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Data-Driven Strategies for Optimizing Customer Journeys Across Telecom and Healthcare Industries

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Abstract

Organizations in the telecom and healthcare industries generate terabytes of data every day from a myriad of sources, including customer interactions from their web, mobile apps, and social media; marketing campaigns including customer responses; billing; customer feedback; transactional systems; prescription patterns; clinical trials; employee accounts; partner interactions; and so on. The question is how to tap into these volumes of data to glean insights that help optimize the overall business process, address customers' needs, and enhance their experience with the organization—essentially, optimize the customer journey. The customer journey is a framework used to understand how a customer interacts with an organization over time, including before becoming a customer, while purchasing a product, during its lifetime, and ending with discontinuing the relationship. This is especially critical in industries, such as telecom and healthcare, that have a longer customer lifecycle and, therefore, higher costs associated with customer acquisition, retention, and win-back. By applying analytics to customer journey data, organizations can gain a deeper understanding of pain points that arise along the journey and address them with new strategies. These strategies might modify transition points, add actions to enhance customers' experiences or reduce communication delays. Using machine learning algorithms, organizations could also create predictive models that identify customers who are more likely to churn or transition to a different buying group. Furthermore, by incorporating market data and internal associate feedback, organizations can optimize their investment in digital experience platforms, brand building, and trial marketing to improve sales closure rates.

In this document, we will first provide an overview of the telecom and healthcare industries, followed by a description of the various data-driven strategies that companies can adopt to enrich and optimize customer journey experiences based on the nature of the organization and its objectives. We will provide some examples of organizations that have successfully implemented these strategies and conclude with a discussion regarding the challenges of implementing data-driven customer journey strategies in the telecom and healthcare industries.

Keywords: Telecom, Healthcare, Data Analytics, Customer Interactions, Mobile Apps, Social Media, Marketing Campaigns, Billing Systems, Customer Feedback, Transactional Systems, Prescription Patterns, Clinical Trials, Customer Journey, Business Optimization, Customer Experience, Customer Lifecycle, Customer Acquisition, Retention, Win-Back Strategies, Machine Learning

1. Introduction

Telecommunication and Healthcare are among the most rapidly evolving industries, given the exponential rise in consumer demand for each to adopt new offerings. Customers increasingly expect seamless, personalized services and products to meet their unique needs and preferences. To meet these requirements, both industries must now recognize the critical role of customer journey experience. In today's technological climate, scrutinizing this aspect of performance at a granular level can be a source of competitive advantage. We outline and quantify the effects of customer interactions on short- and long-term business outcomes across the lifecycle of relationships with each industry. To this end, we build a model that recognizes that these industries operate in a data-rich environment, whereby organizations can now collect and store large amounts of data characterizing customer journeys.

We present new models and approaches that provide industry stakeholders with insights regarding investment and resource allocation decisions. Such decisions may positively enhance the journey experience at key interactions, improve brand loyalty, reduce churn, lower costs, and increase profitability. Given the varying consumer and competitor dynamics present in either of these two industries, we explore the development and implementation of predictive models to analyze the customer journeys of each industry. By breaking down customer interactions into quantifiable metrics, we can offer recommendations to healthcare and telecom executives who are currently experiencing intense pressure to improve operational performance. We also bridge the gap between academia and industry research by leveraging experts in both. We close with a framework that summarizes key decision areas and highlights the next steps for every aspect of these industries that encompasses best practices to improve the customer journey experience.

1.1. Overview of the Study and Its Objectives

Optimizing customer experience (CX) is of paramount importance to the success of any organization, as delivering superior CX has been proven to boost customer satisfaction, increase loyalty, and thereby, uplift an organization's revenue. However, the CX is not a linear journey, particularly in cases of high-involvement organizations, where the customers engage in rich interactions with numerous touchpoints across multiple channels. Additionally, the nature of these interactions varies in terms of their motivations, channels, and emotions. The journey can begin and end at different points along the path, with iterations and loops in between. Furthermore, with the emergence of social media as a major customer engagement channel, CX has considerably broadened from being CX to being CXX – where CXX stands for the before, during, and after phases of the customer journey. Such complexities render the customer journey (CJ) unique for every individual customer and difficult to optimize. Effectively managing the CJ has therefore become a big challenge, especially in the telecom and healthcare sectors delivering high-involvement services.

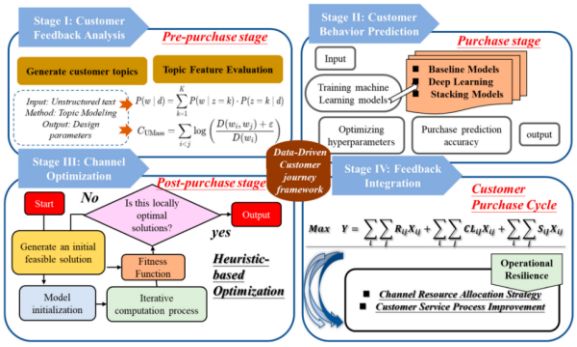

Fig 1 : Customer Journey Optimization

In this study, we develop advanced data-driven models and strategies for optimizing CJs in the telecom and healthcare sectors. Our main objective is to bring our unique CXX and time-driven perspectives to the area of CX, and propose solutions that answer the following managerial questions: 1) How do different CXX stages contribute towards the overall CX? 2) What are the main critical contributors to customer

happiness/unhappiness during specific CXX stages? 3) What does the happiness/loss spiral look like during the CXX stages? As a solution approach, we adopt the lens of machine learning to the challenge of joint CX quantification, map visualization, performance attribution, and explainability on CXX and CJ stages. In summary, through our research, we aim to create actionable tools for CX managers in the telecom and healthcare sectors.

2. Understanding Customer Journeys

In recent years, research has focused on customer journeys and journey stages that map the journey to specific metrics, including satisfaction, emotions, effort, and outcome. Each of these considerations is important when designing endorsements or other actions targeting customers or employees on a segment or group basis. Adding the experience of data-driven marketing delivers positive experiences and positive returns – combining positive experiences with positive business outcomes unique initiatives can positively affect customers by creating new revenue streams, experiential or new product opportunities, deeper conversations, etc. Addressing the entire journey, not just touchpoints and current problems has much greater potential to create long-lasting and transformative change for employees and customers of the business. Transformative change creates greater satisfaction and influence to spend or recommend. From a journey management perspective, the customer journey manages what happens at every phase of the journey, optimally triggering the interactions, foundational outcomes, metrics, and positioning offers for that customer journey at that life stage.

