Big Data in Telecommunications

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Phase 1

Telecommunication Data by Provider - Romello

Analyzing telecommunication data by provider is important in the telecommunications industry as it provides insights into the performance, market share, and customer experience associated with different service providers. Examining data such as network usage, structure type, license, and location to each provider, telecom companies can gain understanding of their competitive landscape. This analysis assists in any decision-making processes. Ultimately, telecommunication data by provider serves as a valuable tool for enhancing operational efficiency, driving customer retention, and fostering innovation within the industry.

Figure 4.1: Count of Cellular Towers In USA by State

Count of Cellular Towers In USA by State

This Tableau visualization presents cellular tower distribution across US states, showing total counts per state and dominant network providers, notably AT&T leading in Texas with 1,854 locations, showing big data's role in understanding telecommunication infrastructure.
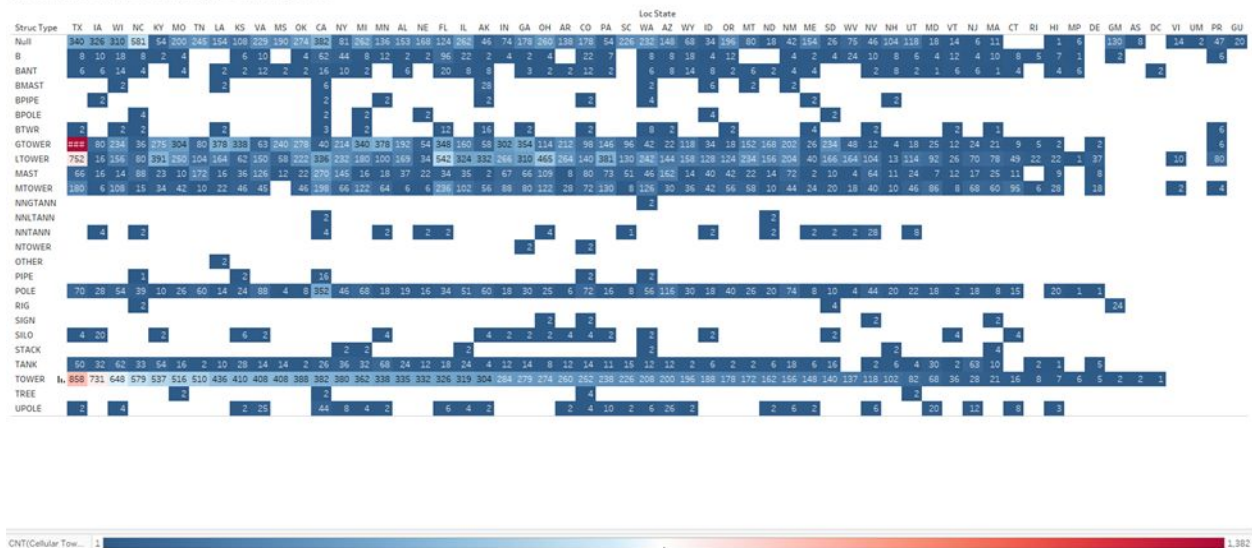
Figure 4.2: Top 3 Network Provider Structure Type

Top 3 Network Provider Structure Type

Struc...	Licensee (group)	Count
TOWER	Verizon	4,699
	ALLTEL Corporation	1,784
	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	87
LTOWER	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	5,208
	Verizon	552
	ALLTEL Corporation	134
GTOWER	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	4,995
	Verizon	515
	ALLTEL Corporation	202
Null	Verizon	2,089
	ALLTEL Corporation	840
	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	11
MTOWER	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	1,974
	Verizon	73
	ALLTEL Corporation	22
MAST	Verizon	922
	ALLTEL Corporation	243
	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	194
POLE	Verizon	644
	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	186
	ALLTEL Corporation	115
TANK	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	296
	Verizon	159
	ALLTEL Corporation	53
B	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	232
	Verizon	71
	ALLTEL Corporation	12
BANT	Verizon	72
	ALLTEL Corporation	27
	AT&T Mobility LLC, AT&T MOBILITY LLC, AT&T Mobility of Galveston LLC and 3 more	16

Count of Cellular Towers In USA.csv

This Tableau visualization displays USA's cellular tower distribution among top providers, predominantly Verizon, categorized by structure type in a descending order bar graph, showcasing Verizon's dominance in the telecommunications industry.

