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Chapter 2: Integrating artificial intelligence with business support systems for smarter billing, CRM, and customer lifecycle management

2.1. Introduction

Artificial Intelligence (AI) is revolutionizing businesses globally by maximizing the workforce's value. AI quickly learns from data, identifies patterns and rules, and gradually improves its capabilities. Through AI's integration and deployment, businesses of all sizes are anticipating both tactical and strategic benefits with relatively low costs by relieving employees of tasks that involve huge but mundane data processes. There is a regular flow of announcements from myriad technology companies that offer IT infrastructure, software applications, and business services for creating integrated AI and data environments as well as from companies across industries that share success stories from implementing smarter operations. These implementations involve the submission of structured and unstructured data from internal and external origins to data lakes for cognitive processing. Through the data lake, AI applications and the workforce are seamlessly connected for the delivery of scalable intelligence (Biesdorf et al., 2013; Deng et al., 2020; Dwivedi et al., 2021).

The statute of Introductory Chapter on Impact of AI on Business Processes is to correlate AI's applications - natural language processing, speech recognition, robotics process automation, machine vision and deep learning - with specific business processes. This Chapter focuses on Data Mining which is the ingrained aspect of AI applications but is relatively more computer intensive. AI's application, data mining, has an unsurpassed impact on the overall business operations from intelligent customer interactions, customer engagement, customer life cycles, intelligent marketing, marketing effectiveness, intelligent product support, product and service design, human resource planning and analytics, supply chain planning and network design, manufacturing and distribution networks, financial risk management and forecasting (Galetic et al., 2021; Liu et al., 2022).

2.1.1. Introduction to the Impact of AI on Business Operations

Business processes involve a complex set of operations that systematically convert input resources into output goods and services in order to fulfill customer needs. Processes define an organization and its strategic advantage, and the efficient management of processes can facilitate the growth, innovation, and profitability of the enterprise. Generalizing, customer-centric processes based on the principles of value chains model, goal-based design framework, knowledge-based accounting, and other modern business process models are having an increasing impact on the performance of modern businesses. Moreover, business processes cannot be effectively managed in isolation but should rather be strategically aligned and managed in conjunction with other essential organizational elements, including customer relationships management, customer lifecycle management, enterprise organizational structure, business control systems, and employee knowledge. Thus, implementing new technical solutions for supporting business processes, especially BSS processes implemented in knowledge intensive business areas, is a challenging but rewarding endeavor.
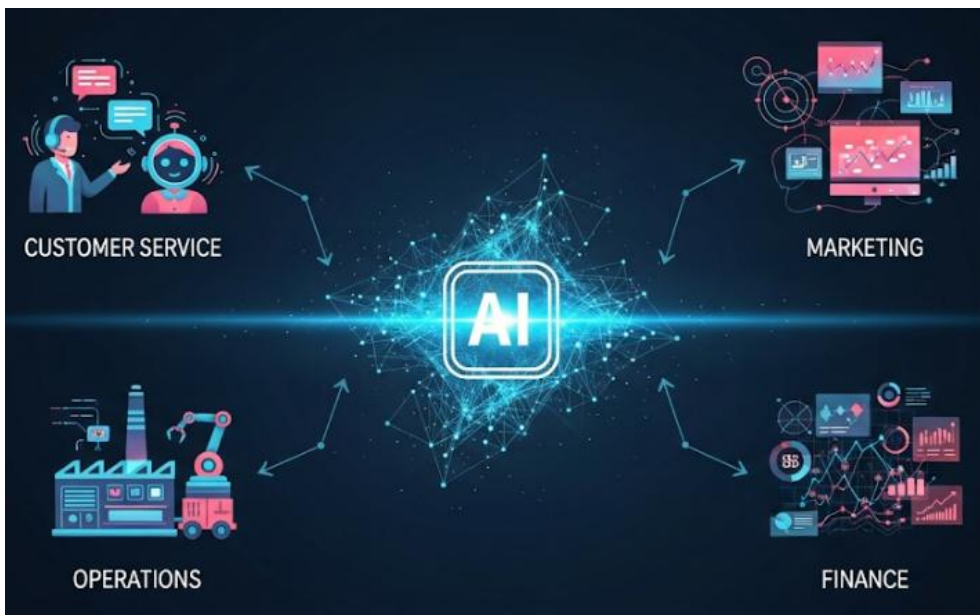

Fig 2 . 1 : Business Potential with Artificial Intelligence

In this context, Artificial Intelligence techniques offer unique opportunities to support and/or implement the operations of organizations in knowledge intensive business areas. Specifically, AI techniques offer the promise of intelligent solutions for performing intellectually demanding business tasks such as data recognition and analysis, decision making, coordination, and technical process and service control. Gradually, these capabilities are beginning to be provided by innovative Intelligent Agent Technology

solutions. IAT is a set of techniques for building intelligent software tools called agents, which can perform pre-programmed tasks independently, flexibly, and/or cooperatively with other agents, with some degree of pro-activity and adaptability, in the service and support of their users. Recent progress in intelligent agent technology, applied in specific business domains, provides a foundation for the development of smarter Business Support Systems for the business support functions of customer relationships, organization processes management, organizational structure, business control, and knowledge management.