Defining Customer Journeys

A customer journey is defined by the march of a customer from sensitivity to fraud awareness to the decision to transfer loyalty and what happens along the way. Customers move between these states based on prompts, persuasion, opportunity, reward, new product, or potentially nothing. An experience is defined by the day-to-day activities of the customer that define whether the customer is in a distressing, neutral, or positive state at any time. A customer journey has a lifetime effect on customer KPIs, while any customer experience moment impacts only short- and intermediate-term customer KPIs. The aggregate of timing, number, and type of experiences determines how long a customer stays in a state before moving to another state.

Equation 1 : Customer Journey Optimization Score (CJOS):

$$CJOS = \beta(C_t + E_r + P_i)$$

where:

- $CJOS$ = Customer journey optimization score
- β = Industry-specific weighting factor
- C_t = Customer touchpoint integration
- E_r = Experience responsiveness
- P_i = Personalization index

2.1. Defining Customer Journeys

The importance and definition of Customer Journey Mapping creates a problem in understanding the customer journey box. Companies and management usually want to present everything that touches the customer – the touchpoint mapping. Here we have a customer journey model and a customer journey map representing only the journey. Distinctions are made to understand what or who we are mapping. Customer journey mapping can have multiple answers and click the boxes of different concerns. A Customer Journey is “an experience a customer passes through, from the moment he thinks about using a product or a service, to the delivery or the execution of that service and to the post-sales follow up.” In our perspective, it’s the global understanding of the customer’s “think” and “pain” throughout any experience of a product/service of a company, that is, the customer-mapped questions and sentiments connected to one single footstep: touching on the service before, during, after, associated, or competing products. The customer journey allows us to understand his expectations feelings, perceptions, and emotions, throughout the entire period of contact.

Experiences can be product and service-driven or company-driven. Companies can use customers' thinking and feeling experiences to connect with the products and services offered. In a complex world, companies should try to map all the different customer currency feet sprints, single, connected, competing, for a defined moment in time, and capture the best investment opportunities offered. Customer Journey Mapping aims to gather, visualize, and consolidate all the available information from the different cross-house departments. This relationship requires C-Levels to instill knowledge sharing and align understanding of the customer needs and sentiments perception. Companies don't need to know every single detail expressed in customers' journey maps. But corporate understanding should be enough to create services aiming to help customers obtain the main objectives of price and quality while achieving satisfaction with how to get there during and after the service offer. For such corporate knowledge sharing to be successful, the customer journey map must respect the organization's different points of view — marketing and product and service development.

2.2. Importance of Customer Experience

Organizations have realized that having the best product, or service or providing the best price may not be enough to win the customers. Customers compared competitor products listened to other people's experiences, performed product trials, etc., but they formed an opinion about the organization based on their experiences with the organization over time. For many organizations, the product life cycles have become too short and the product differentiation has become narrower. In such situations having a great customer experience becomes the distinguishing factor for the organization – not just for retention of existing customers and their lifetime value, but also to attract new customers. Attracting new customers costs more than retaining existing ones, so having a great customer experience increases the value of existing customers, thereby also reducing the cost and effort of retaining them. Satisfied customers do not switch sides quickly and may be able to tolerate minor service failures. Creating a great customer experience may also enhance the organization's popularity and promote word-of-mouth publicity.

Technology has given customers the ability to find out information about an organization and compare experiences with other customers. The advertisers can no longer control the conversations around them. The customers can critique the organization and voice their opinions to a global audience using blogs, social networks, and other online channels. A negative customer experience can go viral. Failed customer interactions and poor customer experience can hurt the organization's reputation and bottom line. Customer experience is worth pursuing as well as measuring since both customers and organizations can benefit from a positive experience. Measuring customer experience helps organizations in the following ways: It can help reduce customer effort, improve retention and customer satisfaction, and create high levels of engagement and advocacy; It can help quantify the impact of experience; It can help correlate experience with revenue; It can provide early warning signals; It can help prioritize customer issues; It can provide a leading indicator of the future and provide benchmarks and identify best practices.

3. Data-Driven Decision Making

Data-driven decision making serves as the foundation for implementing the customer journey strategies across the Telecom and Healthcare industries. The implementation is iterative and primarily encompasses three key dimensions: utilizing both quantitative and qualitative data for cross-channel optimization, employing state-of-the-art analytics tools and techniques, and creating a data-driven business framework for customer journey dynamics management.

Successful data-driven strategy implementation across the customer journey requires leveraging

both quantitative and qualitative data flavors. Telecoms typically capture extensive customer data points at a transactional level and longitudinal view but struggle to amass qualitative data at scale. Telecoms are typically privy to customer data points about source, nature, and volume of transactions; type and tenure of devices; pricing plans and products; historical purchase behavior and customer interactions, and service requests and complaints history, among others. However, such insights are transactional but do not provide a clear understanding of customer needs, wants, and motivations. In contrast, players in the Healthcare ecosystem invest heavily in running surveys to bring insights about customer needs and preferences to the fore but lack the scale required to draw statistically significant conclusions.

To support customer journey strategy building, the Telecom and Healthcare domains require advanced analytics techniques and tools across four key areas: Propensity Modelling, Customer Segmentation, Next Best Action – Channel Optimization, and Journey Dynamics. The customer journey experience analytics decisions can be made at two levels of granularity – customer level and customer segment level. Although the relative importance of analytics tools may change depending on the granularity at which the analysis is conducted and the popularity of attribution modeling methodology, the tools and techniques used in the two approaches tend to be similar.

Fig 2 : Data-Driven Decision-Making

3.1. Types of Data Utilized

The advent of big data and its growing importance have driven firms to enhance their data collection capabilities. As such, organizations have available to themselves a rich set of data from a variety of sources to help them drive their decisions and move towards more evidence-based decision-making. Data sources bring different insights based on data characteristics such as the phase of the customer experience journey, type and nature of experience, and timings. This section presents the various sources of data, traditionally classified as internal vs. external or structured vs. unstructured, as well as the different types of analytics that leverage the data. Data can be classified as either internal or external to the firm. For instance, insights about customer transactions with a firm are probably the most heavily utilized internal source of data. This information is easily collected and stored in internal enterprise resource planning systems and customer relationship management systems. In contrast to the wealth of internal data available to a firm, external data sources are often more diverse in type and more difficult to collect. Thus, the type of external data that is most often used in practice today are third-party customer surveys, packaged and sold to firms. As firms deepen their digital footprints and subscribers become more open to sharing their data, the domain of external data is becoming increasingly richer, with incentives to try and collect externally sourced data for use in decision-making processes.

