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# Chapter 9: Utilizing artificial intelligence to ensure service quality, user satisfaction, and dynamic performance management

## 9.1. Introduction

The development of artificial intelligence (AI) techniques and associated technologies has generated a lot of interest in the press and has stimulated considerable discussion in terms of the potential impact on existing service provision and contemporary work practices (Cheng et al., 2020; Foukas et al., 2017; Kim et al., 2018). This discussion highlights the transformative capacity and application of AI in several different business sectors. In particular, the hypothesis is that by making use of AI, it is possible to deliver improved quality alongside enhanced cost efficiencies. This represents a balanced pursuit of both effectiveness and efficiency, something that is rarely possible in human settings. Given that AI is yet to become mainstream, there is a requirement for additional empirical work that explores and demonstrates specific areas in which it has the potential to transform modern-day activities. This paper aims to offer some initial empirical work about the use and impact of AI within the services context, where AI can act as a service mediator.

Artificial intelligence (AI) and its primary constituent elements of machine learning and data mining have been central to the theory and practice of computer science for many years. Indeed, the principle of AI as a means of programming computer systems to learn, reason, and generate human-level responses was first noted in the 1950s. Since the 1980s, there has been a noted shift from building AI engines that generate results to those that can generate relatively modest performance in an adequate, satisfactory, and workmanlike manner. This shift in strategy has been a driver for AI applications,

including the use of AI within integrated service provision. Using current definitions, AI generally refers to the capability of a machine to imitate intelligent human behavior. In itself, AI encapsulates many different services, including machine learning, whereby AI uses data and algorithms to enable a computer system to learn from experience, meaning that predictions and decision-making can be updated automatically.

### 9.1.1. Introduction to the Impact of AI on Service Delivery

Artificial intelligence can revolutionize service delivery across all sectors. Personalization of interactions with customers is at the center of many digital transformations (Sun et al., 2019; Taleb et al., 2017). Often, waiting time is a substantial factor within the offering **service**, and AI could use real-time data input to alert customers of an expected waiting time. AI could provide the customer with regular updates on the time and date of delivery. Quality in response time can also be improved, such as AI incorporated into customer service chat functions on websites made to answer frequently asked questions. Personalization is related to the understanding and prediction abilities of a given platform. Utilization of big data and AI technologies can yield improved insights and better predictions of behavior.


**Fig 9 . 1 : AI Impact on Service Delivery**

In addition to personalized service, the benefits of incorporating AI into service delivery can increase accuracy and efficiency, and subsequently reduce costs. The shift of technologies can also serve as a new value-adding strategic framework. Implementing AI within a firm can allow for strategic shifts. It can position a firm as an innovative business, driving market leader positions. The strategic value can often be attributed to the brand equity of the AI tool, or conversely, using AI for cost-efficiency strategies. However, if the AI tool fails to develop a fully automatic response, there are potentially negative effects on the brand. Considerations for ethical and policy issues, as well as potential downside strategies and scenarios, structurally impact and develop this concept further. Thus, a deeper discussion is developed further within the emerging issues of this text.

## 9.2. The Role of Artificial Intelligence in Service Delivery

Artificial intelligence (AI) has become an increasingly significant enabler for services, primarily providing tools for back-end service operations but increasingly taking on customer-facing tasks. AI can automate routine and repetitive work, recognize complex patterns in data, and support better decision-making through predictive analytics. In customer interactions, AI is not only an alternative to human service providers; it also enhances the service experience. It can enable faster service, provide around-the-clock availability of services and products, resolve customer inquiries more efficiently, and enhance customer engagement. AI is already widely in use in a range of sectors, e.g., retail, where intelligent sales support systems interact with customers to provide product information, give quotes, and proactively propose special offers. In banking, robo-advisors provide AI-driven investment advice and manage clients' stock portfolios, while in healthcare, chatbots offer mental health therapy.