2.2. The Role of Artificial Intelligence in Business Support Systems

Are billing, CRM, and customer lifecycle management bundled as essential components of more complex Business Support Systems? Generally, these key components assist Service Providers in obtaining and retaining customers and enhancing customer value against costs and external market benchmarks. What if, however, most tasks handled traditionally by BSSs were performed by Artificial Intelligence? The UK Regulator said that with prediction capabilities of AI-based BSSs, automated digital agents could anticipate the likelihood of customer decisions and churn and take action on behalf of the providers to retain them. Providers could develop a competitive edge by leveraging AI-driven autonomous digital customer agents at low or no cost, who could prompt the customer to allow the changes and choices suggested without human interaction.

The more complex the decision, prediction, or activity, the more dramatic the cost advantages of AI-based BSSs. Except for low-value activities where a less expensive human operator is adequate, operators receive minimum wages for speaking basic phrases to customers in immediate need. However, the same digital agents available through AI can provide in situ or digitally augmented advice autonomously, inexpensively, impassively, speedily, and confidentially in major life, technical, business or medical decision processes or dilemmas where utilizing that such precious "expensive" human resource is not feasible. AI is helping benevolent providers find, know, assist, sell, and retain indeed invisible, niche customers who would otherwise default and deter business. Why? Customers are upgrading to more inclusive packages or becoming premium while loyal customers are diluting among cheap providers.

2.2.1. Key Components of Effective Business Support Systems

Aged Business Support Systems (BSS) have often employed disparate back-office systems that have been patched together over the years, creating inflexible siloed environments. What often appears seamless to a customer requires not-so-agreeable back-office surgery or some integrated BSS offerings that do not always deliver on the

promise of being a one-stop shop hub for the complex and variegated needs of telcos. The integration of the various critical capabilities required to attract, manage, and retain customers has proven to be a far more complex activity than the initial estimates for time, cost, and effort, leading to challenges like project delays or getting only piecemeal solutions implemented. The BSS enable critical customer and revenue-related activities, such as providing the customer places to go research different services, potentially enabling telecom service selection by other means, interacting with the telecom service provider for order and provisioning related operations or issues such as credit card or bill payment, service change, and other inquiries to customer support, and customer service interactions with the service provider's contact center via chat, SMS, email, or voice.

However, the BSS does not create a telecommunications company's image or brand. Customer experience, marketing, and billing policies and processes define a telecommunications company's brand as much as an advertising tagline, and the BSS must operate in concert with these policies and processes. Utilizing knowledge of individual customers, the BSS must provide a personal touch and proactivity in identifying and recommending changes to better serve a customer's interests. A capable BSS is not a neutral data handling tool; it must be a volunteer advocate for the relationship between the customer and the service provider, seeking to strengthen that bond and providing support for the entire customer lifecycle.

2.3. Overview of Business Support Systems

The Business Support System (BSS) is the software that telecoms and cable providers use to manage their customers and monetize their services, including, but not limited to, CRM, billing, and customer lifecycle management. BSS software has evolved from systems that managed the telecoms services and the billing associated with those services, and with a specific focus on the BSS software applications that have been developed to meet the needs of Communications Service Providers for decades. Today, BSS software also supports a broad array of business objectives, such as integrated multi-disciplinary approaches to enhancing customer experience and accelerating new service rollout cycles to create a sustainable service delivery ecosystem, especially in the digital era characterized by collaboration and co-invention with third parties and other partners.

The evolution of telecoms BSS software has been charted along a number of milestones commensurate with the age, and keeping in step with the advances and resulting business challenges in telecommunications technology, regulation, and industry structure. BSS was originally developed to record and process transactions and collect payments for telecoms services. BSS handled revenues that increased steadily year-over-year,

alongside the growing subscriber counts as telecoms services were deployed and monetized. BSS remained in stable mode as CSPs architected process capabilities around the software for many years in preparation for the regulated disruption in the 1990s of long distance competition. These capabilities, still relevant today, are driven by support for customer payments; accuracy in customer bills; full visibility into account status, transaction history, and bifurcation of the billing invoice; assistance for customer inquiries; and effective resolution of disputes.

2.3.1. The Evolution and Significance of Business Support Systems

Business Support Systems - BSS for short - is a general term describing the infrastructure that supports the transactional, client-facing activities and business processes in an organization. These include, in particular, charging, billing, order management and provisioning, customer relationship management, and customer life cycle management. BSS functions are supported by software tools that enable the provision of a comprehensive, complete, integrated view of the customer experience over the lifetime of the relationship.

Parts of the functionality supported by SSS are relatively ancient. The customer account balance, the billing account, pre- or post-paid processing, invoice and statement production, electronic bill delivery, have been part of telecom operations for decades. These functions have been automated for an equally long time, evolved with changing technology, consolidated and refined by the well-known billing vendors of the industry. These BSS – SSS elements and software products continue to be mainstays of the various consumer services markets, and only with the advent of the first competitive telecoms in the mid-'90s did the traditional BSS-SSS systems become the splintered historical legacy of earlier, pre-competitive vendor solutions.

The first cracks in BSS/SSS administration began with the introduction of Voice over IP technologies. After the early session initiation protocol, the first mixed VoIP / PSTN local operating companies discovered that their incumbent BSS/SSS vendors were incapable of designing and deploying products that could seamlessly handle – in a Single Bill / One Billing Account – the disparate billing requirement of subscribers who used both VoIP and conventional analog PSTN services, and Native VoIP customers who used no PSTN services at all.