While internal data tends to be far more voluminous than external data, it is external data that richly cuts across many different dimensions. However, the richness of external data does not just come from the number of dimensions but also arises from the granularity, variety, and nature of the data. For instance, the granularity of external data such as customer reviews is at the individual level and captures product/service opinions and feelings towards particular services and aspects of the

experience, allowing the firm to tailor experiences to individual customers very specifically.

3.2. Analytics Tools and Techniques

Increasingly sophisticated data sources and accelerating demands and pressures for financial performance are putting greater pressure on organizations to leverage data-enhanced insights to optimize the management of customer journeys. Decision makers need to identify the most effective analysis techniques that are suited to the complexity of the available data and get them professionally integrated into customer journey management processes. Furthermore, organizations increasingly want, and need, to select vendors that are experts in a small number of specialist techniques that they can deploy with great effect.

The following sections summarize 15 insightful analysis techniques that have found successful application across industries and can be readily adapted to customer journey strategy programs in the telecommunications and healthcare industries. Appropriate techniques will depend on the type of data and goals: for example, if internal data is available and the objective is to predict behavior, supervised data mining techniques like logistic regression or decision trees may be appropriate; if no internal data is available, web content mining may be appropriate; if large-scale dynamic models are needed to manage across customer journeys, choice-based conjoint or agent-based modeling may be preferred. The selection of appropriate analysis techniques is a complex mix of the goals, the type of available data, especially behavioral and attitudinal, the analytical expertise of the internal teams and vendors, the available financial budget, the level of time pressure, future data accessibility for rolling prediction, and technological support: not only the use of big data tools but also cloud-based media should provide great flexibility, scalability, and ease-of-use for many predictive modeling solutions.

4. Telecom Industry Overview

The telecom industry is responsible for connecting humans, companies, services, and devices. People need to communicate, transfer, and receive data every day, and telecom is crucial for facilitating this activity. Telecom has historically provided these services through copper wire implemented by physical infrastructure owners. Now, with the advent of wireless technology enabled by the spectrum, this activity is no longer confined to the traditional infrastructure owner. The company that is in charge of the physical cable or the radio transmission is merely serving as a facilitator of the service being provided. Many other companies add value by reselling this activity using specific data transfer protocols. By only selling the physical connection, telecom has been slowly pushed towards a utility-like business, where the margins are extremely low, and it has become very hard to differentiate from competitors who also offer this activity at the lowest possible price. Customers have come to see telecom as a commodity business.

With technology now enabling printing against direct competition from wireless spectrum-based transmission, and the utility business model limiting the industry to a low-margin business, telecom needs to renew itself. Telecom companies are now trying to regain lost ground in higher-margin value-added services offered to customers. This chapter first discusses the current trends that telecom is following to try to push back against commoditization and regain the opportunity for higher margins. Next, we also discuss what customers expect from telecom, as this will be the basis for the analysis of telecom customer journeys presented in the next chapter.

4.1. Current Trends in Telecom

Telecom technology and services have gained wide commercial success worldwide. The global telecommunications market was valued at around $1.85 trillion in 2022, and it is anticipated to reach around $2.7 trillion by 2030, growing at a CAGR of over 5% during the forecast timeframe. The growth is primarily driven by data demand that supports

mobile work, financial transactions, video streaming, and social networks. Significant market drivers include incessant data traffic surge, affordable and widespread mobile services, increased technology platform integration, VoIP, web communication, and various devices connected via applications. WiFi will remain an important part of the telecom network ecosystem as a last mile. By 2030, annual global mobile data traffic, including network apps, app downloads, and streaming video, will reach 45.0 million petabytes, growing 19 times from 2019.

5G is currently the most significant step in the evolution of telecom networks, enabling the building of smart cities and supporting the huge increase in connected devices around the globe, particularly in the IoT sector. By 2025 over $200 billion will be spent globally on 5G infrastructure and services. 5G infrastructure supports rapid and steady uptake of fixed broadband services. Broadband has become an essential part of customer needs, and telecom operators around the world have invested in expanding networks built with fiber optic technology to increase capacity, enhance transmission speed, improve quality, and reduce service costs. Furthermore, VOIP and web communication apps are causing an explosion in data traffic over mobile networks that continues ignoring traditional regulated telecom voice service ARPU. As telecoms continue to rely on declining voice service revenues, they also search for new revenue sources in growth areas such as mobile payment, M2M, and customer-premises network equipment.

4.2. Customer Expectations in Telecom

As a core underlying activity of telecom services, communication tends to have two main types of customer expectations. These are quality and costs. In exploring quality, the dimensions of telecom service quality altogether include assurance, availability, empathy, responsiveness, and technical system quality. Another perspective of quality is from the standpoint of intrinsic telecom service quality and how this may become a critical trigger for the creation, maintenance, and building of a relationship of familiarity or closeness between service organizations and their customers. Cost is often used in terms of the price customers are willing to pay for the telecom service. Price is thus one type of extrinsic evaluation of telecom services.

There has been a school of thought that studies customers' intentions to use a service through what is described as the "expectancy disconfirmation" approach in the domain of service product quality. The service product approach in which the service consumer has in mind what and how the service has to be realized and its outcome is valuable to the area of service product quality, which is believed to be valid for the telecom service case. In terms of research on the telecom service sector and services in other industries, it would be valuable to have more scientific rigor, especially about the Quality-Price model in what are currently only heuristic studies.

