password resets or account unlocks).
3. **Moderate Resolution Time for Software (5.24 days) and System Issues (6.62 days):**
   * Software and system-related problems have longer resolution times, which might point to:
     + Complex troubleshooting processes.
     + Dependency on IT specialists or cross-team efforts.
     + A need for deeper investigations or configuration changes.
4. **Overall Average (4.55 days):**
   * The grand total average suggests that, on the whole, resolution times can be further optimized, especially for more complex categories like hardware, software, and system issues.

**Recommendations:**

1. **Analyze the Hardware Process:**
   * Investigate bottlenecks in the hardware issue resolution process.
   * Consider maintaining an inventory of commonly needed parts to reduce delivery times.
   * Explore contracts with multiple vendors to improve turnaround.
2. **Maintain Login Access Best Practices:**
   * Since login issues are resolved quickly, this process can serve as a model for other issue categories.
   * Ensure automation tools (e.g., self-service password resets) are optimized to maintain this efficiency.
3. **Improve Software and System Issue Handling:**
   * Review whether additional training for IT teams can reduce the time needed to troubleshoot these issues.
   * Automate routine software updates and configurations, if possible.
   * Develop escalation policies to streamline cross-team collaboration when needed.
4. **Set Target Resolution SLAs:**
   * Introduce target resolution times for each category (e.g., hardware issues should be resolved within 5 days).
   * Monitor cases that exceed SLAs and conduct root-cause analysis to prevent recurrence.
5. **Regular Monitoring and Feedback:**
   * Establish dashboards for tracking issue resolution metrics in real-time.
   * Conduct regular reviews to identify trends and adjust strategies accordingly.

This approach will help improve resolution times and enhance overall service efficiency.

Q.4) How effective are the current software tools in managing IT tickets?

Analysis: Evaluate performance metrics before and after the implementation of new tools.

Answer:-

Approach:- In this question, I first tried to analyse the trends of resolution time and satisfaction rate with time to find out whether current software tools are effective or not. And based on that analysis, I evaluated the possible effect after implementation of new tools.

**Observations:**

1. **Satisfaction Rate Trends:**
   * The satisfaction rate has steadily **improved from 2016 (3.98)** to **2020 (4.16)**, indicating an overall positive trend.
   * However, the growth in satisfaction is relatively **small each year**, suggesting that there is room for further improvement.
2. **Resolution Time Trends:**
   * The **average resolution time has fluctuated** across the years, remaining between **4.52 to 4.58 days.**
   * Although resolution times haven’t significantly worsened, **2020 shows the highest average resolution time** (4.59 days), which might be a cause for concern, given that faster resolutions generally lead to higher satisfaction.
3. **Correlation between Satisfaction and Resolution Time:**
   * There is **no clear inverse correlation** between the satisfaction rate and resolution time (i.e., an increase in resolution time in 2020 didn’t dramatically reduce satisfaction). However, quicker resolutions typically enhance user experience.
   * Despite the **improving satisfaction**, the resolution time isn’t showing similar progress, which could indicate **inefficiencies in current processes or tools.**

**Recommendations:**

1. **Evaluate Current Tools:**
   * **Resolution time hasn’t improved significantly**, despite the steady increase in satisfaction. This suggests that while users might be content with the outcomes, the **tools in use may not be efficient** in handling issues swiftly.
   * A **performance audit** of the tools and processes should be conducted to identify bottlenecks, especially for complex cases such as hardware or software issues.
2. **Automation and AI Tools:**
   * Introduce **AI-based ticketing tools** or **workflow automation** to handle repetitive tasks and speed up resolutions.
   * Implement **self-service options** where users can solve common issues independently (e.g., password resets, simple software issues).
3. **Better Incident Management Systems:**
   * Consider **upgrading to more advanced incident management platforms** that offer better tracking and prioritization of tickets.
   * Use **dashboards** for real-time monitoring and escalation to reduce delays.
4. **Focus on Reducing Resolution Time:**
   * Even though satisfaction is improving, **resolution time needs to align with user expectations**. Faster resolutions could further boost satisfaction.
   * Introduce **Service Level Agreements (SLAs)** to ensure response and resolution times meet specific benchmarks.
5. **Employee Training and Process Improvements:**
   * Evaluate if the **current support staff needs additional training** or access to better troubleshooting tools.
   * Regularly **review processes** to ensure optimal usage of the current tools.