2.4. Smart Billing Solutions

Accurate billing is a hallmark of customer-centric businesses. It is a universal trait of customer-oriented organizations to have less billing errors resulting in fewer payment

discrepancies. Intelligent businesses are increasingly integrating artificial intelligence into their business support systems to fuel smarter billing processes. Our actions in the physical world are being digitally represented in the form of data available to businesses. This data along with predictive analytical models and AI-ML based solutions can help organizations to provide close to seamless customer experiences while generating accurate bills. Integrating AI into billing processes can lead to increased customer satisfaction as discrepancies are few and far between and billing errors are resolved rapidly. Accurate processing leads to timely generation of error free bills while predictive models can also intelligently assess and modify customer payment behavior. We examine solutions for these processes that can be integrated as solutions in Billing Systems or augmented back-end solutions for existing enterprise billing systems. Accurate and timely generation of bills according to strict regulatory guidelines remains a challenge for Billing Systems of businesses today. Through advances in Natural Language Processing, Optical Character Recognition and Data Standards, invoice generation solutions can serve these purposes. Automating invoice generation using a combination of AI and ML methods will increase invoice accuracy and reduce invoice generation time from days to hours. Ongoing contract networks have also become more complex in their structure. The contract data defining billing events is voluminous, containing multiple clauses and is presented in unstructured format. Businesses usually look to a team of legal process experts to analyze this data for potential discrepancies, thereby incurring high costs. Intelligent automation can transform contracts to predictive billing models, spotting potential discrepancies and generating rules for alerts. Automated contract data analysis can therefore make billing both quicker and more accurate. Consumer businesses and their customers have been at the forefront of rapid adoption of new technologies for commencing and managing engagements.

2.4.1. AI-Driven Billing Processes

As billing solutions evolve, businesses are beginning to want more versatility. While monthly subscriptions are still popular, the demand for on-off services payable upon receipt of the service is accompanying the wide adoption of cloud-based services. The same enables on-off charging and push-notification pricing with our smartphones. IoT devices can be charged differently during day and night-time, and the price notification sent via email or SMS. Hence a simple monthly "one-size-fits-all" billing model is no longer feasible. Our different changing needs often require using different channels, and this is being enabled at the moment by Assistance with Chatbots and Smart Agents. While virtually eliminating some cost through a digital wallet. But this further increases the cost and complexity. What do you want your AI to do? To make things easy or automates things and makes things complex?

The challenge for businesses is how to make available all these options with near-instant response to the customer and for their query to be handled confidentially. How to ensure faster response times and digital wear and tear, with no significant additional increase in cost. Providing better customer experience and long-term relationship with less frustration on both sides. These factors influence customer retention and acquisition which are what are important to businesses. AI has helped small businesses analyze customer's online behavior, search history, and purchase patterns. It has also effectively targeted potential customers with personalized ads to drive online purchases over social media platforms. Enabling businesses to respond to customer queries that come up during business hours, evenings, and weekends. Processing increasing data and transaction demands to support customer relationships and product life cycles. With the help of Automation, AI-driven solutions can intelligently streamline the entire invoice, payment, and dispute resolution cycle.

2.4.2. Automating Invoice Generation

Businesses utilize utilities like electricity, telecommunication, and other services that have a defined usage. For the services provided, they need to make monthly payments. There are periodic payments where either the number of packets of the service utilized is known or the amount is fixed. In the central billing section, all the periodic payments are calculated separately so that the printer can issue the payment advice by entering the customer number. But for these utilities and many other similar businesses, the pattern of usage is rather irregular. Since the invoices are generated every month, expenses are incurred in collection, data entry, and invoice generation.

Using AI with appropriate artificial neural networks for supervised learning of invoice generation has become attractive lately. The type of service availed for each customer, its category, the previous usage under normal condition, and the discounts given during parts of the year are usually taken as input features. In areas like this, with a sufficient amount of data available, precise prediction can be made for the actual usage. Because of input space parameterization, revenue prediction can be done error-free or with very small error margins with most of the customers. Large datasets exist with known usage data for many previous periods. Hence it is naturally attractive to assign some of the invoices of customers with no error as test datasets. Then it was shown using simulated data that among a few prototypes, the cross-validated neural network can produce the least prediction error even with large numbers of predictors. If revenue errors are less than 0.3 or 0.4%, prediction can be said to be error-free.

2.4.3. Predictive Billing Models

Notifications and reminders are particularly valuable in billing and communications because they cut down on the number of late payments that businesses have to chase down. But in order for them to be effective, people have to heed them. The best type of notification is that which is specifically tailored for the individual receiving it because will be more likely to engage with the reminder. On occasion, an individual customer may need help understanding their payment obligation, typically when that bill is for an uncommon amount or when it's linked to a service that the customer feels was unreasonably provided. In those instances, an unexpectedly late payment can be anticipated based on those two definitional characteristics. Automated help interfaces can assist with the necessary exchanges.

Most importantly for the business so eager to get paid: some customers don't heed the notification or reminder when they have the resources or the opportunity to pay. Often, these customers fall into cohorts that are unique to the business, and whose payment history indicates risk of this neglect. Businesses need to use these more personalized predictive billing models in these situations, as genericized models that collect cohorts together lack the variance across cohorts that supports proactive rejection of a notification and reminder. As a result, given the probability thresholds for acceptance, the customer incurs further consequences. Neglecting to pay leads to the addition of late fees or penalties without offering the customer an out, and increases the expense of future collections.