Figure 4.3: Network Provider Type Count by State

Network Provider Structure Type Count by State

This Tableau visualization displays Network Providers Structure Type by State in a horizontal bar graph sorted by the most used structure type, predominantly towers indicated by the red color, with Texas showing the highest usage due to its large size. The blanks show lack of structure type within a state.

Figure 4.4 Treemap Representation of Cell to Province Groups

Treemap Representation of Cell to Province Groups

This Tableau Treemap illustrates cellular infrastructure distribution across provinces, with colors indicating varying counts and Milano having the highest count, offering insights for telecommunications strategy and regional development decisions, showcasing the importance of Big Data at a provincial level and highlighting Italy's provinces globally.

Phase I Conclusions

Types - In the countries that the data was collected calls were the more popular form of communication. Figure 3 also shows the rising popularity of the internet as the data comes into the present day.

Churn - Phase I was not particularly forthcoming with information relevant to churn reasoning. More analysis is needed to understand what makes customers decide to leave the given provider.

Region - The conclusions drawn by these charts are straightforward: Telecommunication markets worldwide are rapidly expanding, even in the lowest growth areas, and the data variance from region to region gives good insight into what a company in this market should do.

Provider - The provided visualizations illustrate the competitive landscape of the telecommunications industry in the USA, with major providers like Verizon and AT&T dominating the cellular tower distribution.

