MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal
ISSN: 1053-7899
Vol. 34 Issue 2, July-Dec 2024, Pages: 1161-1174

# Transforming Customer Experience in Telecom: Agentic AI-Driven BSS Solutions for Hyper-Personalized Service Delivery

**Shabrinath Motamary, Software/Systems Architect, ORCID ID: 0009-0009-6540-7585**

## Abstract

In an environment in which users and telecommunications providers are increasingly interconnected, it has become difficult to obtain relevant data that answers customers' questions or needs, therefore leading to a poor customer experience. Large companies have various channels to communicate with customers, yet many users' issues are not solved in the first interaction. Often, after establishing a context with an automated response system, users are redirected to speak to a person, wasting both parties' time. Despite the technical complexity behind those last resort solutions, they are not satisfactory from either the user or organisation's point of view. Modern Virtual assistants are effectively gathering data, understanding a user's context and creating a conversation model that can lead to relevant and pertinent answers being provided on most occasions without intervention from a human agent. In recent years, key 'ingredients' in telecommunication firms' available datasets have become similarly accessible to other businesses or even developers. Would it not make sense to implement similar technology to both improve quality of service and a better customer experience?

In conclusion, the presented design prospect of what aspects telecommunications firms could develop in their virtual assistant applications is valued, assessments of perceived value and risks are critically examined, and future research prospects are proposed. An emerging customer experience model and a technology that could enhance it are bridged to raise questions about the future of telecommunications firms in an environment where hyper-personalised service provision is becoming even more relevant.

**Keywords:** Telecom ,Telecommunications ,Artificial Intelligence ,Natural Language Processing ,Data-driven Virtual Assistants ,Speech Recognition ,Agentic AI ,Customer Experience ,Customer Care ,Non-Functional Communication ,Knowledge Bases ,Semantic Memory ,Conversational Agents ,Business Support Systems ,Hyper-Personalization.

## 1. Introduction

Telecommunication customers have seen the biggest changes in the way services are provided. There are many new services to choose from, new devices, and the internet has introduced an entire new wave of services. Thus, the competition among players in this industry is now stronger than ever. Still, the increasing complexity of services is detracting from the user experience of telecommunications customers who find it difficult, time-consuming, and costly to manage the services. This issue has been emphasized through research that shows a clear correlation between customer experience and customer satisfaction in the telecommunications industry.

When customers cannot access the information or operate the service, they turn to the telecommunications companies' customer service organizations. Most often, customers turn to call centers as the main channel for managing telecommunication services. This is an issue both for customers and the telecom organizations. On the one hand, customers have to schedule a time to contact their telecom provider during business hours, wait on hold for long periods, explain the issue often without any context, and deal with failed call backs. On the other hand, when talking to a client service representative, the organization does not use any machine data about the customer's behavior, context, or preferences. Although this interaction is very limited on the customer side and fails to utilize most of the available data on the organization's side, it is still the focus of most of the investments in the telecommunications companies' customer service organizations.


**Fig 1: Hyper-Personalization**

**1.1. Background and significance** The telecommunications industry has witnessed unprecedented growth and competition since its liberalization. Telecommunication Service Providers (TSPs) have invested heavily in network capabilities and offerings to acquire the required scale to compete with other licensed operators, cable companies, and technology companies looking to enter this space. However, despite past investments and the resulting profitability, the industry is seeing a decline in Traditional Revenue (TR). As a result, TSPs are turning to a new paradigm for growth through the Continuous Service

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Delivery (CSD) model, whereby network operators hope to monetize their assets and improve profitability by converting costly-to-build and own network capabilities to a subscription or fee-based model. The growth in OTT video using telecom networks has led to a decline in TR once forecasted growth.

Consequently, regional TSPs are increasing their investments in new offerings to capture new revenue opportunities. In many parts of the world, these CSD offerings are in the early stages of development, and the requirements of such offerings have yet to become clear. Some aspects of this offering and market are expected: multiple services will be required to justify the investment in capability across various network technologies, such as cable and mobile networks. Competition will come from both other TSPs and large technology companies. It is, therefore, a broad and complex space that will require a significant initial investment. A key differentiator on which TSPs historically competed—price—is likely to become a race to the bottom in many regions. Some TSPs have already articulated their desire to compete on price, and the probability of that competition spreading is high. In terms of new customer acquisition, other criteria will need to drive the market.