2.5. Customer Relationship Management (CRM) Enhancements

Customer relationship management (CRM) is a crucial aspect of organization's lifecycle. Our analysis revealed sentiments towards organization's offerings such as services, products, and their competitors on social media platforms and inbound requests, which can be used for creating personalized marketing messages. Since it aids in increasing their market power, it is assumed that integration of AI with CRM functions, particularly in the areas of customer segmentation utilizing purchase data, personalized marketing messages employing social, email, and call data, and sentiment analysis would help organizations in competing more efficiently. The main objective is to provide insights into the shared sentiments, apply AI techniques to augment the functions of standard CRM tools, and to suggest areas for future research, thus aiding in smarter execution of CRM strategy. The segmentation of customers using traditional demographic details such as age, gender, and income is no longer sufficient. Customer segmentation models have employed machine learning techniques to segment consumers based on numerous behavioral and psychographics parameters. Unsupervised and semi-supervised machine learning approaches combine consumer data such as

transaction history, preferences, and opinions about product features to cluster customers into potential segments. These segments also assist in cross-selling and up-selling services or products. The machine learning algorithms have also been utilized for predicting customer lifetime value. Another approach is to employ deep reinforcement learning for CLV prediction by modeling the CLV as a dynamic sequential recommendation problem and deploying a factored approximate value iteration algorithm. The superior performance helps organizations in identifying loyal customers and in formulating targeted resource allocation policies towards these customers by performing retention, acquisition, and development activities.

2.5.1. AI in Customer Segmentation

Segmentation is a common concept not just in sales and marketing disciplines, but also in many social sciences. The customer segmentation question was one of the first questions addressed in marketing science. The question remained as one of the most intractable questions addressed in the marketing academic community. Should more focus be placed on putting people in different groups to differentiate them as opposed to understanding what is common among customers? Traditional segmentation approaches relied on qualitative aspects as well as quantitative aspects to develop the segments. The segment definition methods partitioned customers to distinct segments based on customer data attributes fitting a particular requirement to be placed within a segment. This partitioning method would result in all customers falling in specific segments according to the specified rules. Typically, a limited number of segments were formed and these segments were defined for the marketing efforts of the firm.

The competitive landscape is constantly changing, and new markets are continuously being formed. Standard customer type segmentations are static. In particular, they do not allow for the situation where customers are actively changing their behavior over time. While research in marketing science previously addressed this question with innovative modeling methods, rigorous implementation proved difficult – and application to marketing was relatively rare. Market Research departments have constantly – and perhaps futilely – asked for marketing executives to consider personalized marketing. The advent of emerging technologies introduced new opportunities and in fact, opportunities to worthwhile uses of artificial intelligence methods. Data mining, machine learning, and other methods are able to consider the unstructured data elements that are present in the structured aspects associated with customers, and can support our marketing efforts as we move towards a more personalized orientation.

2.5.2. Sentiment Analysis for Customer Feedback

A significant portion of the consumer's voice is in the form of free-form text comments left on surveys, social media, and postings and comments in other online forums discussing their impressions of the vendor experience. Sentiment analysis allows us to derive specific insights from that portion of VOS that is free-form text, processing the sheer volume of comments but also to disambiguate terms to know not only what customers mean but what they mean in the context of the entire comment. These systems can also categorize text comments by specific topics such as service issues, product performance, product usability, and so on. Advanced models can also determine if two comments are duplicates to better quantify the issue and sentiment. This VOS data can be readily applied directly to the product lifecycle by analyzing customer comments to evaluate response to marketing and communication campaigns, emerging functionality trends, new product launches, product and service issues, competitive issues, and external events or crises. These VOS insights can also be used as input to corporate dashboards that monitor customer experience scorecards and key performance indicators around trust, advocacy, and satisfaction. Integrating these scores or KPIs with business outcomes such as performance and profitability creates a stronger connection to corporate performance and expands the role of the CX team from mere sentiment analysis to direct involvement in innovation with product management and finance to drive business results.

2.5.3. Personalized Marketing Strategies

Though marketing is traditionally a process of broadcasting and advertising products and services to the masses, ideally, in a modern customer-centric scenario, marketing should be aimed at individuals rather than the whole crowd. AI would play a pivotal role in making marketing personal. Personalized marketing using customer data will help transmit the right message at the right time to the right person, resulting in higher ROI for the organization.

Typically, internet marketers primarily addressed only transactional emails and newsletters to customers. Although this takes into account some customer data, like their purchases, browsing, preferences, interests, etc. while sending out thousands of emails, it lacks the personalized simplicity that today's customers expect. This is where AI can help make marketing a bit more personal by leveraging the voluminous customer data that can be gathered by businesses and bridging the gap between digital and real customer experience.

Fig 2 . 2 : Personalized Marketing

Typically, we see personalization features in nearly all of the customer touchpoints like emails, ads, apps, and websites. In emails, it is not uncommon to see customers receive emails from big brands recommending items that are based on their previous purchases, visits, and preferences really makes it special. In this regard, we present the case of online ticketing where personalization of marketing is critical to prevent customers from abandoning their wishlist. Travel requirements can be very specific depending on family size, choice of carrier, class of travel, budget, and destination. Online ticketing sites harvest template patterns but also rich user data. They need to use this information to deliver relevant marketing for all wishers. For example, if a user is wishing for an airline that is part of the AI hub, or another airline that refuses to share user data, they can receive a wishlist reminder email every day. If a user has requested tickets for a festival period, the cleverest online ticketing sites send personalized emails to suggest the most suitable itineraries. More personalization knowledge can come from a market-response model, econometric analysis, search history, and privacy switches that influence customer behavior towards online ticketing sites.