5. Healthcare Industry Overview

The healthcare industry is a broad spectrum of establishments providing health services, information, and technology. Healthcare organizations prevent, diagnose, treat, and rehabilitate old and young people alike through various services. Of course, healthcare services are needed globally and locally, however, what makes this industry distinctive is that these services are often called for in emergencies, requiring the industry's participants to deliver them, day in and day out, at all hours. Insurers, hospitals, outpatient and rehabilitation centers, and telehealth providers are only some of the parties participating in the larger healthcare ecosystem. The interoperability of the services they provide is crucial to maintaining the balance among financial success, improved health outcomes, and reduced costs. Yet, that is only one of the current challenges faced by the healthcare industry. As its associated organizations are continuously working at incorporating intelligent technologies, further issues are surfacing,

such as an increased risk of cybersecurity vulnerabilities, struggles in hiring and retaining healthcare professionals, regulatory improvements, and facilitating value-based care.

Healthcare organizations must align their goals while adapting their offerings to the current trends and prospects put forth by the healthcare ecosystem. The best way to do that is to adopt data-driven strategies that prioritize the wants and needs of the patient population. When it comes to patient expectations, consumers want a healthcare system that can deliver improved accessibility, reduced operational inefficiencies, deployment of technology to augment high-touch and bespoke care, improved affordability, greater engagement with concierge-like services, and enhanced and hassle-free experience. Telehealth, health tech, and digital are currently playing pivotal roles in shaping patients' expectations with the latter heading in the direction of utilizing data for superior personalization and engagement. With this knowledge in hand, it is paramount for healthcare organizations to capitalize on this trend while decoupling their activities from the ones delivered by their competitors.

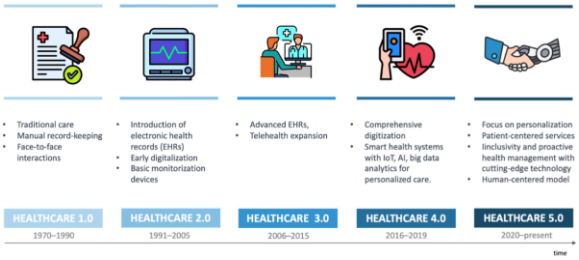

Fig 3 : Healthcare with Industry 5.0

5.1. Current Trends in Healthcare

The healthcare sector is undergoing a drastic transformation. While spikes in customer expectations have prompted a reassessment of the overall customer journey across touches, other forces at play are prompting significant, tectonic shifts. The aging population and associated chronic diseases are on the rise. Payers have to meet the rising demand for support, but the technologically-enabled cost of entry for service providers, unfavorable reimbursement policies, and lack of large sample sizes rendered many profits deprived. Patients have become proactive consumers and cautiously overlook the service evolution across sectors with growing discomfort. Service providers are also at the mercy of talent shortages and financial distress and are gradually abandoning the traditional specialization model. Some of the trends drastically reshaping the healthcare industry include a shift towards Value-Based Care with associated Professional Service Automation; increased reliance on customer data to personalize communication and decision-making, build tribes, and increase NPS; AI and Robotics at the physical and emotional frontiers of care delivery; virtual care and triage; digital-first omnichannel customer experience; transition from procedures to preventive care; and more integrated relationship between patients, providers, and payers. These are not recent trends; however, their permeation across the different services and spaces is accelerating. Organizations across sectors have evolved a risk appetite, leading to the exploration of long-ignored challenges, and the adoption of experimental, cross-sector approaches for addressing them. While digital is, and can, no longer be ignored, digitization need not accompany the journey. Data-driven, outcome-focused investments have replaced budget-driven, silo-focused. The use of outwardly visible and intuitive digital ecosystems and AI-enabled advanced analytics to drive organizational transformation are paradigmatic shifts that demand a rethink of the investments in Digital Consumer Intelligence and Experience. Data, Technology, and Processes form the magic triangle to increase returns from CX investments while increasing Loyalty and LTV for Customers.

Equation 2 : Multi-Channel Engagement Efficiency (MCEE):

$$MCEE = \frac{S_c \times D_p}{A_n}$$

where:

- $MCEE$ = Multi-channel engagement efficiency
- S_c = Service channel variety
- D_p = Data processing speed
- A_n = Average network latency

5.2. Patient Expectations in Healthcare

In recent years, the expectations of patients have shifted. More than ever, patients are empowered to take charge of their healthcare and make informed decisions. With easy access to information through the internet and social media, they demand access and transparency. As a result, healthcare companies must align their strategy for managing patient interactions with their expectations to win in today's competitive world. For value-driven patients, the entire experience matters. They want investment in technology to mean convenience. They want greater transparency in billing as well as pricing for tests and procedures. They want, especially, their time to be respected. The appointment process should be streamlined and should take minutes. Appointments should run on time and, if they're not running on time, patients should be informed. Patients want accessibility to their providers.

Patients expect instant access. Instant chat and text messaging should supplement the phone and video interaction tools that are becoming commonplace. They expect to be authenticated in secure channels with face recognition. But beyond these desires for instant everything, greater transparency, and clued-in interactions, patients seek help solving real-life problems. They want care teams to collaborate across specialties to coordinate their care and eliminate the risk of being passed around from one provider to the next in search of answers. They want access to education on what to expect after a procedure; to tips on how to prepare themselves, from a medical perspective, for their first visit back after such a surgery; and to information on apparent incongruities. For example, if a new blood pressure drug causes unexplained side effects. What the patient should do is the following. What is a sudden weight gain is also alarming? They expect ongoing remote monitoring, not acrid warnings received when they've gone off the rails. They want providers to understand what's going on in their lives affecting their health.

6. Comparative Analysis of Customer Journeys

Telecom and healthcare customer journeys exhibit both unique characteristics and commonalities due to market individualities, the service product being intangible, and different buyer goals and motivations. As an intangible service product, both sectors are characterized by heterogeneity. Future buyers of services need to formulate varying preferences when considering what and how to purchase services within a given service category. In essence, buyers need different features and factors in varying commercial situations. Thus service products within the same service category are generally perceived to be heterogeneous.

When contrasting the typical customer journey in the telecom with the healthcare sector, we find that to a greater extent and for a longer period, a customer in telecom tends to have continuous interaction with the service provider as compared to a user in healthcare who perhaps has only utilized the service briefly at the point and time of need. The service product for telecom is offered in various configurations and requires the physical product to function as a means to access the service in return for payment of monthly service subscriptions interspersed with periodic purchases of hardware configurations, which keeps the customer constantly engaged with the telecom provider. The healthcare sector on the other hand offers treatment for a nonrecurring physical ailment with interaction requiring physical interventions of various intervals depending on the condition for which treatment is sought. In essence, the customer journey in telecom is ongoing by nature while in healthcare it is intermittent.