**Equ 1: Agentic AI Efficiency (AIE)**

$$AIE = \frac{IR \times CL \times CE}{TR + HL}$$

Where:

- IR = Intent Recognition Accuracy
- CL = Contextual Learning Depth
- CE = Conversational Effectiveness
- TR = Time to Resolution
- HL = Handoff Latency (to human agents)

## 2. Understanding Customer Experience in Telecom

Customer experience has emerged as the prime differentiator for telecom operators capable of generating more revenues and profits from their customer base. These operators offer similar services in the market and are regulated by a similar regime. They do not get more out of a service they create and offer. At this juncture of market maturity, understanding customer experience could thus fulfill the vision of operators to become a communication powerhouse for an information-rich society. Customer experience is defined as the perception on the part of a customer from his/her interaction with a product or services provided by a company. It describes the impression on the part of a customer before, during, and after the purchase. A customer and a provider cannot be independent if they are in a transaction environment defined by George Simmonds. These models are more appropriately called multi-agent systems where the customer and provider are independent agents with their own objectives and strategies which can negotiate mutually beneficial contracts. A purchase made in the consumer goods industry is therefore influenced by the mom's active or passive use of the product, peer groups consumed, advertisements perceived, and information gathered. Since an IMTS telephone is a fixed line instrument valid until power cut or landline being brought to swing, there is not much association about the instrument and the company providing services. Services differ because each possess characteristics defining its essence. In a hyper competitive environment, telecom is the only sector having intelligent agents -be it network, account, data, machine, etc. – running the complex BSS /OSS era with their own protocol.

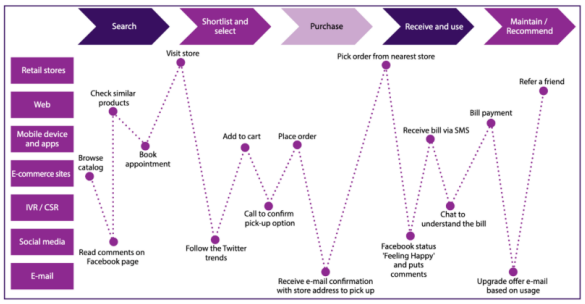


**Fig 2: Telecom customer experience**

### 2.1. The Importance of Customer Experience

In the race toward revenue-generating services and disruptive business models, customer-centric approaches and hyper-personalized services are critical imperatives in telecommunications. Customer experience is increasingly seen as the next competitive battleground in the telecom industry, but it is a complex construct that has received little empirical validation and operationalization. Existing research fails to contribute to managerially relevant actions of telecom service providers in a controlling and steering sense for coherent service ideology, well-balanced interaction and experience management, and ultimately transformed enterprise health, profitability, and service innovation level in telecom service provisioning. Accordingly, managerial instructions for a holistic service ideology encompass a three-dimensional integrated enhancement of 6 behavioral service delivery modes and 12 quality dimensions of experience, process, and resource behavior.

Telecom customers are truly empowered to steer and create their own experiences as the telecommunications market

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ISSN: 1053-7899
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evolves toward a service-dominant view. However, the prevailing, predominantly futuristic consideration of service ecosystems rather curtails managed customer empowerment- and experience-enhancing alternatives. Given the complexity of earlier constructs found in the systematic literature review, agentic AI applications to business and telecommunication contexts are found to be particularly suitable to induce effective, efficient, coherent, seamless, augmented experience action for customers, professionals, and machines. By recommendation of system process scenarios and initial operationalization on a high-tech ecosystem, up to 23 dimensions of existing AI applications in telecommunication contexts are identified to enhance customer experience once exploited and tailored with high diligence to adopt E2E data coherence and cross-fidelity simulation to close customer service cycles and satisfy customer needs.

**2.2. Current Challenges in Telecom Customer Experience**

Telecommunications service providers (TSPs) face numerous challenges related to evolving customer expectations. Driven by a digitalization wave and a surge of app-based services and platforms, customers now expect multiple channels to engage organizations, secure immediate answers to every inquiry, and receive solutions tailored to their specific needs. This dynamic has disrupted many industries. Failing to recognize these rapid paradigm changes poses the risk of cross-industry churn, where dissatisfied telecom consumers abandon the sector altogether by migrating to alternative service providers, lowering overall sector profitability, and benefiting other industries' growth. Therefore, urgent measures must be taken to delight and hyper-personalize experiences for telecom consumers. The digital divide, a consequence of the rapid transformation into a digital world, now comes as a second threat to customer experience. As the majority of customers are bombarded with customer touching points, an increasing spectrum of users, aged over 65 years, still prefer conveying inquiries regarding their service or fault via old-fashioned channels. Service providers must invest heavily in predominantly economy-of-scale companies and must have annual releases in the billion euro range to keep their networks solid and reasonably modern. Households now have 1.51 fixed broadband subscriptions, 1.37 mobile broadband subscriptions, 1.43 VoIP subscriptions, 2.11 televisions, and 1.93 pay television subscriptions. Furthermore, the lion's share of service provider revenue is recurrent income through a subscription basis. A minor failure in any service or any faulty customer experience can lead to massive churn and revenue loss. Hence, holistic management of the customer experience is critical for every TSP.