2.6. Customer Lifecycle Management

Six Sigma and customer relationship management literature consider three components of customer relationship management: the customer lifecycle, customer value measurement, and customer value increasing strategies. In today's competition sensitive markets, effectively managing a customer's lifecycle is crucial for success. The customer lifecycle monitoring process provides insights into each customer's behavioral evolution rather than focusing solely on static or historic attributes. Some industries believe that

all customers are alike, however, customers exhibit unique patterns over the lifecycle; some appear for only brief periods, others switch from one preference to another, while still others seem to be in steady-state mode for years on end. These unique behavioral patterns can be used to determine the most effective resource allocation strategy. As industries become increasingly competitive, a firm's sole product differentiation strategy may cease to be a viable option if competitors are adopting similar strategies. Consequently, more and more companies are turning to customer strategy, segmenting their markets and providing more for more.

Technological advancements in last few years have made it easier for companies to customize marketing strategies to specific clusters of customers, making it possible to implement a customer-driven strategy. However, as technology continues to evolve, customer segments can be expected to change rapidly. This segment instability has made it increasingly difficult to enhance customer profitability. When a business categorizes its customers into segments based on similar characteristics or preferences at a specific time, this information can be leveraged to estimate the future value for the customers based on insights gained through the behavior of current customers.

Today, it is critical for organizations to be able to anticipate future customer behavior, as well as the effects of marketing actions on those behaviors. Given the cost-of-service delivery and the widespread use of digital strategies to remove many of the "bricks" from traditional "bricks and clicks" infrastructures, organizations need to devote attention to the customer lifecycle. Addressing such issues can have a significant impact on sustaining profitability. In this section, we look at three areas of customer lifecycle management: customer journey mapping; strategies to boost retention; and churn prediction models.

2.6.1. AI for Customer Journey Mapping

As businesses grow in sizes, the interaction between prospects, customers, and brands become increasingly complex. Creating attractive paths that influence consumers to execute a specific action is unavoidable in the journey towards better conversion. As all businesses attempt to synchronize all communication channels relevant for customers, the lifetime value of a now monitored journey becomes strategic for companies looking to delight customers. Due to these facts, myriad tools exist for mapping, modeling, and automating customer journeys, however, few look into the capability of artificial intelligence at monitoring and powering customer experience in relation to marketing, sales, and service operations. This section introduces elements of debate that focus on how AI technologies can be puppeteered into automating customer journey mapping. In addition, the chapter will explore the relationships organizing AI into a single command center can create, who manages the AI command center, and how companies can benefit

from it. Further, in-house or third-party offerings that can help effectively automate CRM operations will be assessed.

Journey mapping informs what the business priorities are in relation to the key phases of a customer's journey. Important phase areas include Researching & Comparison, Buying, Using, and Post-Purchase phases. Understanding touches and emotions that flow during phases of the journey can deliver insights that help businesses accelerate the conversion, engagement, and interaction experience, ultimately improving returns, revenue growth, and shareholder value. Activities include gathering qualitative observations; completing surveys or polls; analyzing customer comments; and studying customers' inbound and outbound contact history. In recent events, several companies have commenced the use of AI models such as sentiment analysis and natural language processing in scrape. These technologies help rapidly assimilate data from different social channels. Furthermore, some experts also believe the use of AI-based models would help identify specific areas and branches of a journey map that require a predetermined focus and attention.

2.6.2. Retention Strategies Using AI

AI solutions can leverage CRM data, social listening tools, behavioral analysis, and influence mapping tools to help brands shape better retention offers. Routes to retention may be cheaper than acquisition, and AI systems can have longevity modeling components to help outline better reward structures. However, propensity modeling should play a key role in the design of retention strategies, and this does run into issues when the score would be expected to go down over time and the models are built using static training samples from the last year or two. More systemically, a churn score using existing methods may be used to derive a set of users that would benefit from an intervention at T0. This activity then provides a set of users for whom the effectiveness of the intervention is assessed at T1 after the retention action had taken place. This data can then be used to identify which component can help retain when and for whom, greatly increasing effectiveness and/or lowering Cost per Acquired User – both of which would inform longer term modeling of a proactive intervention model to run targeting and budget allocation.

While the methodology resonates strongly with the principle of attract, convert, grow, retain and referrals, in the days of social influence, users represent the most valuable strategic agenda item to optimize for. Brand safety considerations and brand activation that truly connect with deeper underlying motivations for the users become strategic value increasingly in demand by influencer agencies in the consumer lifestyle as influencers became relatable on social networks that can be turned onto brand supporters

to become more representative of a brand rather than simply monetizing their influence to make as many sponsored posts.

2.6.3. Churn Prediction Models

Since the vast majority of predictive research analyzes voluntary customer churn, these models explore the different reasons for not renewing a contract with a service provider. Given the plethora of techniques available, we discuss why not to use popular ones and briefly present the major predictive examples applied to churn. Churn models have become mainstream due to the choices made by numerous industries. Insurance companies in particular are worried about a selective churn, which is the source of increased markups propagated from those looking for more attractive pricing to new customers in the financial industry. Traditional marketing segmentation is often substituted by predictive or response modeling of churn, which forecasts which customers are likely to leave and attempts to determine the principal reasons. The retail financial, telecommunications, and digital marketplace industries being particularly churn sensitive, dedicate significant money to marketing campaigns focused on keeping these groups.