Phase 2

Figure 4.5 Daily Variation of Cell to Province Levels

This Tableau line graph displays the daily data usage fluctuations from cell to province levels on November 1, 2013. It indicates data usage peaks at 11:00 AM (86,321) and lows at 4:00 AM (2,704). This data is significant for Big Data analytics, revealing usage patterns crucial for optimizing network performance and planning infrastructure.
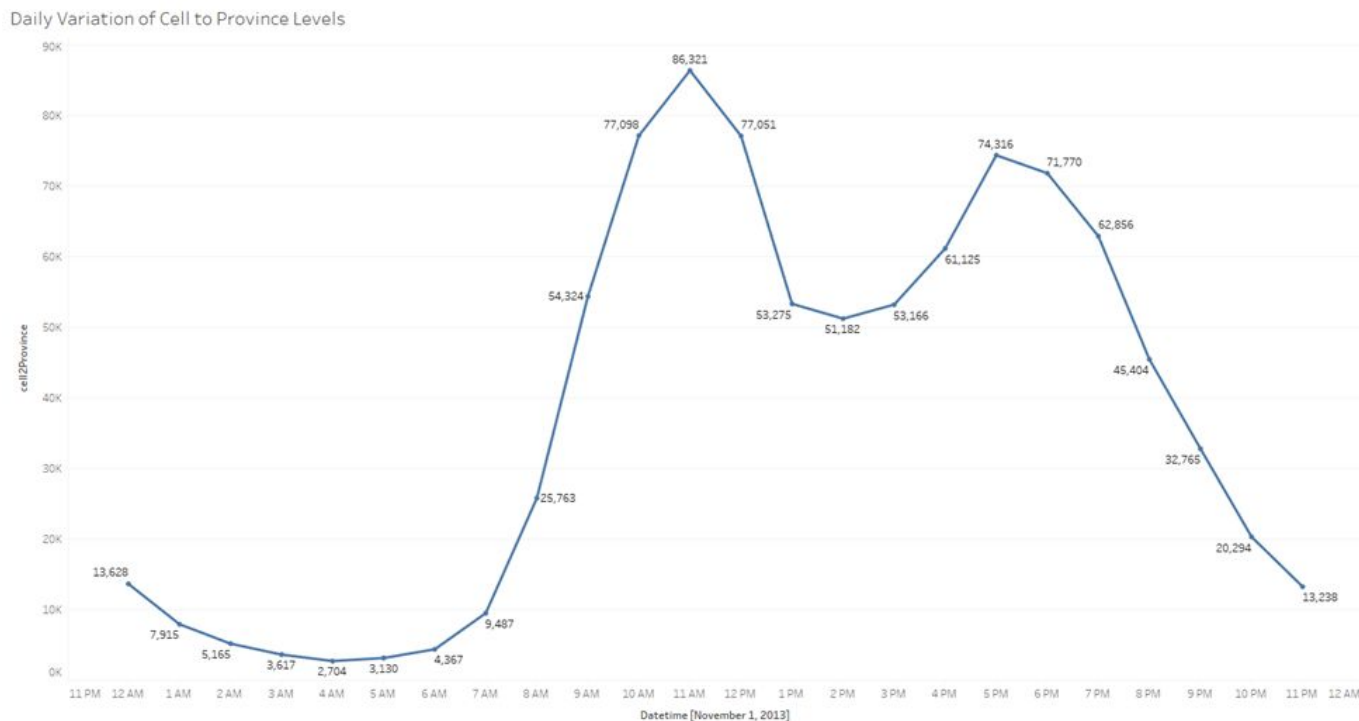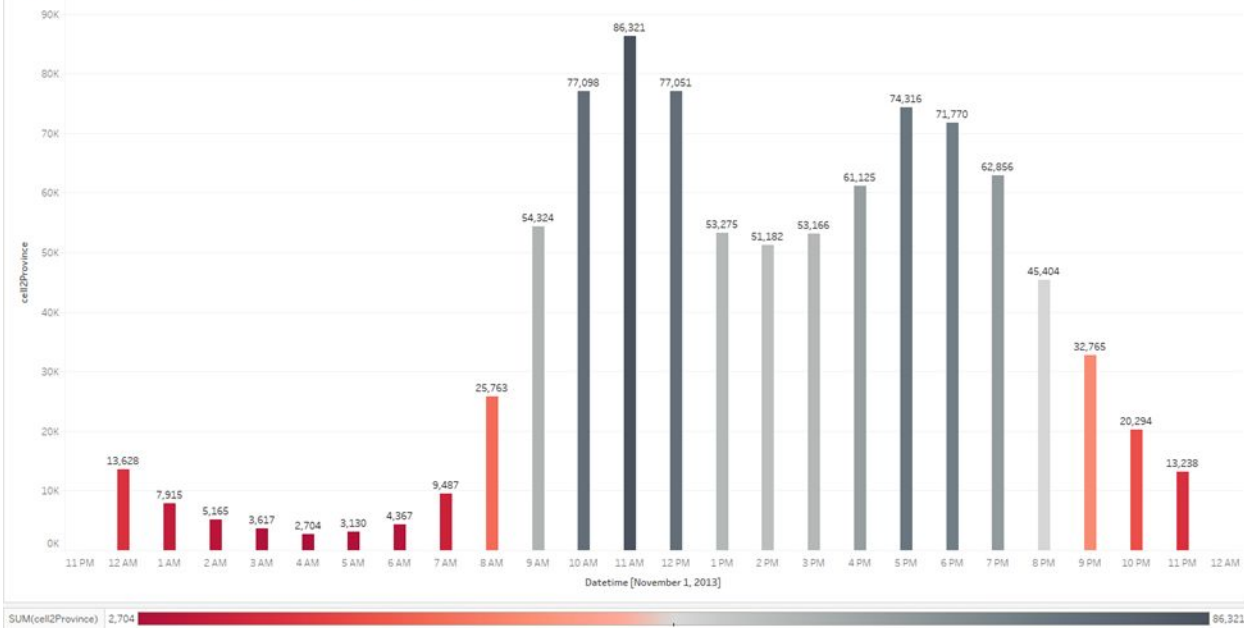

Daily Variation of Cell to Province Levels

Figure 4.6 Daily Trends of Cell to Province Levels: Line Graph Representation

Daily Trends of Cell to Province Levels: Line Graph Representation

This Tableau visualization showcases the daily fluctuations in cell-to-province data on November 1, 2013, using a color-coded bar graph. The color spectrum indicates data volume, aiding in identifying usage peaks and lows. This data is significant for Big Data analytics, providing insights into cellular infrastructure utilization. Stakeholders can use this information for resource allocation, capacity planning, and proactive management.