Technologically, organizations have desired several initiatives to evolve customer experiences, many aiming to embrace or simply apply machine learning technologies to automate customer journeys, operations, or service quality. Nevertheless, customer experience in a hyper-connected broadband world goes over much more than merely automating factors within a journey. Interactions beyond the technical description of journey steps have increased complexity and linked phenomena that also impact the customer experience. Accordingly, it sounds unreasonable to plan CX initiatives stacked on top of existing engagements as successful efforts to understand customer experience need a strategic and enterprise-level adjustment comprising people, companies, interfaces, backends, procedures, and management practices.

## 3. Overview of BSS Solutions

With the rapidly growing volume of customer data and diverse service channels, telecom service providers face new challenges in delivering proactive customer engagement and improving retention. Most existing telecommunications customer management solutions are implemented on the operational level, responding to customer requests through inefficient reactive approaches such as manual insights generation and agent-initiated offer calls. Approached on the companies' strategic level, a recent multi-year survey to global telecommunications firms revealed the need for agentic AI-driven Business Support System (BSS) solutions that recognize customer needs through the measurement of emotional sentiments via diverse service interactions and the generation of contextual service offers. The proposals are presented in two forms: a high-level technical architecture and an investment road map based on a return-on-investment ratio analysis. Such advanced AI-driven BSS solutions will help telecommunications customers gain hyper-personalized service delivery and connect with the firms beyond traditional relationships.

In recent years, telecom service providers have faced an increasingly volatile, uncertain, complex, and ambiguous business ecosystem characterized by a rapid increase in the volume and velocity of customer behavior data collected through diverse service channels. Meanwhile, the telecom customer base is shown to be highly segmented with a small proportion that generates the majority of service revenue. Sustaining stable service revenue amidst the resulting challenges requires the proactive engagement of customers and the ongoing improvement of retention. State-of-the-art customer management techniques, such as deep learning and agentic AI, were applied in the financial service industry and have been found to be highly effective in generating timely and customized service solutions that will accommodate changing customer needs.

MSW MANAGEMENT -Multidisciplinary, Scientific Work and Management Journal
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However, most existing telecom customer management solutions are implemented on the operational level inside service centers, addressing customers' needs after requests are raised through inefficient reactive approaches. In early 2023, a longitudinal multi-year survey was conducted to global telecommunications firms via a co-designing approach, which revealed the need for agentic AI-driven Business Support System (BSS) solutions. Such transformative solutions could proactively recognize customer needs through the measurement of emotional sentiments based on diverse service interactions. The identified gaps are presented in two forms: a high-level technical architecture consisting of a Customer and Behavior Data Pool, an Emotional Sentiment Measurement Engine, and an Automated Transformation Engine, and an investment road map based on return-on-investment ratio analysis aggregating recent case studies of agentic AI applications in the software industry.

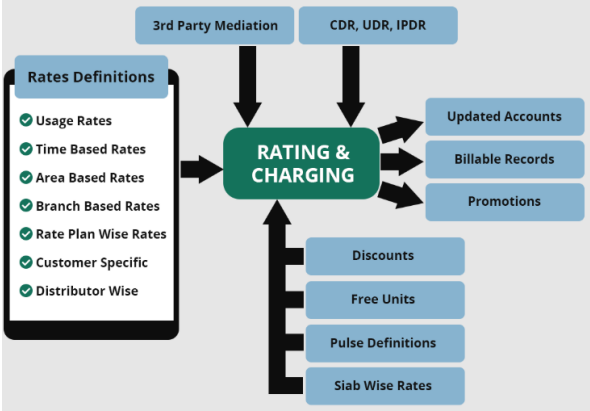


**Fig 3: OSS BSS Solutions**

**3.1. What are BSS Solutions?** The world has never been more connected. Telecom companies provide crucial infrastructure that keeps children in touch with their grandparents, enables colleagues to get work done from more than 10,000 miles away, and allows large enterprises to have a presence in multiple continents. Despite this, telecoms are seen as old-school "smoke-and-mirrors" firms – complicated by legacy technologies and labyrinthine processes. Detracting from their otherwise core competence; the utter boredom of consumer-facing mobile products: a screen, a keyboard, billing flexibility. Nevertheless, trying to stem subscriber churn is like polishing the brass on the Titanic, while the telecoms race to fend off disruptive moves from OTT players and tech giants, which have embarked on the journey of fusion, interpenetration, and convergence.

Betting on the future through partnerships with IR 4.0 technology companies may relieve telecoms from legacy infrastructure and business processes, but it'll still give CSOs sleepless nights. How do telecoms simultaneously improve operational efficiency, decrease the sensitivity of the subscriber base to product ranges and pricing strategy, and more? The answer is transformational business support systems (BSS) that leverage agentic AI to imbue communications products with hyper-personalization, selection-based autonomy, and give end-users control over the customization and management of telecoms services. The result is a radical departure from the current static telephony/browser based self-service menus, and an effective shield against the coming storm of generative AI (the next hyper-competitive battleground).