At first glance, using binary classification techniques, churn detection seems straightforward. Furthermore, it is fairly easy to interpret the most influential variables. Even the rules arising from association mining tend to be associated with this process. Using a profit curve, or an alternative like cost-benefit analysis, marketing officers will estimate how successful their retention policies will be with the target population, but risk comparative models are often simply ranked using predictive accuracy measures. The main area where churn modeling deserves attention is with regard to its economic implications. Therefore, we present a comprehensive case study that highlights the insights such a model can provide.

2.7. Data Management and AI Integration

Interesting as it is, the AI revolution is still dependent on data management solutions and decisions. Even so-called Data Lakehouses are compromised when data is of poor quality or ungoverned; ML training can overfit to bad data or only reflect patterns in bad data. Yet, most enterprises lag behind on poor Data Governance capabilities and mature Data Governance practices, as well as enterprise DNA, which applies even more so to telecoms, with their experience abusing Customer Data, and now Federated Learning and self-organizing solutions increasingly desired as the answer. After exploring some of the possibilities around AI, data integration, and data quality, we discuss how AI companies should integrate with the traditional BSS or high componentized BSS stacks,

and consider the implications of having part of the BSS remain on-prem, while the AI is likely Cloud-based.

Enterprises are already challenged with the Cost and Complexity of managed data integration processes that govern, control, and secure brand and customer information. Customers want their data securely held but also opened to the ecosystem, where they can federate their interaction digitally and on-demand. In fact, customer relations are the obvious application for enterprises looking to access the business benefits promised by AI Machine Learning predictions. To date, these predictions are wholesale second-hand – offered as SaaS using parameters offered up on-demand by the enterprise and pooled with those of other enterprises – because it is difficult to visualize how an enterprise can provide a secure, private environment for AI Training to be multi-tenanted across multiple enterprises.

Cloud-based software and ML processing time have now gotten affordable enough for TPX to offer a software plus service paradigm, supporting enterprises who increasingly do not want to handle over-sensitive data on-premise, but still require an on-going and dynamic link to their proprietary data environments. We expect this to continue within the AI specialist domain, except more and more companies prefer to engage training on the Cloud or as Managed Service with selected partners.

2.7.1. Data Quality and Governance

Data is a key aspect of business planning and execution in any company or industry. Its proper management leading to usable sets of data that guarantee the quality of the information and adequate mapping of business processes are the keys to success when integrating data-centric solutions such as business support systems. This paper presents considerations related to different contexts of business management that can leverage the use of smart solutions based on big data, artificial intelligence, and deep learning to increase decision-making agility and streamline automated processes. These considerations guarantee the appropriate use of the mass data produced today to generate information and knowledge, enhancing the use of business support systems. New technologies are able to integrate Artificial Intelligence and optimize dynamic management of processes such as Marketing, CRM, and Billing Management, aiming at a view of the whole. The business support systems allow integration with smart business tactics to take advantage of the skills they provide and boost business and infrastructure management. Business intelligence uses these systems to analyze past processes with the goal of providing insight to decision makers. New technologies, such as big data and data science, make it possible to integrate Artificial Intelligence into decision-making processes based on smart tools supported by business support systems. The adoption of these technologies implies the need for governance policies focused on speed and

dynamism in the response of these decision-making systems or business support environments to the strategies to be implemented and the tactics to be taken advantage of.

2.7.2. Integrating AI with Existing Systems

Integrating AI capabilities with existing systems likely involves solution development and middleware usage to facilitate connectivity, interoperability, and data sharing between enterprise applications, data stores, and AI tools and platforms, as well as application customization to assert the right degree of AI usage and achieve the optimal level of impact. Integration of AI platforms and internal enterprise applications is probably easier to develop, but it also likely uses only limited out-of-the-box capabilities of AI tools and algorithms, delivering limited benefits. Data transfer between applications, data stores, and AI tool platforms is probably the most likely use case, leading to additional transactional costs and time delays for certain use cases and lack of capability optimization for others. But not every application, analytical or corporate data store, or problem can be directly integrated with available services of a single external AI tool platform without incurring prohibitive effort or transaction costs.

Middleware products are available that reduce the need for custom application code development and support both on-premise and cloud-based AI tool services usage. These middleware tools implement different levels of abstract models of business processes and data objects that can support a variety of corporate use cases in a more customizable and reusable manner. There are also available customizable middleware products that help integrate any external tools and services accessible via APIs and secure a flexible modular architecture for building enterprise solutions based on external AI, ML, and data analytical services, making middleware-based integration the most flexible solution for team-specific corporate functions. Several of these products can also perform automatic process discovery based on monitoring of enterprise data flows and tool utilization.