Current applications of AI in service are often based on the idea that it plays a complementary role to humans: humans do tasks that AI is currently incapable of, or that are not economical to automate, while they 'outsource' other tasks to AI. Although some see the advent of AI as a trend toward full automation, much practical relevant service work is not fully automated, and there is an increasing need for human-in-the-loop AI systems where human experts with deep domain expertise collaborate with AI. This raises challenges in redefining how work is shared between AI and human experts, what level of uncertainty and diversity of solutions are accepted and appreciated by customers, and how AI specialists and domain experts interact and communicate, among other issues. Yet the prospect of merging AI with human assistance makes conformance to ethical principles even more urgent.

### 9.2.1. Overview of AI Technologies

AI is an umbrella term for fields of research, techniques, and technologies to develop computational algorithms and systems to perform tasks that typically require human intelligence. A wide range of technologies fall under the AI subsystem, but three basic technologies have attracted much attention and fundamentally changed the nature of computational system development in the last two decades: machine learning (ML), natural language processing (NLP), and neural networks.

Machine learning algorithms, such as decision trees, provide tools for the classification or clustering of logical keystones of several databases that are well-structured. Supervised algorithms require training examples from which to draw patterns or characteristics for decision-making processes. Implementations of machine learning algorithms, such as neural networks, have progressed dramatically since the early days of artificial intelligence and are helping to solve complex decision-making processes by approximating functions of any complexity. The available computing power now has triggered the possibility of developing very large complex neural network models leading to an unprecedented improvement of performance across applications and theoretical research. Either in supervised or unsupervised contexts, ML can be used to clean and harmonize multi-stranded data for different operational intelligence needs. Yet, to this aim, ML requires models to be effectively embedded within the system, and they can be counterintuitive when corrupted by noisy sampling, non-representative data, or tiny variance. Although demonstrating great developmental promise, these technologies cannot yet instantaneously take over service activities involving complex stakeholders without a robust data infrastructure. Given the numerous AI tools and algorithms that exist across different disciplines, relating to managing the full scope of service practices from this broad AI reference model is plausible.

### 9.2.2. AI in Customer Service

Artificial Intelligence (AI) has become more and more a part of daily communication, significantly shaping every aspect of customer service. The most common and visible applications of AI in customer service are chatbots and virtual assistants that are driven by AI. These AI-driven interfaces can deliver a far more satisfying and effective experience for users than the classic system, making the firm’s assistance more accessible to the consumer. First, employing an inviting interface can break with the status quo of the call center and enhance an individual’s view of a company; consumers do not like automated teller systems because humans do not. Chatbots give companies another digital context to get in touch with users on a completely scalable and relatively

affordable basis. Consequently, corporate service alerts and messaging are forecasted to expand significantly. Additionally, to the improved service capabilities, chatbots allow for enhanced performance through their ability to concurrently manage and react to millions of requests in mere milliseconds.

The time-to-response for questions decreased significantly in operational parameters, and when it comes to consumer service metrics, not only did initial resolution times increase, but consumer satisfaction increased in the same month; in those two counties combined, more than 3,000 consumers' queries were instantly dealt with, yielding an extra income in the peak season. The chatbots deployed by a major airline reached a success rate after only a short period, decreasing passenger inquiries significantly during this period. In a capitalist society, consumer responsiveness to advertising isn't guaranteed, but in AI and statistics, a contextual prophecy is marginally greater than it would be if consumers weren't provided with this kind of information. With the most predictive customer-based AI technique, a multinational wine company extensively implemented digital support, driving an impressive increase in first-time purchase rates from customers looking to be informed of the product's story.

### 9.3. Ensuring Service Quality through AI

In today's competitive market and complex landscape, companies focus on increasing their competitiveness. Organizations pay attention to ensuring service quality at a high level, a task that is difficult to realize with traditional quality management mechanisms and methods. Utilizing human intelligence in understanding data works in new complex environments differently than typical structured systems. Human intelligence does not work effectively in large, complex systems. Monitoring service quality is not enough. Continuous monitoring of quality, predictive modeling based on data, and proactive management processes are becoming more prevalent as required. For the analysis of service quality and performance data, we hope that utilizing artificial intelligence technologies provides valuable results, as in many areas, we can improve the quality of service delivery and performance enhancement processes for organizations.