BSS (business support system) solutions enable telecom service providers to manage all external-facing (front office) systems and business processes to increase customer acquisition, retention, and overall profitability. Reducing churn and improving revenues is paramount to telcos, beyond the need to improve operational efficiency and reduce costs. BSS remains paramount with the advent of an increasing array of digital OTT services such as social networking, video and music streaming services, etc. acquired from non-telco providers, as these have resulted in lowering or even stunting revenue growth opportunities for telcos. Telecom service providers have a plethora of BSS solutions to choose from. All of them would be capable of delivering similar outcomes, i.e. managing billing and customer care processes of the service provider effectively. However, an increasing scope of technology-enabled capabilities and a flat competitive landscape have led to commoditization of all BSS solutions.

**Equ 2: Hyper-Personalized Service Delivery (HPSD)**

$$HPSD = f(PS, RTD, DA, NR)$$

Where:

- `RTD` = Real-Time Decisioning
- `DA` = Dynamic Adjustments to plans, pricing, content
- `NR` = Next-Best Recommendations

**3.2. The Role of BSS in Telecom** As generating and consuming data has become the core activity for telecom companies, many of them have repositioned their business strategy from asset-driven or capacity-driven to data-driven in the face of the dynamic competition resulting from the Internet of Things (IoT) and other disruptive technologies. To comprehensively exploit the internal and external data/information owned by telecom companies, the luz of Big Data, the possibility of Effective Artificial Intelligence (AI) and trust technologies are embraced into their business transformation with immediate and long-term effects.

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The business model evolution schemes of data-driven business models (DDbMs) in telecom with three generations and proactive and reactive adjustments (themes and methods) after the business transformation strategy formation stage are proposed. The application of DDbMs in telecom, especially customer experience (CX) management-related use cases, is performed in the descriptive way due to the limited internal information disclosure and the fierce competition. This paper ends with the prospect of the future research directions and implementation horizons of DDbMs in the telecom industry. Being asset-intensive industries with huge infrastructures, telecom operators have made substantial contributions to the rapid growth of the digital economy and have access to immense data that could be turned into new valuable assets.

Nevertheless, declining revenues and increasing capex have greatly challenged telecom operators' competitive advantages in the data-driven economy. By adopting online chatbots for process automation, such as answering inquiries regarding account or bill payments, telecom operators aim to increase customer satisfaction, improve agents' performance, and lessen customer service and marketing costs. Finally, a survey of subjective assessments regarding the identified efficient and effective attributes pertaining to the service quality from the perspective of telecom operators in relation to the human-like interaction manner, comprehensive domain knowledge, and polite communication style is performed in the context of the intelligent chatbots.

## 4. The Rise of AI in Telecom

In recent years, AI has seen astonishing advancements in dealing with vast amounts of data and generating actionable insights. The impact on various industries has been visible and remarkable. The growing capabilities of AI systems have raised concerns about the impact of automation on the nature of work and how jobs are created or destroyed. AI presents a rich opportunity for all industries in raising productivity and innovation. Still, there are difficult challenges to overcome, including building a workforce that has the right mix of skills for a future of work with AI. Researchers suggest that by thinking through what capabilities are needed for the future of work and driving concerted action to secure it, nations can avoid risking a lost decade. AI is the most significant factor shaping jobs over the next five years. Telecom is not an exception to this rule. The internet and mobile revolution was consumer-driven but the next revolution is expected to be predominantly enterprise-led. While all the digital nano and micro businesses will adopt all manners of AI and a plethora of AI-based solutions, telecom needs to rethink its AI strategy in large. AI must be at the very core of telecom's strategy, its products and services because most products and services delivered by telecom will be commoditized. Generative AI is a new problem space for telecom and necessitates generative AI native systems in the OSS-BSS milieu. Telecom has been grappling for a long time with huge amounts of structured and unstructured data. These existing AI systems that have been put in place have been limited to mainly narrow econometric type deep learning systems that have been focusing on providing AI-driven products and services in the narrow window of estimation and prediction. The generative AI emergence into the scene necessitates the rethinking of an operator's AI systems in both the bread-and-butter 'narrow' AI native systems, and in the new paradigms that new service delivery architectures introduce into the service context. While generative text-to-text AI systems have been widely deployed across various industries, telecoms have been lagging for more than a decade in unraveling how analytics can be embedded into text-to-text type products. The text-to-text engineering chapter of telecoms will need the emergence of ideal generative AI native OSS-BSS in reacting to enterprise generative text AI type systems.