However, both journeys are laden with pain points and experiences, the solution of which could keep customers loyal in the case of telecom and improve patient outcomes in the case of healthcare. In the case of telecom, given the disruptive nature of the environment with price changes, new service entrants, and switching behavior resulting from aggressive promotional campaigns, telecom companies need to ensure a constantly superior service experience and the removal of pain points to reduce churn.

6.1. Telecom vs. Healthcare

Organizations across sectors are continuously challenged by changing customer needs and environments. Today's customers are more perceptive than ever and often make inquiries or purchases through multiple touchpoints, interacting over a range of devices. This Section analyzes and contrasts the customer journeys in the different sectors we work across. The fundamental premise is that the better we understand customer needs and behaviors, the better we can form plans to optimize the processes that drive customer interactions. Communications companies deliver services that allow customers to connect with others through voice, email, SMS, and other data services. Telecom has its roots in simply connecting people. Service provision is at the core of the business. Healthcare, on the other hand, is built on giving quality service and care to the customer, to make them feel better and to cure their ailments. From inception, the focus has rightly been on the customer. Still, in recent years, we have seen evidence of some of the same touchpoints and convergence of journeys in the same way that several other traditional sectors have begun to do. Banking is now undeniably digital. For Telcos and healthcare providers, their websites, mobile applications, and customer support teams are now the critical junctions for the organization's customers. At the same time, the different touchpoints involved serve to showcase the idiosyncrasies – and strengths – of the two industries. In this Section, we will first look at the comparison between the traditional telecom and healthcare journeys. Then we will examine what new lessons can be learned in terms of this convergence.

6.2. Common Challenges Faced

Customer experience is an emerging focus of competitive activity. It is increasingly seen as a core element of differentiation that transcends traditional factors of quality, service, price, and product. Despite its growing importance, however, delivering a good customer experience has proven to be one of the most common challenges faced by many industry leaders. For one, customer experience is inherently multifaceted; it encompasses all facets of a customer's interactions with the firm, not just the touch points traditionally viewed as service-related, such as making a booking, receiving service delivery, or failure resolution. Every interaction that a customer has with a firm contributes to the customer experience — from advertising to promotions to the quality and design of the product or service, to employee interactions, and to the physical environment in which the service is delivered. Added to this, over the years, organizations have tried to try and gain a competitive advantage by cutting costs and thereby concentrating resources and efforts on back-end processes; this, in turn, has adversely affected experiences at the front end. In addition, with the growth of online and self-service channels, customers are increasingly likely to encounter the organization "alone", without any human interaction or company "help". The challenge lies in the fact that customers are not only dissatisfied with their "disconnection" from companies during such interactions, but they are also unable to receive any redress.

7. Data-Driven Strategies in Telecom

In other major industries, accumulating and managing product/service data is associated with limited difficulties. However, in the telecom

industry, there are several categories of data and products/services about which data are generated throughout the usage of the service, which include: network data related to network usage, service quality data related to service quality, customer behavior versus customer product/service usage, and customer profile versus product/service attributes. Analysis of these data categories and the relationships between pairs or triplets of these categories for each telecom service will need extensive exploratory data analysis to have a base for collaboration.

Telecom wireline companies were viewed to be nearing the end of the growth curve and telecom wireless emerging companies are now investing heavily and providing innovations that bring increasingly assessed value in the world economy. However, telecom companies and consumer relations have been changing. Telecom companies are aware that information has real value and active consumers are involved in the dramatization of its participation in commerce and the demand for revenue from telecom services. Management of customer relationships requires the management of value relationships as much as directors manage financial relations. Customer value management is a primary marketing management theme and a challenge for marketing management in the telecom sector.

We examine the application of the various data-intensive techniques that can be used to improve current customer relationship management processes. In particular, we will portray the data-intensive techniques that are viewed as elements of personalization. We will classify personalization into three groups – product/service recommendation, predictive model customization, and base prediction enhancement – and we will present the data-intensive methods available for implementing these generic personalization elements.

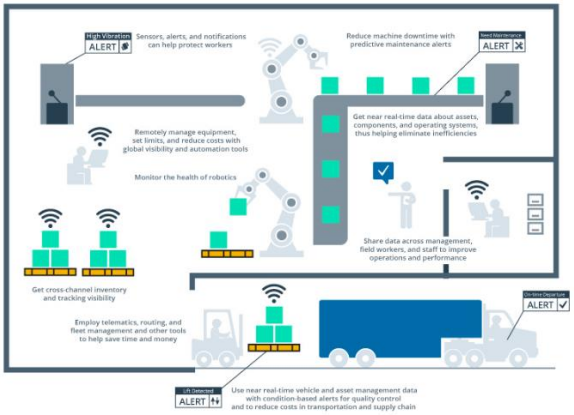

Fig 4 : IoT in Telecom: A Data-Driven Path to Growth

7.1. Personalization Techniques

Company managers, data scientists, and marketers have developed customer insights formulating diverse models for personalization, using advanced databases, data warehouses, and data lakes technologies. From the research and business practice perspective, we can develop the following classical areas of personalization techniques. The first area constitutes embedding personalization in the value proposition of different customer segments. It models value-in-exchange that offers a company's value mix through a rich content variation in promotional messages, emails, navigation flows, mobile apps, infomercials, devices, customer support contacts, and call routing. From airline pick-up to hotel selection, tourism packages become adapted to customers' attributes and travel behavior. Personalized gift recommendations are based on matching products, offers, and advertising messages to customers' tastes. For motor insurance, recognizing customer segments by risk policies allows offers adapted to driving habits. Wealth management presents customized portfolios by projecting customer expectations. Online retailers propose adjacent products by modifying their browsing history.

The second area contains customer experience management optimization, which operates on shared experience and different engagement points. It affects different relationship management stages through contact channels, mobile apps, embedded

software, and portals integrating purchase data. Multichannel analytics apply voice and data solutions to understand customers' experience awareness, measurement, and monetization to define satisfaction drivers and profitability. Call volume and reason requests to validate support centers' threshold capacity. Call and contact message evaluations allow direct routing, tracking, and fixing of unresolved issues, advising optimal procedure guides for representatives. Customer analytics identify problems in websites, redirect customers to portals with the highest conversion margins, and select interfaces for either fast or complete navigation. UX Design creates applications based on predicted user behavior flows to provide real value to the largest number of users. Different techniques personalize the entire shopping experience, from product choice to payment checkout, to customer support.