Figure 4.7 Geographical Distribution of Cellular Towers in the USA and Structure Type
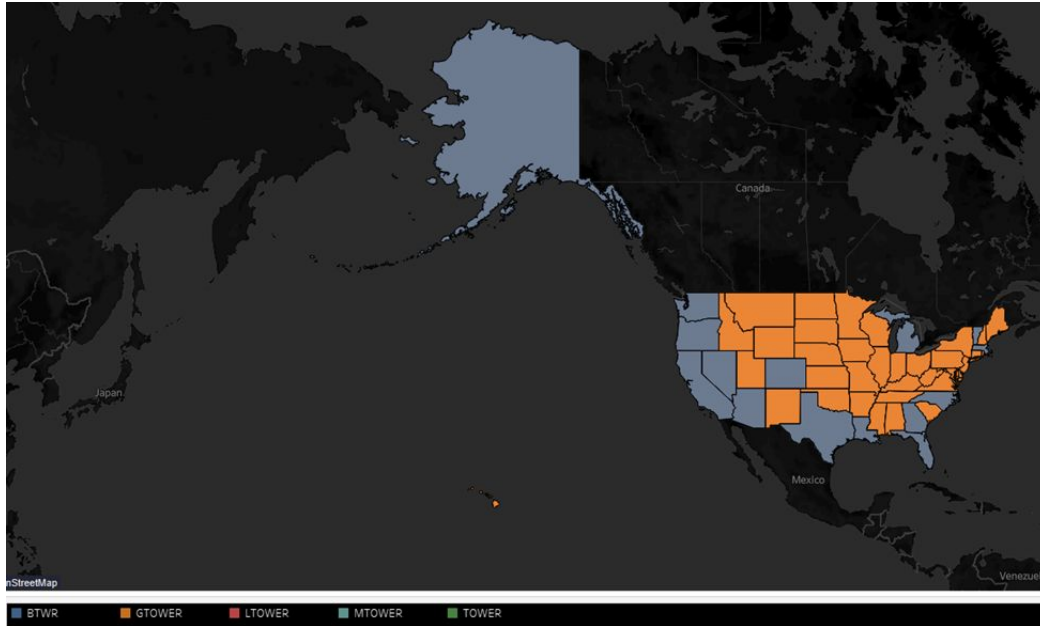
This Tableau visualization depicts the geographical distribution of cellular towers in the United States by state and tower type, using a filled map format and color-coded structures. It provides valuable insights for telecom companies, policymakers, and urban planners, aiding in network coverage, capacity planning, and resource allocation decisions. With coverage across all 50 states and multiple tower types, it qualifies as Big Data, requiring advanced tools for analysis, and highlights varying network needs such as BTWRs for rural areas and GTOWERs for urban centers.

Figure 4.8 Geographical Distribution of Cellular Tower Licenses in the United States