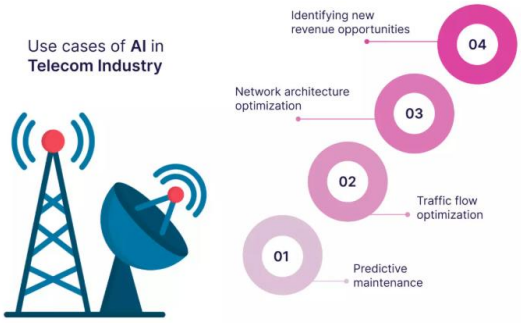


**Fig 4: AI in Telecom**

### 4.1. AI Technologies Transforming Telecom

Emerging Artificial Intelligence (AI) has already produced a resounding impact on multiple sectors. With a focus on the telecom industry, AI-powered solutions that analyze datasets using proprietary algorithms and sophisticated learning methods to recognize various patterns, make recommendations, and automate actions feature prominently. The transformational benefit of Advanced AI technologies is broadly covered, while providing a detailed examination of applications of AI Technologies on several domains that are significant for the telecommunications industry. Telecom AI native system and wider service cloud models have crucially evolved and transformed a plethora of classic OSS and BSS solutions to web-oriented solutions robustly processing any amount of event and data flows in a highly distributed architecture.

MLOps' emergence and importance are emphasized during the ML lifecycle processes as an integral part of the

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transformation. The broader benefits and potential impacts of emerging LLM or Generative AI solutions on both telecom products and administration are elaborated. Cloud-native Open-RAN development as an opportunity and a challenge is outlined. To enrich the above aspects, a few insights into the European extreme Big Data market and the National Data Wells As A Service concept are also included. Accordingly, telecom-native applications are created to deliver business-critical real-time information to keep networks self-aware, self-adaptive, and self-optimizing.

Based on previous experiences and astonishing performance improvements on a plethora of classical AI applications, particularly Classic Computer Vision, Speech Recognition, and NLP ones, the impact of LLMs and other new AI technologies on telecom networks is broadly speculated, although they are still more in a theoretical stage than industry-grade applications. Most recent massive-multimodal AI models are selected and described in more detail with an engineering perspective on their telecom-native applications or a broader view where relevant. The effects of telco-specific training datasets on capability improvements are elaborated, and it is explained how proactively building a significantly large and multi-dimensional dataset can make a broader sense and enlarge the outcome. It is advised to remain open-minded and actively explore all possibilities to start the revolution from the foundation.

**4.2. Benefits of AI in Customer Service** The potential of Artificial Intelligence (AI) to significantly alter human life is projected in aspects of experience and day-to-day businesses. In particular, the consultancy is expected to undergo drastic structural changes; hence how companies engage prospective consumers will change dramatically. This is linked to the increasing role of machines in knowledge work. Indeed, for transforming the customer experience, aspects of agenda setting and information processing will change fundamentally.

Ten years ago, customer experience was largely absent from the organizational agenda of most industries on a strategic level. Today, it occupies a prime spot on many senior management's organizational wish-lists. In this history, with the recent advent of artificial intelligence (AI) in customer service, an outburst in the entrepreneurial interest in the pragmatic and creative application of AI has occurred. The use of Artificial Intelligence in services has increased dramatically in recent years. AI-based service management is part of this affluent time in history. AI uses huge amounts of data on selected regularities or trends in past behavior during the lifetime of the software, issues increasingly precise predictions on the development of future behavior, and generates necessary suggestions.

Today, automated service engagements are expected to provide progressively individualised service while lowering both unpredictability and mistakes. The automated service engagements generate a wealth of presumably irrelevant knowledge which can lower both prediction robustness and trustworthiness. There are currently many interesting cases. Some well-known examples are KLM's Spencer chatbot, which supports customer relations; McDonald's terminals, which automate and streamline the delivery of services; and Royal Caribbean's Quantum of the Seas, which has 'trained' and automated waiters. Also, interest in information-automating services surged significantly after the outbreak of COVID-19 after which strengthened hygiene claims, reduced gauge, fallout time, and critical mass development all caused vivid interest in driverless food delivery robots.

## 5. Agentic AI: A New Paradigm

Telecom network infrastructure has gone through an impressive evolution over the last four decades. The last transformation towards open clouds and openRAN has led to the rise of multi-tenant and cloud-native disaggregated networks. In this context, Telecom IT has had to transform as well. Traditional on-premises Enterprise/OSS/BSS/Supply Chain solutions have to evolve to make room for cloud-native, open and real-time applications, bringing new business models for the telecom industry. On one hand, telecom engineers and managers are looking at modern forklifts for legacy monolithic applications, migrating to public or private clouds. On the other hand, Telecom has an enormous opportunity to leap-frog into the future with the right planning of technical architecture.

Traditional Telecom OSS/BSS solutions are not feasible for this open and real-time vision. The traditional big boxes/enterprise software suppliers are actively working on the cloud rehabbing of their boxes. Telecom is looking for new agile players that will work towards open/cloud-native and real-time solutions. In either case, it is necessary to highlight and review a more architectural approach to BSS/BG that will work for Telecoms in an open, real-time, crowded, and competitive environment. The idea is to define the needs and characteristics of the new BSS/BG approach, as well as some examples of passive and active architectures that fit. Consideration is given to why Telecom should think not only about software solutions but also about systems architectures, bringing in several examples of BSS systems architectures that fit the open/cloud-native and real-time market context.