7.2. Predictive Analytics Applications

As the telecommunications industry matures, the need to differentiate products and services grows, and the industry becomes more and more data-driven. The industry has become primarily focused on gathering more personalized information for customers to be able to better target and predict what products a customer is most likely to buy. Large-scale data mining techniques are applied to customer data and effort is made to certain existing customer bases. Investment in predictive analytics solutions allows the company to act with precision when sending out mass marketing campaigns and be able to act on more targeted manageable lists. With the help of predictive analytics applications, decision-makers in telecom use modeling techniques to forecast when a customer is most likely to react to a service offer or reach a point of no return, so they can step in proactively. Each of these possible forecasts can tell decision-makers when an individual customer is likely to take a desired action, such as generating additional revenue from new services or churn. By integrating models with the telecom's customer information database, predictive analytics applications can access and assess individual customer profiles in operational business processes. Service companies can seize marketing opportunities that might otherwise have been missed and improve the success rate and ROI of their marketing campaigns by offering relevant products and services at the precise time that customers are about to make decisions. For example, using a predictive model to target offers for short-term calling features in advance of the busy holiday calling season can help expand revenues.

8. Data-Driven Strategies in Healthcare

As we navigate into the future, the health of populations will rely on the patient's responsibility regarding their health. In this direction, an increasing component of healthcare is being shared with the patients. This could be achieved by the emerging field of digital health which could help the transition of healthcare to a consumer-driven industry, in which the patients gain access to relevant information, tools, and services, and become active players in the prevention and treatment of their diseases. As their involvement increases, it is expected that healthcare costs reduce and the quality of life will improve. Some of the new approaches to healthcare services associated with digital health are telehealth, telemedicine, remote patient monitoring, and social media.

With the advent of newly developed devices and wearable technology, healthcare services centered on patients are gaining strength. These strategies are based on the personal motivational skills of patients using mobile apps to receive reminders regarding preventive behaviors, suggestions for practicing physical activity to reach certain goals, or nutritional consumption monitoring for weight loss or chronic disease management. In this context, large amounts of data are continuously generated with the potential to reinforce and promote the health of populations if adequately analyzed. This chapter aims to present new mobile-based data-driven digital health solutions that support

healthcare decision-makers in their related issues. Furthermore, it provides a contemporary overview of digital health data management regarding the major telehealth and patient engagement strategies for developing mobile-based health solutions to monitor provided services.

8.1. Telehealth and Remote Monitoring

Telehealth has been available since the 1960s, when it was used to remotely monitor astronauts' health, for example, via telemetry of electrocardiograms. In the interim decades, telehealth, especially video consultations with healthcare professionals, remained mostly stagnant in adoption. However, the adoption of the smartphone in the mid-2000s, equipped with communication technologies that could enable remote video communication, and the COVID-19 pandemic in 2020–2021, which limited face-to-face interactions, joined to create the explosion in telehealth use we saw after 2020. Remote monitoring of patients began to be deployed at scale in the 2010s, as the use of internet-connected wearable devices rose dramatically. The combination of telehealth and remote monitoring can provide tremendous benefits to both patients and healthcare systems.

The rapid growth of telehealth was catalyzed by the COVID-19 pandemic and resulted in a slew of studies confirming its efficacy. Professional societies issued policy recommendations on the use of telehealth. Restrictions on the use of telehealth services for behavioral healthcare were temporarily lifted. Licensure boards relaxed interstate practice restrictions, effectively issuing multistate telehealth licenses. Additionally, there were modifications to reimbursement for telehealth services, and private payers came to match their policies. Payers' rationale for coverage is reflected in statements emphasizing the need to remove barriers that prevent patients from accessing telehealth services.

8.2. Patient Engagement Strategies

Patient engagement strategies make it easier for healthcare providers to improve the patient experience. Hospitals and health systems are increasingly looking to enhance patient experiences through comprehensive Digital Experience Platforms (DXPs). DXPs are highly specialized digital tools that facilitate seamless patient engagement from pre- to post-care and beyond by integrating various aspects of patient interaction.

Digital experience platforms designated for patient engagement give providers comprehensive solutions to streamline patients' digital journeys, ultimately allowing them to control their interactions with providers. DXPs often incorporate many functions, including digital front doors, online booking and scheduling, patient-provider communication channels, telehealth services, patient education and resources, therapeutic programs, health record access, and payment options.

An advantage of these digital patient engagement strategies is that they consolidate various digital service functions into a single hub, acting as a digital front door. Outpatient services often rely on patients initiating care, and simplifying the process through an easy-to-navigate and accessible front door can attract and retain patients through valuable interactions.

DXPs enable hospitals and health systems to present patients with a unified interface that gives them easy access to on-demand and virtual care services. Using these updated unified patient engagement tools, care providers can allow patients to make appointments for and engage with outpatient therapy services or specialists remotely, without a prior appointment, where indicated. Having various aspects of patient engagement fit together into a unified platform may help integrated health systems build relationships with patients engaged across various aspects of care.

9. Technology and Infrastructure

Despite having ample data, access to modern technology, highly advanced talent, and systems, the optimization of customer journeys remains a challenge for the telecom and healthcare industries.

A deep understanding of technologies, integrations, and infrastructure helps in the easy accessibility and automation of tasks with a concentration on solutions. Application of big data is the new normal, the cloud has become the backbone of data management, and the use of cloud-based products is helping industries optimize their solutions. Cloud-based big data programs are streamlining the processes of checking, cleaning, and preparing data for analysis. Just one wrong contact during the entire journey can easily scare customers away. Hence, any cluster can be used for implementing data management technologies, processes, and infrastructure. The objective should be to focus on how much and what kind of infrastructure is needed to build a data-driven organization and not to get caught up in which technology or infrastructure to use.

The art of blending multiple capabilities can provide a cost-effective and cohesive solution. To derive business value from data requires optimization and implementation of all the components of the customer journey. With data becoming a creative asset, the use of the right tool is important. Data analytics have moved from traditional methods to data storytelling tools that enable users to discover, explore, and visualize data on their own. Rapid Data Discovery tools have increased the visibility of data in a way that is available for business users. However, while the story of data is being told, organizations need to keep an eye on data management to control data challenges.