Artificial intelligence can help companies meet customer expectations more quickly by predicting disruptions in process performance and helping to optimize processes in general. These AI-based quality assurance mechanisms help to reduce process errors and increase manufacturing process efficiency. The same mechanisms can be utilized for service quality management and help to reduce service quality problems. Service quality is difficult to measure or directly monitor, which is one of the major problems in managing service quality. Utilizing artificial intelligence and predictive monitoring

tools, most patterns in service delivery processes can be observed and proactive measures taken against service delivery problems. However, setting up AI-based service quality management tools is still complex. The important part is setting it up. Buffer time will always be required for unexpected analysis results. There are a few case studies of organizations using AI tools to maintain service and manage service quality. In most cases, modeling for setting up AI tools is complex, but these organizations aim for continuous improvement in service delivery and excellence. A significant gap exists in understanding deep learning and other similar technologies that need to be comprehended by service quality researchers and practitioners.

### 9.3.1. Quality Assurance Mechanisms

The accuracy of any AI model is largely predicated on its training data, necessitating a high degree of monitoring and ongoing learning. AI technologies can greatly assist in service quality assurance mechanisms by emphasizing this monitoring and the continuous anomaly detection learning of models from new data. AI can identify relevant and efficient quality checks to satisfy user needs and service-level policies, ensuring timely and effective service provision. Automated quality checks can also reduce human error. This, when powered by AI, can fit changes in service requirements, including the determination of effective remediation measures, real-time service assessment, and the prediction of continuous performance degradation. With AI's sensitivity to sudden changes in data flows, new and unusual patterns can be recognized and acted on in advance to prevent excessive service degradation or complete cessation. This high level of automation under an AI system enables proactive risk mitigation.

AI's sensitivity to large datasets allows powerful predictive quality to be rendered significantly greater and more sophisticated than in purely manual quality models. A high level of detail in the insight is made possible, including performance and efficiency measurements at the individual server or team level. Standardized, AI-based systematic service quality manuals improve resilience to avoid human variation and judgment errors. In addition, the roles of engineering team members can be revised, so that as service-level performance deteriorates, AI-based models on the server can take on many of the main important roles in the entire service delivery application, reallocating engineering team members to non-AI-trainable business roles, depending on company requirements. AI-based predictive models also contribute directly to SLA service assurance by identifying, predicting, and resolving the impact of any degradation in service performance. Carry out a large number of case studies to illustrate and demonstrate the AI-based performance quality assurance method and its business benefits in more detail.

### 9.3.2. Predictive Analytics for Service Improvement

Customers are the source of revenues, and by collecting data about their behavior and needs, organizations can improve their offerings, marketing, and customer service. In AI-based service scenarios, data about customer interactions is collected, answered, and then used to predict future demands on the service. Demand predictions link to predictive analytics, which generates customer data to describe the expected number of calls in detail, i.e., 1,000 calls. Managers are then able to drill into this data and view their possible calls in the next week, perhaps 1,000 in total, with 500 during the morning rush. Service managers can then compare their expected performance with the customer demand forecast. For those experiencing time-off-office attendance parameters, the predictive analytics leveraging AI can forecast those likely to be absent through email data, for instance, and prompt these workers to divert their calls to voicemail or to update their time-out office.

The dynamic nature of these predictive insights and the use of historical data provide service organizations with the opportunity to adapt quickly to changing customer needs. Predictive analytics can provide an effective way to link operations back to strategy and to ensure that daily operational decisions are aligned with overall service and production strategies. However, the success of predictive analytics solutions is not simply a reflection of their technical capability, but also of the willingness and capacity of organizations to act upon the intelligence garnered from them; ultimately, it is the delivery of improvements that creates a competitive advantage. Predictive service quality systems are available in the industry, offering the capability to develop mathematical forecasts based on both historical and future inputs. These forecasts focus on the number of events – calls, emails, etc. – that customers can be expected to make. While successful in general terms, one of the practical challenges organizations face in implementing such technological applications is the process of accurately interpreting and implementing the findings within the context of the wider organization. This is a challenge linked to the enablers of service quality.