Business Process Management and real-time decisioning/activation engines are complementary but

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different classes of components for any BSS implementation. BPM can plan, execute, monitor and optimize business processes, whether automating or semi-automating human work. Real-time engines can create new Events of Interest based on analyzed data, creating Remediations through Event Action Plans which can invoke actions on network elements or trigger workflows on BPM. For BSS to evolve towards open, cloud-native and real-time systems, BPM Solutions that can embed Active Intelligent Solutions are needed. There are several Open Source BPM solutions that can be deployed as cloud-native for process orchestration, as well as Free and Open Source real-time engines, but there is little integration between them.

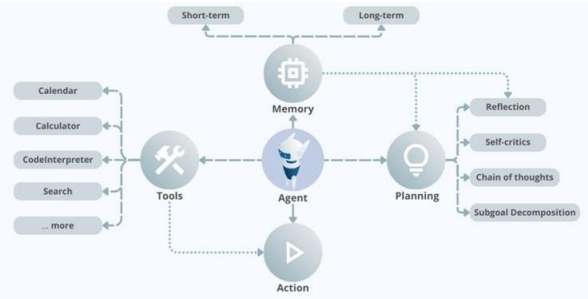


**Fig 5: Agentic AI The New Trend**

**5.1. Definition and Characteristics of Agentic AI**
The terms Agentic AI (AgAI) or Agentic Intelligence (AgI) arise from the concept of agency in AIs, which is often misinterpreted as behavioral intelligence, autonomy, or intelligence designed to carry out tasks. In contrast, AI system agency suggests a deeper potential of AI systems even before being explicitly implemented into a software solution. Understanding this premise can help AI engineers discover new business applications of generative and autonomous AI. AgAI systems can suggest actions, modify existing software, and generate RAG applications or other intelligent agents. Nevertheless, almost all current digital industries, including Telecom/BSS solutions, haven't yet realized their potential and have remained data states rather than intelligence states. The agents of these systems are humans having the ultimate agency over the data, identifier, and parameters. Thus, AgI systems, from both data and aspect perspectives, are absent .

The digitization of customer operations has led Telecom operators to invest heavily in data lakes and BSS digitization projects. In contrast, Indirect Intelligence (IndI)-driven Telecom BSS systems expose opportunities to develop or acquire new platforms with AgI capabilities to become more intelligent than human understanding or effort. In this premise, the primary research question is: What are Agentic AI-driven telecom BSS solutions for hyper-personalized service delivery? The most interesting SaaS product idea that uses an AgI-powered data modeling engine is elaborated for LPW zákazník a a. BSS refers to software solutions that help Telcos operate by planning, selling, delivering, billing, and analyzing network services to diverse channels, whether fixed or mobile. Data and decision-driven process automation in business solutions assists employees across various domains.

**5.2. Case Studies of Agentic AI Implementation** In the Agentic AI design space, telecom providers can implement a data-driven smart assistant (SA) to provide customers with multi-modal service delivery that integrates voice and text chats. A data-driven SA can employ telecommunication client data with agentic AI technologies and natural language processing capabilities to provide hyper-personalized service delivery. Furthermore, a data-driven SA can understand customer concerns and intents, generate a natural language response in text or voice, and perform an action based on customer needs. For instance, a customer can request a SIM card delivery in Spanish; the virtual agent can deliver the service by initiating coordinates with delivery personnel. In a different use case, a customer can ask follow-up questions like "Is there any cheaper plan?" or "Change my plan from 10GB to 50GB." Agentic AI can analyze the data-driven conditions to continuously engage with the EVA. By transforming raw data from telecom OSS and BSS applications and employing intelligence-enhancing, it is possible to boost customer retention through voice and chat interactions, real-time health monitoring, intelligent event detection, and process adjustments.

The implementation of Agentic AI-enabled smart agents will enhance the end-user experience for telecom customers by improving the self-service option for routine inquiries and increasing NPS and CSAT scores for product quality. For telecom providers, the implementation of Agentic AI chatbots and voice bots will increase worker productivity, reduce routine queries for contact centers, and improve network performance by detecting faults in the telecom network. Furthermore, pre-built templates and low-code deployment pipelines simplify and accelerate the onboarding process for telecom clients, thereby speeding up innovation cycles and time to market.

**Equ 3: AI-Driven BSS Agility (BSS_{AI})**

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$$BSS_{AI} = \frac{DPI + MCM + OR}{LTS}$$

Where:

- `DPI` = Data Pipeline Integration (across OSS/BSS/CRM)
- `MCM` = Modular Configuration & Monetization capabilities
- `OR` = Orchestration Responsiveness
- `LTS` = Legacy Technical Stack (inertia factor)

## 6. Hyper-Personalization in Service Delivery

A comprehensive understanding of each customer's needs, motivations, and preferences is critical for service providers to offer better and hyper-personalized customer experiences. As a rationale, a wider audience gets converted from a prospective customer to an existing customer and consequently a valued customer. Hyper-personalization becomes even more critical in today's competitive telecom landscape where the existing subscribers exhibit either low loyalty or high churn. As a result, telecom service providers seek ways to keep current customers loyal including reducing the faux pas and service disruption and formulating cross-sell and up-sell offers in line with a valued customer profile.