9.1. Role of Big Data Technologies

Most organizations undergo a transformational change as they tend to invest in analytics and become insights-driven. Data is the new oil for the organizations as each interaction with the customer leaves a data trail, which the organizations need to consume and analyze in real-time to derive actionable insight for optimizing the customer journey, personalize the experience, mitigating churn, improving upsell/cross-sell, customer satisfaction rating, complaint resolution, etc. Organizations store both structured and unstructured data in transaction systems, observability systems, big data lakes, and other repositories for analysis. For many organizations, more than 80% of data sits within data lakes mostly stored in a raw form using commercial or open-source data lake technologies. Data lakes thus enable organizations to store data at low cost and consolidate data of disparate sources and types in different formats. However, organizations need to extract usable insights from terabytes or petabytes of raw data across various source and storage silos to make better, and faster, business decisions to gain competitive advantage and innovate to adapt to fast-changing market conditions.

Hybrid data analytics platforms equipped with new-generation Machine Learning and Deep Learning algorithms and visualization tools reduce data preparation time, and work involved in moving data around cumbersome sources and make analytics accessible even to business users using Natural Language Processing conversational interfaces. These ML algorithms also help automate tedious and time-consuming functions earlier performed exclusively by data science teams, which are becoming increasingly easier and faster, as compared to previous generation algorithms. Cloud-based systems are making computing power available on demand and removing processing speed constraints of traditional technologies.

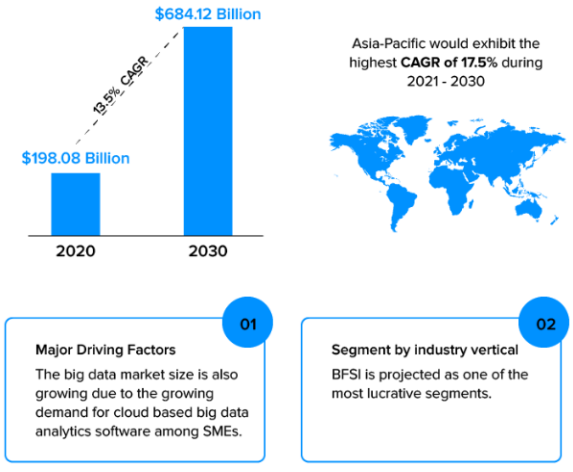

Fig 5 : Big Data Analytics in Telecom Industry

9.2. Integration of AI and Machine Learning

Machine learning and Artificial Intelligence can either be deployed as part of a real-time customer service process or utilized offline for optimizing customer service operations. They are, increasingly, integrated with real-time decision systems in a hybrid fashion. It allows businesses to operationalize a variety of important predictive and automation capabilities with great technical elegance, and firms can improve predictive precision and production speed by working across the two domains.

More specifically, off-line ML/AI techniques can be used within real-time systems to: Identify key behavioral-strategy interactions. Determine how customer and real-time contextual characteristics combine with past performance of particular strategies to influence predicted outcomes for the various strategies. Use this information to assess 'what-if' prospects of future outcomes to support critical strategic decisions by customer touchpoint managers. In many domains today, automatically-released marketing offers customized to individuals via digital touchpoints frequently employ these types of predictive capabilities to determine the action expected to bring about the most favorable outcome. These offerings rely on offline modeling of strategy-specific predictive relationships, with the results embedded in a trigger-based marketing automation system.

These predictive relationships embed not just results associated with the customer but also the capability of each offering expected to modify the predicted spending effect. While predicting spending is the key role of off-line predictive modeling systems, recommended modifications of spending are crucial to the performance of real-time customer strategies. Eventually, the challenge becomes one of designing a system where the automation can rely on off-line systems where the volume and speed of data make the operation of real-time systems difficult, if not impossible.

10. Ethical Implications

Like any technology that has the capability for influence, machine learning within the context of customer journey optimization is a double-edged sword. While there are numerous benefits to both businesses and their end users, this technology cannot be adopted blindly. Specific ethical implications must be considered as we adopt these tools. The areas of focus for the discussion of ethical implications in this chapter are privacy and transparency concerning users as individual stakeholders and the overall economy as the greater social platform for commerce.

Protecting User Privacy Rights

The importance of privacy is unassailable. Without the ability to compartmentalize our lives to protect ourselves from the scrutiny of the outside world, democracy becomes simply a transitional step toward something else. It should not be the prerogative of big business to make decisions for us or to impose their values on us when their influence allows them to do so. The power of voice to alter decisions, actions, and motivations must be retained by individuals for justice to thrive. And therein lies the problem. Data-driven technologies confront the requirements of privacy and the inevitable trade-off that results from this confrontation.

On one hand, we have our human desire to engage in commerce and the quest for profit that drives business strategy and invites us to share who we are and what we want with the technology we use to control our lives. On the other hand, the application of learning to the millions of bits of data exchanged creates the very social consequences to which democratic values are so sensitive. Learning incurs the peril of altering social behavior to the detriment of the individual.

Ensuring Regulatory Compliance

In an era defined by data privacy scandals, governance regulations have made data privacy front and center on the agendas of policymakers across the world. In 2020, the European Union formally proposed the first-ever legislative framework governing AI and machine learning. The AI Act and the General Data Protection Regulation

have called for strict requirements on AI and ML models, to ensure that the companies deploying these systems take user rights into account. Similar regulations have already been adopted or are being developed in various other parts of the world such as the California Consumer Privacy Act and the Personal Information Protection and Electronic Documents Act.

10.1. Protecting User Privacy Rights

The emerging use of new technologies and data science is propelling the trajectory of innovation in various organizations. However, there are growing ethical concerns about how organizations handle personal data. Individuals have started to realize that the benefits being offered as a tradeoff are nowhere close to the highly sensitive personal data being shared and the increasingly monopolistic power that organizations accumulate over one's digital footprint via the collection and processing of massive amounts of individual data. Therefore, individuals are wary of the long-term consequences of data collection on their lives that may infringe on their civil liberties. With such opposing viewpoints, there is increasing tension between users' privacy and organizations' pursuit of organizational learning and innovation to address societal problems and enhance economic prosperity. Hence, it becomes paramount for organizations to prioritize ethical concerns and implement mechanisms to ensure their privacy is put first. Companies must rethink their corporate ethos and cultural values to prioritize user privacy rights at all times, instead of being reactive and using mitigation methods only for post-user-facing legal consequences.