2.8. Challenges in Implementing AI in Business Support Systems

Despite the transformative potential of integrating AI into BSS, organizations may encounter technical, organizational, and cultural challenges. Lack of AI technical skills and shortage of trustworthy domain-specific data are reportedly the biggest challenges. In addition, organizations will likely need to bridge corporate silos, integrate AI project teams with other corporate functions to speed execution, cultivate a culture of innovation, and encourage creative ways to experiment with limited use cases before scaling up AI technologies within their BSS. Furthermore, organizations should not

underestimate the potential reputation risk and regulatory burden associated with AI for automating revenue assurance, billing, and customer care operations.
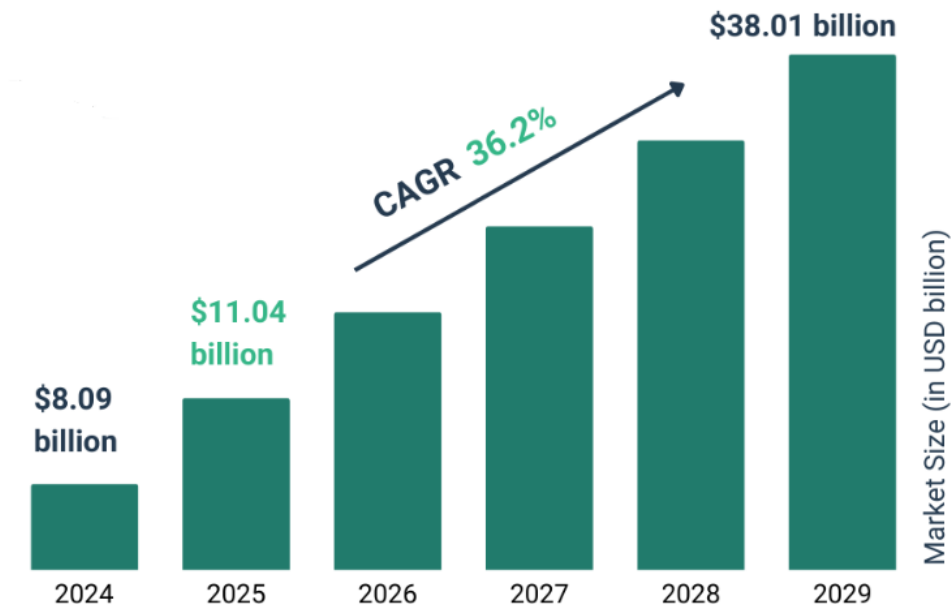

Fig 2 . 3 : Artificial Intelligence (AI) in Customer Relationship Management (CRM) Market Report

Technical Barriers

The technical barriers may appear to be prohibitive. AI is notoriously complicated to configure and install. Furthermore, organizations need to invest in additional digital infrastructure to capture and store the massive volumes of data that are needed to develop advanced AI capabilities. However, numerous companies and service providers offer BSS software solutions that have substantial embedded AI capabilities. These solutions may not provide the full array of features and functions that organizations want, but they can jump-start an organization's use of AI. Also, dramatic improvements in AI technology, combined with robust cloud platforms, are reducing the cost and time to deploy these AI tools.

Cultural Resistance

AI is not an off-the-shelf technology that can be easily deployed within organizations. AI is often viewed as a threat that will undermine the job security of workers. As such, organizations need to invest considerable time and effort to educate employees about the productivity and efficiency advantages of integrating AI into the workforce. Moreover, organizations should take steps to mitigate the personal impact on affected employees, especially for those upper-experience-level employees in the service and support

delivery organizations. One reason for their heightened concern is that AI tools can augment existing employee skills, and therefore have a greater immediate impact on their work than on employees in other job classifications.

2.8.1. Technical Barriers

1. Introduction 1.1. Artificial Intelligence and Automation 1.2. The Benefits of AI for Modernizing Communications Business Support Systems 1.3. How AI Will be Used for Billing, CRM, and CLM 1.4. The Structure of This Essay 8. Challenges in Implementing AI in Business Support Systems 8.1. Technical Barriers 8.2. Cultural Resistance 8.3. Compliance and Ethical Considerations 8.1. Technical Barriers Every previous technological transition has had some barriers to implementation: financial, expertise, and simply the lack of development of the underlying technology. Until now, the major investments in systems such as Billing, CRM, and CLM have been in developing those systems. AI was not a priority for the vendors of these systems, and until recently, little research had been done on integrating AI with them. There is a latent risk of investing in process automation and acceleration, only to discover that the same relative scarcity still exists for the "hard" capability to innovate by combining AI with product and service design and delivery. In the case of TTL and the vendors of the systems, it is possible that priority will not be given to AI internal capabilities for Product and Service design and delivery, as they are also becoming providers of Enterprises Digital Transformation and their own Recurring Revenue Systems, following the path taken by Six Sigma and Agile. Given the growing R&D budgets of the IT Technology Stack vendors, it may be that the bottleneck that will slow the provision of AI-assisted solutions will be the lack of skilled labor capable of advising these vendor organizations in combining AI and Human Intelligence and the lack of integration of the systems with all throughout the ecosystem of customer, supplier, and participant organizations, not the components offered at market.

2.8.2. Cultural Resistance

Cultural resistance is a thorny issue that can derail any efforts to implement Artificial Intelligence (AI) into an existing system including Business Support Systems. Cultural resistance can take various forms and can arise from differing resistance or motivational factors. These may include fear of competing with newly deployed AI capabilities, resistance to relinquishing familiar routines and processes for new ways of working, worry about possible job redundancies, lack of engagement in adopting new AI-enabled solutions, desire for continued reassurance that day-to-day issues will be handled personally and the sentiment that an AI-based resource just does not have the right

capabilities or demeanor to perform the required tasks for particular user interactions and use cases, to highlight just a few. Additionally, the characteristics of any incumbent workforce, whether they are younger, older, data-savvy, less data-savvy, or operate within a data-poor environment can also play a part in resistance.