Automated systems are widely being used to eliminate interpretable attributes of raw data of the aforementioned intent. Moreover, the CEX metrics or key performance indicators are a set of attributes which need to form the boundaries of the agents or systems. Hence, the telecom business support system platforms require heterogeneous systems to easily cater to the demand level of hyper-personalization tradeoff, which is qualitative, flexible, and explainable in nature. Therefore, the move towards AI-driven systems concerns both agents and ML-based systems, several consequences of AI systems, which include interpretability and explainability. Unexplainable AI is termed "secret" and is detrimental/inappropriate when augmented agents are to directly interact with the customers to serve the queries/requirements.

Telecom-centric implementation helps buyers visualize the aesthetic view and BI dashboards of agentic AI-driven telecom BSS and conceptual model works at the telecom BSS level. To summarize, on one hand, telecom-centered technical concerns and evaluating the corporates or buyers, it serves two purposes. On the other hand, to start up and generalize the issues in the telecom service industry, up to the best of knowledge, there is no similar work or system. Specifically, owing to high automation tendency utilizing agentic AI, hyper-personalization demand is losing the trade-off merit which is fragile and inaccurate perceptions on the demand of manual adjustment on the parameters and low-width clients or customers become excluded.

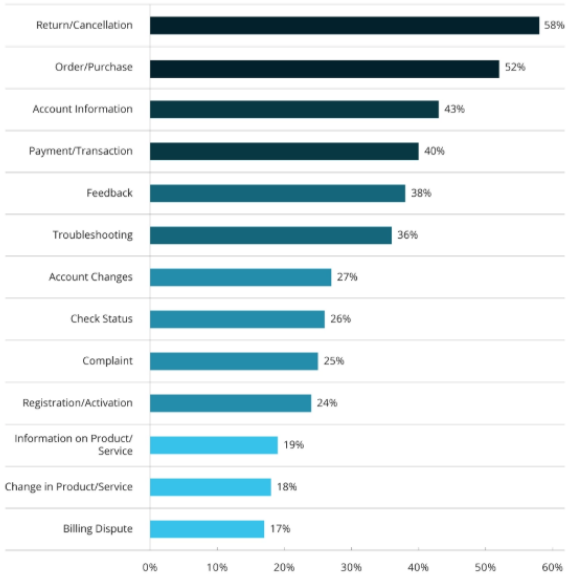


**Fig : AI Assistants Help Telcos Improve CX**

**6.1. Understanding Hyper-Personalization** Hyper-personalization has become a need of the hour for telecom operators to initiate their digital transformation. This transformation entails a relaxed, transparent, user-driven, and more worry-free engagement that may take a little time yet can provide rewards as long as the relationship remains on the "good side" of the digital ecosystem. Such a transformation leads to the creation of a very new data environment in which the deployment of an Agentic AI-based system raises questions about how to do the "right things" for each customer in each situation. Currently, telecom providers face demand unpredictability, outrageous competition, and innovation-thirsty customers who desire a faithful digital partner. Fresh revenues from advanced service areas such as "futuristic connectivity" or "super-digitalization" require comprehensive asset reorganization, regeneration from an asset-centric view to a service-centric one (a multi-player approach in which the customer co-creates the service with and beyond the telecom operator) through flexibility that enables research and replication of numerous service delivery designs (for a very customized user experience). The telecommunication cost per unit for end users has considerably decreased during the last three decades in almost all parts of the world, primarily as a result of the disaggregation of telecommunication operations and deregulation of telecom markets. To ensure the long-term

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viability of telecommunications enterprises, capital-intensive infrastructure investments are still required. Efforts are still being made to raise the quality of services. However, as a result of intense competition in urbanized areas, the telecom industry is turning into a commodity-like market, with basic network services extensively offered by several operators. Conversely, there are still customers who cannot use any services. Their populations include financially excluded individuals, rural under-coverage areas, and customers with high illiteracy rates.

### 6.2. Strategies for Hyper-Personalized Services

The telecom landscape has experienced rapid changes in the past decade. With Wi-Fi, 4G, and fiber internet readily accessible and affordable, telecom consumers are more likely to switch providers for a better offer. Despite its position as a crucial player in the digital era, telecommunications is relegated to fast-moving consumer goods (FMCG) brands. Telecom usage patterns change and are increasingly subject to price sensitivity, comfort, experience, and anticipation. Telecom customers want their service satellite and the software they run, brands be highly responsive, mobile apps to be adapted to their preferred channels of communication, and packages to be flexible. Unlike more conventional services, telecom services are invisible, intangible, inaccessible, and consistently variable. They are often the subject of hedonic expectations towards the consumption experience .