This Tableau-generated map of the United States uses color coding to represent the dominant license groups providing coverage in each county. AT&T emerges as the predominant group, shown in blue across many counties. This visualization offers detailed insights into cellular tower coverage distribution, crucial for understanding telecom infrastructure nationwide.
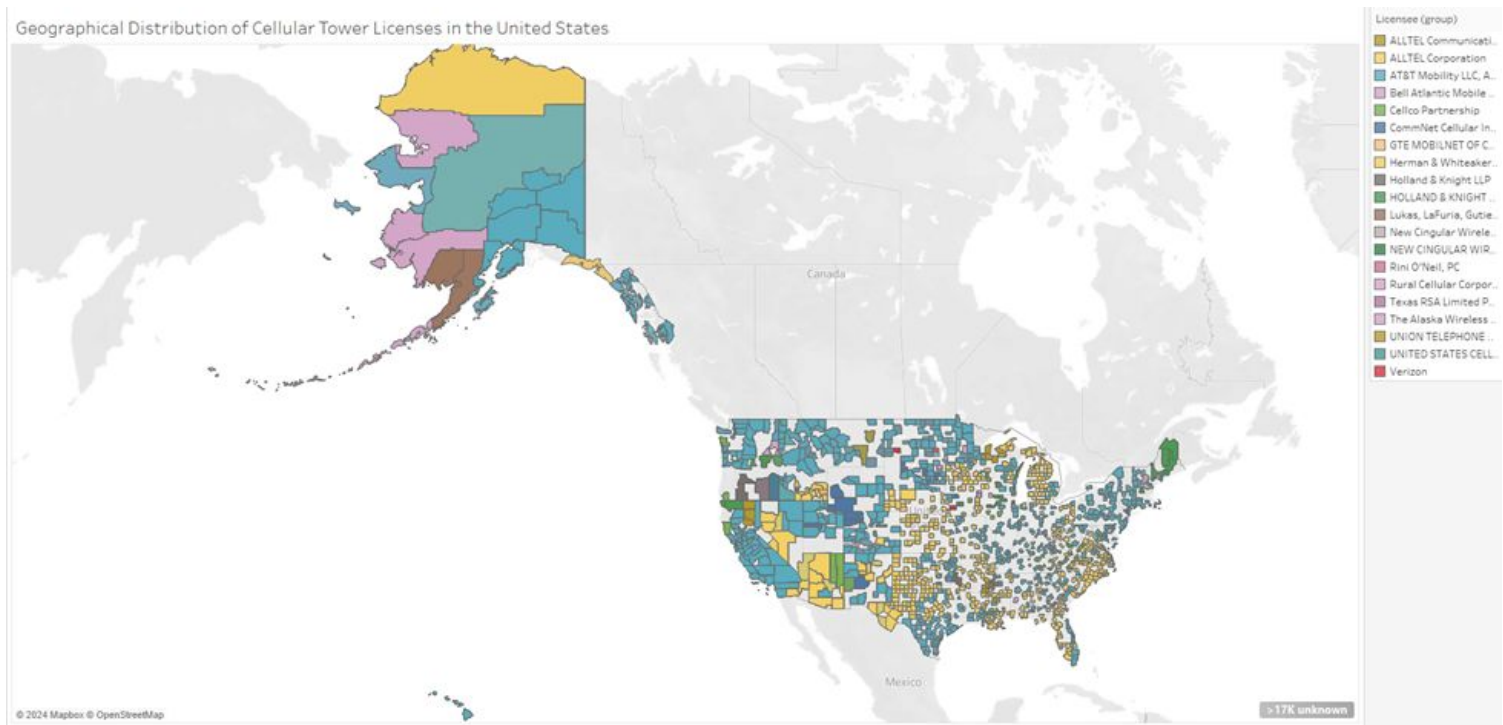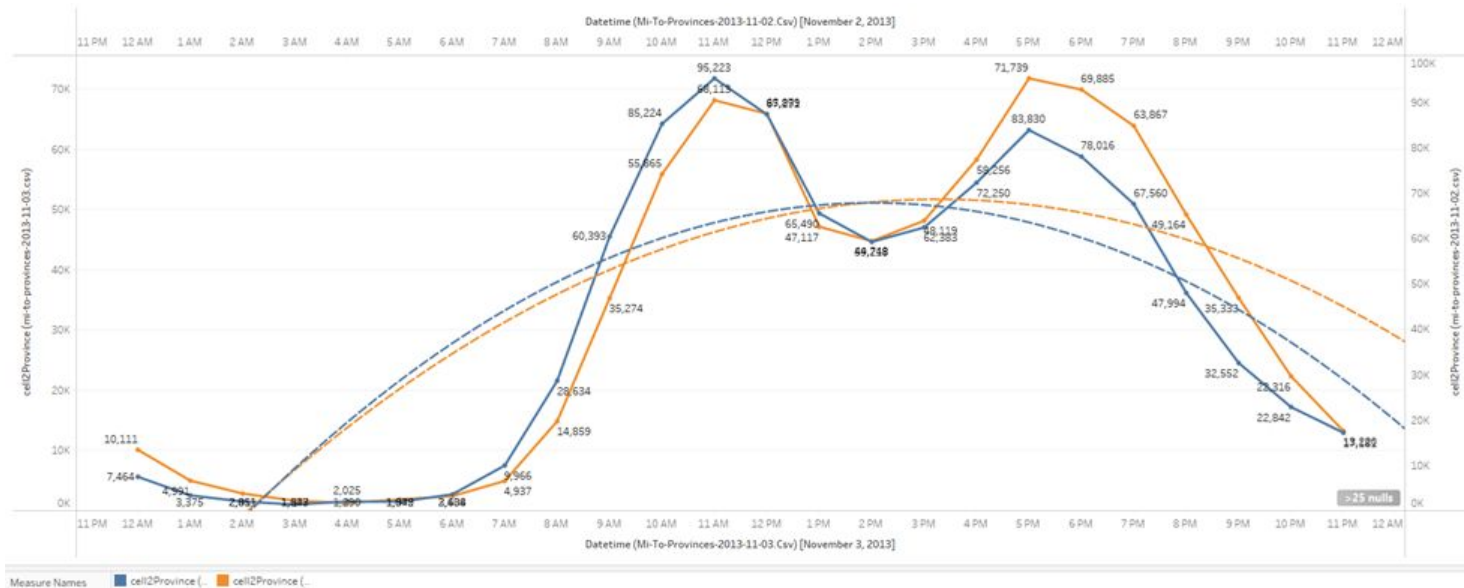