Effect on performance after the implementation of new tools:-

a)Automated Ticket Assignment and Prioritization:- Reduced delays in ticket assignment and faster resolution for high-priority issues.

b) Enhanced Ticket Tracking and Monitoring:- IT teams can proactively manage tickets, reducing resolution time and ensuring no ticket is overlooked.

c)Knowledge Base Integration:- Agents can resolve tickets faster by referencing previous solutions, reducing time spent on research and troubleshooting.

d)Data-Driven Insights and Analytics:- Managers can identify and address inefficiencies, reassign resources, and improve workflows based on real-time data.

**Conclusion:**

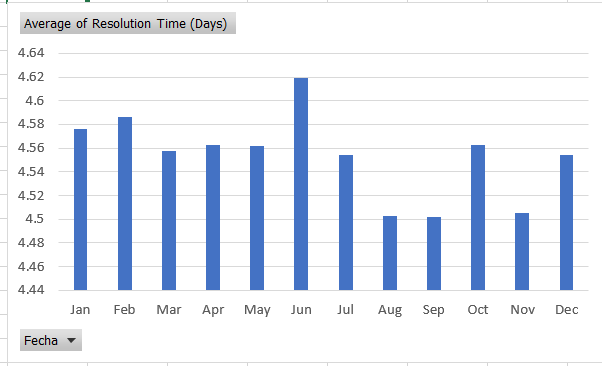
While satisfaction rates are improving, the **stagnant resolution times** suggest that the **current tools are not fully optimized** for efficiency. Implementing **new tools with automation capabilities** or **enhancing current systems** will likely reduce resolution time and further boost satisfaction levels. This will ensure continued growth in user satisfaction while maintaining or improving operational efficiency.

Q.5)How has the performance of the IT support team changed over time (e.g., monthly or quarterly)?

Analysis: Trend analysis using time series charts.

Answer:-

Approach:-To answer this, we will use 2 charts showing the variation of resolution time and satisfaction rate over months to see how the performance of IT team varies monthly.



Conclusion:- Requests gets resolved very shortly in July , August , September and November while the best satisfaction rate is achieved in months of January and July. So July is the month of best performance of IT agents.

Q.6) If we invest more on tech (Hardware, software, etc), do you think it will improve the ticket resolution times and employee satisfaction?

Answer:-

**Approach:-** In this I first tried to analyse resolution time and satisfaction rate by request category to see the how the current tech is ineffective or not and further decide about investment.

**Analysis:**

1. **Resolution Times vs Request Category:**
   * Hardware issues take the longest time to resolve, with an average of 7.63 days, which is notably higher than other categories.
   * System-related issues follow with an average resolution time of 6.62 days, also indicating delays.
   * In contrast, Login Access requests are resolved quickly (0.31 days), likely because they are simpler to manage.
2. **Satisfaction Rate vs Request Category:**
   * All categories show similar satisfaction rates (~4.09 - 4.11), which indicates that employees are relatively satisfied overall.
   * However, hardware-related requests (with 4.10 satisfaction) have a lower margin for error, given their long resolution time. Delays in hardware may lead to frustration over time, despite the current satisfaction levels.

**Impact of Investment in Technology:**

1. **Faster Hardware Resolutions:**
   * Investing in hardware (such as better diagnostic tools, spare parts, or automated hardware management solutions) could reduce the 7.63-day resolution time, directly impacting user satisfaction.
   * Proactive maintenance programs can further reduce downtime and ticket volumes, especially for recurring hardware issues**.**
2. **Improved Software Tools and Automation:**
   * Investment in software tools (e.g., AI-based ticketing systems, automation) could further reduce system-related delays by prioritizing critical issues and auto-assigning tickets.
   * Faster resolution for software and system issues would boost employee productivity and satisfaction.
3. **Scalable Login Access Solutions:**
   * Since login-related issues already have fast resolution times, continued optimization with self-service tools (like automated password resets) will help maintain this performance without significant additional investment**.**