Numerous research works have been published on harnessing AI to improve the customer experience in telecom, ranging from repackaging customer-generated data into call centers to management solutions predicting customer churn. AGENTIC focuses on developing AI agents able to conduct the required transformations in infrastructure and operations to deliver highly personalized customer experience management solutions from the analysis of customer data and the auto-generation of intuitive interactions with them. Imagine a coping, human-like conversation where the agent manages the entire customer lifecycle, including interaction, experience, acquisition of new clients, upselling, and down-selling, churn prevention, and event-resolution.

AGENTIC BSS solutions would augment call center agents' jobs by attending to routine problems, queries, and dispositions, thoroughly analyzing recorded conversations to derive insights on customer needs, and allowing customer data navigation and explanation through voice-controlled AI agents. Hence, the company would improve retention by anticipating mismatches between quality and expectation. These highly personalized and efficient service deliveries would be increasingly complex yet ubiquitous, possibly requiring consumers to build impersonation agents. Such agents would gather data concerning every aspect of service usage and develop a model of the ideal service partner, resulting in a complete reversal of power where telecom firms would be forced not only to comply with regulatory initiatives to keep the data shared to a minimum but also to compensate consumers for the data employed.

## 7. Conclusion

The Telecom industry came under unprecedented pressure when a pandemic locked down billions. To meet this sudden spike in mobile data and voice call traffic, operators hurriedly invested in capacity growth and macro site automation. As the dust settled, the attention turned to softer aspects of the business and underlying systems. A key component of the addressable market was the headroom for minute-by-minute response to volatile traffic, prefab rollout planning and execution through managed site acquisition and utility, autonomous gender agnostic capacity growth across small cells, disruptive capacity transformation through AI-powered mega designs to isolate traffic in aerial towers, and real-time spectrum sharing through coordinated multicolor mass action across cells.

This agenda on its own was deemed exponential, but the possible disruption from digital upstarts loomed larger. The Trojan horse was the app stores; a creed of digital experience narratives. Regional operators rolled out their own branded stores replete with billing integration. However, many had invested prematurely in conventional app catalog storage systems. The fundamental difference of making apps sound and feel native was missed. The additional detail in using voice and touch, spotting favorite recommendations, auto-finding bundled hidden delights, omni-channel narrator agent and ceaselessly self-evolving intelligence was non-existent. There was a great loss of ownership in the audience. Direct agentic AI integration into self-evolving building blocks was seen to be the possible lifeline.

Traditional BSS was built on dated paradigms of hooded expert systems and equity forgate penalties; tedious uploads and precision static spreadsheets. A hotbed for third-party implementations and bolt-on subsystems; an audacious accumulation of technologies and spaghetti business processes. The challenging agentic AI architecture and data fabric was envisaged as 'software powers' revolutionizing customer experience through hyper-personalized delivery at an order of magnitude unseen before. An integrated design emerged from years of inner product research. Domain controllers unrivaled in the ability of self-exploration and self-evolution in code through five levels of abstraction and an array of neural techniques against a merklized spin lock safe

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data fabric unprecedentedly engineered for performance and security were developed.

Continuous and parallel over-the-air software updates on the building blocks and rapidly self-reengineered data ingestion pipelines supposedly returned radically advanced customer experience with zero time to market and top maintenance of benignness. The design was started on generative and reinforcement learning paradigms from scratch and only needed a gold mine of customer interactions and latent networks while being orders of magnitude more wasteful than collaborative tools.

**7.1. Future Trends** When analyzing the deep business process at a telecom operator or service provider, stand-alone BSS systems, such as CRM, Ordering and Billing Systems, are often being considered. From a Business Solution architecture perspective, relevant processes are made readable for the BSS systems. As telecom service providers advance with the deployment of cloud computing techniques and platforms, they are seeking cloud-based BSS- as-a-service propositions]. Given the scope of the processes, a dedicated BSS solution cannot only be a big monolith. Telecom service providers are looking more towards microservice and platform-based architectures. Several topics are relevant for the future research agenda of telecom service providers. The services and implementation of agentic-service BSSs have to be investigated more thoroughly. Ambiguity and complexity should be resolved for specific services because there are various interpretations of agentic services. The telecom industry is moving towards edge cloud computing, in which part of the computing and storing tasks are shifted from the data center of large service providers towards the edge of the telecom network. This raises questions of how locally operated BSS microservices can find the right data models and access data while preserving what has remained behind in the central definition. Transforming in-house standalone legacy systems towards integrated microservice platforms exposes numerous integration problems, especially with regard to the transformation of the BO-model. These questions remain open for future research. Once fully deployed, questions are raised about the performance of agentic AI in BSSs. BSSs contain many agents interacting with other agents. Applied games theory research on these interactions is relevant, particularly for designing agentic agents with complex and rational behavior.

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