Geographical Distribution of Cellular Tower Licenses in the United States

Figure 4.9 Analyzing Daily Variations in Cell to Province Levels: Insights from November 2nd and 3rd, 2013

This Tableau figure visualizes daily variations in cell-to-province data from November 2nd and 3rd, 2013. Line graphs represent trends for each province, with an exponential trend line for trend analysis and anomaly detection. Understanding these variations is crucial for telecom companies and infrastructure planners, guiding resource allocation and network optimization. The figure qualifies as big data due to its extensive dataset spanning multiple provinces over two days, involving complex analysis to derive meaningful insights from historical and real-time observations.

4.10 Distribution of Cellular Tower Structure Types in the USA
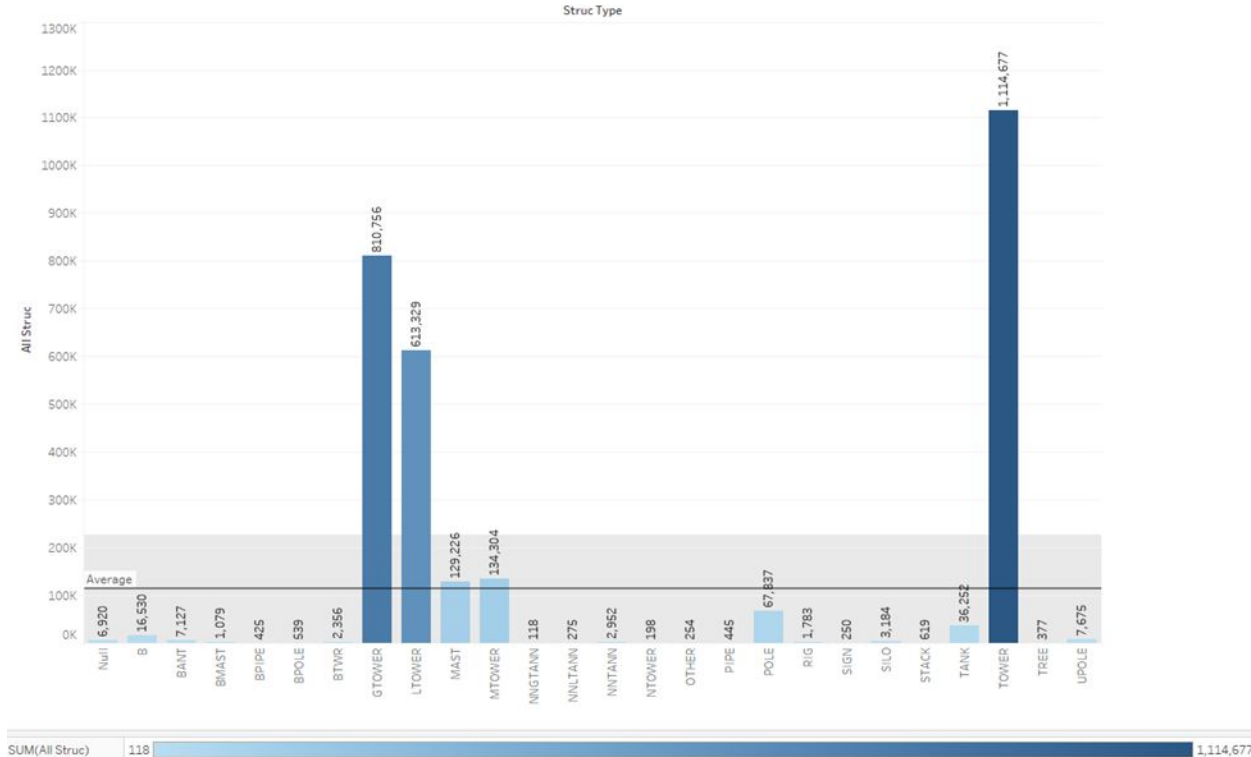
This Tableau figure displays the diversity of cellular tower structures in the USA through a bar graph, each bar representing a structure type and its count. The color gradient indicates distribution patterns. This analysis helps telecom companies optimize network coverage and performance by informing infrastructure decisions. It qualifies as Big Data analytics due to its extensive dataset covering 26 structure types and a wide range of sums.

4.11 Provincial Distribution of Province to cell

This Tableau visualization depicts Province Name data with square marks representing provinces, showing the sum of Province to Cell with color and size. It's crucial for optimizing telecom networks at a provincial level, spanning 110 provinces with varying infrastructure levels. The dataset, considered Big Data, ranges from 73 to 656,782 values, highlighting significant values in provinces like MILANO and MONZA E DELLA BRIANZA.

Figure 4.12 Cellular Tower Distribution Analysis: Structure Type and License Breakdown

This Tableau visualization depicts the distribution of cellular towers across the USA by Structure Type and License. It offers insights into coverage patterns for AT&T and Verizon, aiding stakeholders in assessing network coverage, identifying strengths, and planning infrastructure deployment. Its capability to handle diverse data sources qualifies it as Big Data, as it efficiently processes extensive information, providing valuable insights crucial for optimizing telecommunications operations in a data-rich environment.

Phase II Conclusions -

Types - In this section you continue to see the rise in popularity of the internet with the large amount of internet services provided shown in multiple figures. You also see how younger people and people with higher revenue both use more minutes.

Churn - Churn here has more visible causes. Competitors offering better offers or devices is a significant find that the company can directly counteract. Subpar customer service also seemed to be a glaring issue that the company can directly control and correct.

Region - Not only is there and increase in the amount of money spent across the entire planet in the telecommunications industry, there is also a sharp jump in the amount of information being shared across the world even over the course of just a few years.