**Expected Outcomes of Investment:**

* **Reduction in Average Resolution Times:**
  + Investments in hardware and software technologies will likely bring down resolution times, especially for hardware and system categories.
  + Faster resolution translates to reduced downtime, enhancing employee productivity and job satisfaction.
* **Improved Satisfaction Rates:**
  + While satisfaction is currently stable, delays in hardware and system issues could erode employee satisfaction over time if not addressed. Investing in technology ensures sustained or improved satisfaction levels.
* **Long-term Efficiency Gains:**
  + New tools and processes reduce the need for manual intervention and repetitive tasks, leading to a more efficient helpdesk and reduced ticket volumes over time.

**Conclusion:**

Yes, investing in technology, particularly in hardware and software tools, will improve ticket resolution times and sustain or increase employee satisfaction. With faster resolution of complex issues and reduced delays, employees will experience fewer disruptions, leading to higher productivity and satisfaction in the long run**.**

Q.7)What are the key performance metrics for IT agents, and how can they be improved, do we need to fire any agents?

Answer:-

Approach:-The key performance metrics are less resolution time and more satisfaction rate.

Regarding the firing of agents, we have already done analysis in the Q.2 and we found that agent id 19,22,25,28,3,22, 7 have satisfaction rate <=4 and resolution time>=5 days. These are the agents which can be fired or given some training. Here is the analysis again:-

1. Agents with lowest satisfaction rates:-

These are the agents which have satisfaction rate<=4.

2)Agents with longest resolution time:-

These are the agents having resolution time>=5 days

From both the tables, we can see that agents with agent id 19,22,25,28,3,22, 7 have satisfaction rate <=4 and resolution time>=5 days. These are the agents which need training.

**CSAT:** **A measure of how satisfied users are with the service they received from an agent, typically collected through post-resolution surveys.**

**Improvement:-**

Option 1: Hire More IT Agents

Cost: Hiring more agents incurs salary costs, benefits, and overhead expenses.

Benefit: This could reduce the workload for existing agents, leading to faster ticket resolution times and more satisfaction rate as resolution time has increased.

Analysis: We have to calculate the current **agent-to-ticket ratio**. The current agent-to-ticket ratio is approx 1912 tickets per agent over four years from 2016-2020. It seems that the resolution time is high due to agent overload, so hiring more agents can be the solution.

Option 2: Improve Training Programs

Cost: Cost will increase due to investment in training programs (cost of trainers, material, time spent in training).

Benefit: Better-trained agents can resolve tickets faster and more accurately, improving satisfaction scores and lowering resolution times.

Analysis: We should focus on agents with high resolution times and low satisfaction scores. Analyze whether their performance is due to a lack of training or complexity of issues. If it’s a training issue, improving training could be a cost-effective solution.

Q.8) How do employee demographics (e.g., department, seniority) impact satisfaction and ticket outcomes?

Answer:-

Approach:- Here we will use 3 charts which will consider variation of resolution time, satisfaction rate and count of ticket with age.

**Conclusion:-** By analysing all the 3 graphs, we can conclude that demographics do not impact satisfaction, resolution time and tickets handled.

Q.9)Identify the trends for IT support operations based on ticket volumes and satisfaction, and mention the peak and stable times?

Answer:-

Approach:- To identify these trends, I will use 2 graphs, satisfaction rate by months and count of ticket by months.

Conclusion:- a) From the charts we can conclude that the peak time for satisfaction rate is January and for ticket volume it is August.

b) The stable months for satisfaction rate are April, May, Jul , Aug ,Sep and for ticket volumes are Mar, May, Jun, Sep, Nov.

Q,10)What metrics should be included in the final dashboard to provide a comprehensive view of call center performance and guide investment decisions?

Answer:- The metrice that should be included are:-

* Average resolution time by category, severity type, priority type
* Satisfaction rate of each agent
* Tickets handled by each agent
* Slicers of priority type, year , severity type, weekday, issue type, request category.