To deliver more ethical data-driven solutions, organizations can take proactive measures to facilitate privacy across the data life cycle. Data generation should be informed and consent-based, with individuals being made aware of the types of data being collected, for what purpose, how it will be used, who will have access to it, how long it will be stored, and how it will be protected from being misused. The privacy of collected data needs to be ensured during the storage, sharing, and processing life cycle using encryption or de-identification methods. By implementing measures to comply with privacy regulations, organizations may also promote user trust and loyalty by demonstrating their commitment to user privacy and alleviating concerns about unethical data practices.

Equation 3 : Cross-Industry Data Synergy Score (CIDSS):

$$CIDSS = \gamma(I_c \times T_p)$$

where:

- $CIDSS$ = Cross-industry data synergy score
- γ = Industry collaboration factor
- I_c = Integration of customer data across industries
- T_p = Technology platform compatibility

10.2. Ensuring Regulatory Compliance

When successfully applied, data optimization strategies offer significant benefits for marketers, customers, and the overall economy. However, data-driven decision-making can also jeopardize customer rights through harm from intrusively focused and persisting marketing pushes and from erroneous business model decisions based on unsuitable data compilations. In addition, other ethical issues can arise from organizations not being aligned with broader societal values. Finally, data-driven decision-making may violate explicit rules and norms through company policies not adhering to regulations or either willfully or textually neglecting compliance monitoring.

Large-scale optimization of customer journeys involves big data, artificial intelligence, and advanced statistical and mathematical modeling. Organizations are forced by regulators to work, usually under stiff sanctions, to ensure customer rights such as data privacy. Auditable decisions and verifiable data privacy are key comparative advantages for firms throughout the relationship with their customers. Organizations collect comprehensive personal data, e.g., online behavior, store transactional data, track loyalty and reward

point accumulation, reconcile payment balances, investigate customer service through voice remarks, and transcribe live and avatar-driven agent calls. Organizations collate known-identified personal data with anonymized data from other known via third-party cookies and non-customers around specific content for such data synergies. To date, regulators require firms to establish a foundation of known customer data.

11. Conclusion

At the outset, this chapter explored the importance of Customer Journey Mapping (CJM) in identifying customers' pain points, uncovering friction in customer experiences, improving customer engagement, and identifying moments of truth. For businesses, whether telecom or healthcare, customer journeys have now evolved from physical store visits to being online, and customers are now exploring multiple channels and touchpoints to interact with businesses. Customers expect seamless experiences via all channels and touchpoints and expect support interaction to be seamless across stages and channels. This has made the mapping of customer journeys and optimizing experiences across customers' journeys indispensable. We also noted how technology has changed the way customers interact with a business, and how technology has enabled businesses to evolve and expand customer experiences which help them draw customers to multiple customer touchpoints.

Telecom and healthcare both share similar challenges including high customer churn rates, disloyal customers, service delivery pressures, business growth hurdles, and rigid organizational adversities, among others. Businesses in both industries have been diligently making use of data analytics in decision-making in terms of improving experiences for their customers and ensuring customer satisfaction and loyalty. However, customer journey optimization using data analytics is still an emerging area with limited work specific to the telecom or healthcare industry. Therefore, this is a fertile area of research. This observation is also supported by the recommendations received during our research to explore different data analytics tools, retirements, types of analysis in understanding customers' journeys, and customer segmentation for targeted customer engagement.

In summary, we presented the state of customer journeys in present-day business settings, a retrospective on the traditional CJM methods, and how the traditional CJMs lost their relevance over time giving way to data-driven CJMs. We presented details of two research studies in both the telecom and healthcare industry respectively, which presented evidence of data-driven CJMs being correlated with improving business profitability through improved customer experiences. We also presented the tools, techniques, methods, analyses, and formulation of data-driven CJMs, and shed some light on the nuances of CJM.

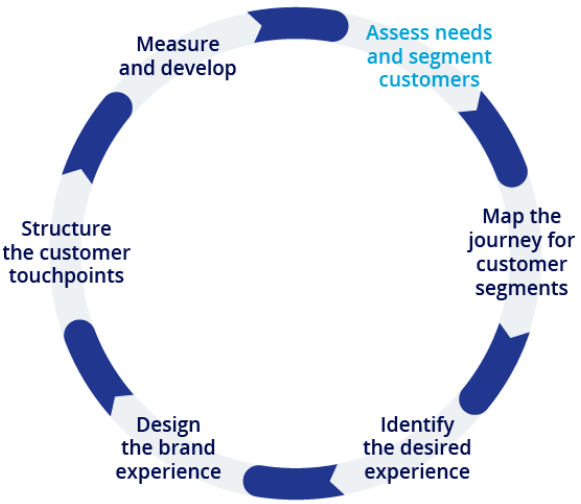

Fig 6 : Customer Journey Mapping in B2B Markets

11.1. Final Thoughts and Future Directions

All businesses must be extremely focused on their customers, constantly searching for ways to meet and exceed their needs. For telecom and healthcare companies, this need is amplified, where a loyal customer base or patient pool not only increases revenues via sales or co-pays but can also lead to widespread marketing and brand awareness by an organization's most valuable asset, its customers. Both industries struggle with how to best meet these

customer needs and what solution is best suited to capture additional spending and create an emotional bond necessitating customer loyalty. The value in researching and analyzing the concepts of customer experience, patient engagement, data-driven segmentation, and predictive analytics is that these disciplines are foundational to a successful customer journey - one that captures omnichannel interactions and creates a seamless and effortless interaction with the business.

It is important to remember that improving a segment of the persona, customer experience or patient engagement does not guarantee that the overall improved journey will have a positive impact. The entire journey must be assessed, including moments of big and little impact to determine whether a better and more emotional engagement will ensue. We outline four large and ubiquitous steps throughout this essay. Particularly challenging for many companies is the ability to create a holistic omnichannel perception of interactions for each step. Our predictive journey effect model helps with this challenge in guiding organizations on how to prioritize within the journey the suggests that are not only impactful and often used, but with what channel in what segment and with what product. We encourage further exploration of the customer experience journey, particularly concerning future work that employs more rigorous analytical tools to derive journey highlights predictive of customer outcomes.

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