The issue of cultural resistance applies equally to all types of Business Support System where AI capability is being incorporated. This includes systems for Billing and Revenue Management, Customer Relationship Management or Customer Life Cycle Management. Customers, resellers, partners and employees in contact with any such AI-enabled tool wanting confirming answers as to "Why AI for that?" or "Why AI and not other means for that?" must be satisfied that the proposed role of AI in the system is uniquely the right match – which for what type of function and benefit – of the many tools and functions that AI can perform for BSS and what the BSS is accomplishing. Often, the answer to such questions provides a compass to ensure that expectations for BSS functionality and performance both for the service provider and for their business-supporting customers and affiliates become aligned and optimized, minimizing the risk of disappointment for all parties.

2.8.3. Compliance and Ethical Considerations

AI development and application have rapid growth, but the possibility of individuals or businesses monetizing AI damage is currently left with few legal tools. Specifically for implementation of AI in Business Support Systems for customer management, billing, collections, and related disciplines, data quality assurance and ethical restrictions on how to use the data should involve customers in the accountability chain. Compliance and ethical considerations hinder the creation of theories, models, and frameworks for an automatic, autonomous, and ethical process of integrating AI with Business Support Systems, such as customer relationship management and billing. An ethical, responsible, and transparent utilization of AI in organizations should be in alignment with the values and norms embedded in society. This is where considerations related to accountability become relevant in generating transparency and contribution towards avoiding AI damage.

Accountability for data contains two components in the success and continuity of ongoing interaction supported by Business Support Systems: (1) Fair and equal customer treatment and (2) Protection of customer privacy and security. Elements in Business Support Systems having an ongoing transaction agreement or contract with the organization have, from the ethical point of view, the same rights. How CEOs, CDOs and CIOs design and sync different AI systems for business optimization can either promote customers' rights or leverage different lapses that can actually create incalculable business and social damage. For instance, AI systems that are developed for

business decisions but leverage different sets of customer data can lead to differential customer treatment, levying a risk to business continuity. At the same time, protecting the customer's data must be high on the priority agenda for Boards of Directors and Chief Information Security Officers.

2.9. Conclusion

The business environment today is highly competitive and complicated. Companies struggle to succeed in an uncertain world. Business Support Systems: Billing, CRM, and Customer Lifecycle Management perform strategies and processes that track customer relationships that enhance profit. Billing Systems ensure that services are billed and payments collected efficiently. A Billing System collects the information from various service departments; processes the data for billing; issues invoices, bills and statements; and manages payments. A Billing System also handles Accounting processes for Subscription Services. The process is a highly complex one, sending bills and collecting payments from millions of subscribers all over the world every month, every quarter. The information about payments, pending payments, unpaid bills, previous history of payments from each subscriber provide useful information that help Sales and Marketing Departments decide revival strategy.

The CRM and Customer Lifecycle Management Systems tracks each customer relationship with the business concern across the various service areas and Product Line decisions. Products, Still Services and Non-telecom Services supplied to customers as per their choices help Business Strategies not only forecast future sales but also decide new products that they need to supply to their customers to make them stay loyal to a particular brand. AI today can support the BSS processes by financial transaction details to Billing, digital channels to various Service Touch Points to purchase products and avail SMS Services, identifying patterns in Customer Behavior, predicting Customer Sentiment, deploying Customer Support Agents using Chatbots, virtual assistants to resolve customer queries on a timely basis to adhere to the Service Level Agreements, and utilizing Smart Algorithms to optimize various processes. AI for Smarter Billing, CRM and Customer Lifecycle provides business houses with tools and capabilities to be Future Ready Success Strategies.

2.9.1. Final Thoughts: Embracing AI for Future Business Success

Executive and entrepreneurs have long set the direction for their organizations and harnessed the resources required to achieve success, and some have tried to automate management and decision making with little success. Business Support Systems and the Internet created a much larger community of decision makers, and Sales, Marketing,

Customer Support, Accounting, and Product Marketing increasingly had to share and justify decisions. For certain tasks, the collective intelligence of the Internet is replacing or augmenting the more formal Business Support Systems that have created structured decision procedures.

Finally, in the past decade, Artificial Intelligence or AI has grown tremendously due to better, lower-cost hardware, programs that enable computers to imitate intelligence, and access to the large volumes of inexpensive data required for training. There is now a plethora of solutions available to help businesses, including advances in Natural Language Processing, Natural Language Generation, Computer Vision, Robotics, and Collectively Intelligence. With BSS and the Internet, this new generation of AI can enable smarter Business Support Systems that create smarter, responsible decisions when integrated with the business processes we discussed. Too many decisions are being made blindly with business processes or Business Rules that are inflexible or based on outdated data and analytical capabilities.

It is up to management, the designers of Business Support, Conversational, and Collaborative Systems to make sure that we adapt all of these capabilities in a respectful way, so that the new AI capabilities augment and improve the quality of decision making at organizations. By taking advantage of Smart Support Systems that integrate AI, the Internet, the Cloud, and Business Process Automation gives business organizations another opportunity to take a giant leap in staying one step ahead of the competition and optimizing organizational success.

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