Provider - Phase 2 concludes that the provider data reveals significant insights into the daily variation of cell-to-province levels, showcasing fluctuations in data usage. These trends provide valuable information for optimizing network performance, anticipating traffic demands, and managing provincial levels efficiently in the telecommunications sector.
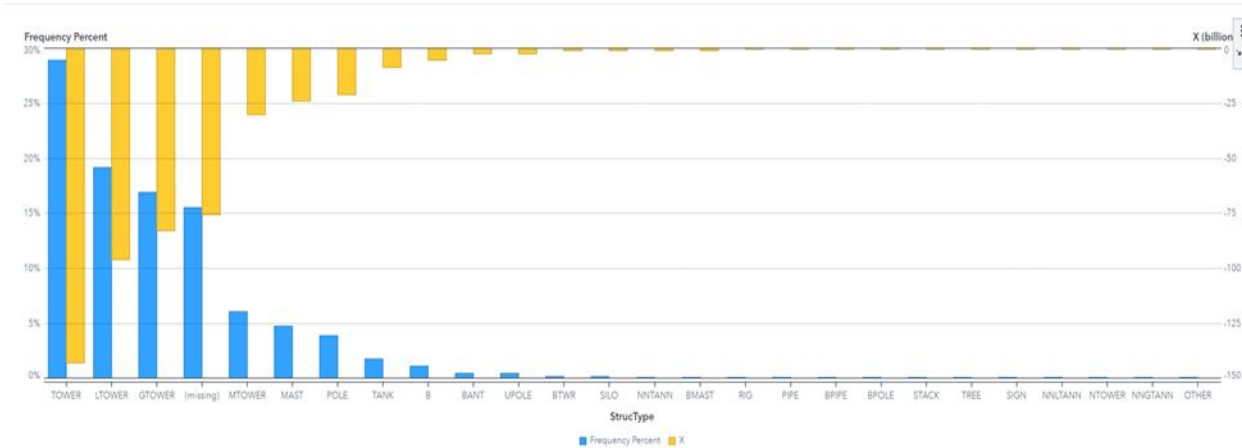
Phase 3

Figure 4.13 World Cloud of Cellular Towers License

This SAS Viya visualization presents a word cloud mapping cellular tower licensing across the USA. Each word represents a licensed company, with size indicating licensing activity. Dominant players like Verizon, AT&T, ALLTEL, and Cellco Partnership stand out, reflecting their significant presence in telecommunications. This illustrates the variety and complexity of big data, condensing licensing data into a visually accessible format.

Licensee	Frequency ▼
Verizon Wireless	7,894
AT&T Mobility LLC	6,328
AT&T Mobility Spectrum LLC	4,089
ALLTEL Corporation	3,464
Cellco Partnership	3,305

Figure 4.14 Frequency Percent of Cellular Towers Structure Types

This dual bar chart from SAS Viya shows different types of cell towers in the USA. Each type is shown as a bar, and the height of the bar represents how many towers there are. The most common type is "TOWER," which is used a lot across the country. Interestingly, the third most common type is "POLE." Even though it's less common, it's still important. This chart helps us understand the variety of cell towers across different areas of the country, which is a big part of managing our cell networks efficiently.

StrucType	.	Frequency Percent ▼	X
TOWER		28.96%	-1.428732E11
LTOWER		19.20%	-95789676055
GTOWER		16.90%	-82761606204
		15.53%	-75553042413
MTOWER		6.07%	-30204544686

Figure 4.15 Gauge Chart of Call Frequency 11-02-2013

   This SAS Viya Gauge chart maps out the ups and downs of call activity across different provinces in Italy on November 2nd, 2013. It focuses on the first ten hours of the day. You can see a clear trend of more calls being made as the morning turns into afternoon, giving us a snapshot of how people use their phones throughout the day. This figure exemplifies the power of big data analysis, helping us uncover patterns in large datasets.

Final Conclusions

Types - One thing that I believe can be gathered is that SMS is becoming the least valuable of the three types of telecommunication. Most people are leaning towards the internet and calling over sending a text message.

Churn - All together, churn can very hard for providers to predict, as sometimes there is simply no concrete basis. This provider in particular could investigate the areas of products/services offered, technical support quality control, and internal gender bias in order to try and improve its current churn rate.

Region - India is a powerhouse in the telecommunications industry as of the past decade. Massive populations mean massive amounts of possible traffic generated and with each passing year the world is becoming more and more online.

Provider - SAS Viya visualizations offer valuable insights into various aspects of telecommunications, from licensing distribution to call activity patterns. These visualizations condense complex data into easily understandable formats, highlighting trends and facilitating informed decision-making in network management and optimization.

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