## 9.4. User Satisfaction and AI

Improved service experience has been shown to generate significantly higher end-user satisfaction scores. Targeting services based on individual instincts can enhance user experience. An estimated 41% of data and analytics leaders in Australasia expect to incorporate AI tools into their user satisfaction measurements. This represents a statistically significant proportion when compared to their global counterparts at 30%. Human intuition can be beneficial in utilizing user satisfaction scores to enhance service

encounters. Yet in today's world, data is collected far more rapidly and in significantly larger volumes than ever before. AI tools could be utilized to scan this wide range of information to collect comments in a structured and interpreted way, so that service delivery can be evaluated and, where appropriate, be changed.

Furthermore, service delivery can be enhanced when AI is employed to identify better ways to deliver information on the same service elements, such as how to use a system or how to log a support request. In addition, current AI-driven personalization tactics have paralleled findings that link enhanced personalized user experiences to increased loyalty. Real-time user data offered by universities has also been demonstrated to provide key insights on how events or approaches may generate user upset and how personalized programs can, as a result, be enhanced. The main challenge in using AI to behave in an omnipersonalized manner is navigating the fine boundary between being personalized and unknowingly biased. Another obstacle is how to use AI while remaining 'human'. AI-driven study approach to recruitment has proven to be powerful in developing a comprehensive understanding of the positive and negative experiences foreign students have when planning and arriving in Queensland for their studies.

### 9.4.1. Measuring User Satisfaction

User satisfaction can be measured using a combination of surveys, interviews, and direct feedback following customer service interactions. Recently, the use of AI-based techniques such as speech recognition and machine learning has permitted a greater understanding of the volume, sentiment, and main subjects of conversations about products, businesses, and entire industry sectors. This AI-based shortcut to measuring success has value, taking less time and eliciting information on a far greater scope than phone or physical contact with customers. Sentiment analysis refers to gauging the feelings of segments or individuals based on their behavior or spoken feedback. Results from this approach can help to predict trends. Considering the relatively low cost of sentiment analysis, this constitutes a relatively economical method by which to understand the needs and satisfaction of a great many people. Closer to our professions, understanding user sentiment can permit swifter alteration or withdrawal of an offer or strategy causing concern and downgrading the impact of negative sentiment upon unenthusiastic or indifferent people. Sentiment analysis has been employed very successfully in some applications, leading to an elevation in customer satisfaction and reputation of happiness.

A standard response to the question of how to know when a service is user-friendly seems to be the regular data analysis of proceedings such as sales, user interactions with

a website, device usage data, and availability. As well as the quality of machines, field services, and customer service personnel, User Satisfaction Index (USI) and Net Promoter Score (NPS) assessments are the outcome of user surveys and interviews conducted by subject matter experts. Data sets are accumulated at the site level, caterer, and national level in µ-SERV and annually by both Eurosfaire and in cooperation with the Human Resources Management Unit, from nearly all sites across Europe. These surveys then provide the first position on the user's impression of the utility. Through these surveys, the service suppliers record satisfaction, perceived importance, and if directly asked what they would enhance, and so on. The surveys also ask for user suggestions that they feel are important to enhance. In the evaluation of Very Large Research Infrastructure (VLRI), the National User Committees (NUCs) are supporting the EC in gathering these data. User satisfaction scores and user profile data are collected through interviews at the experiment for the same reason every year, and scores from 1 to 5 of overall satisfaction with the first trip or visit are recorded by this questionnaire. The questionnaire also requires an overall satisfaction rating for the decision, with a score of 0-10, and a 'why' question exploring the rationales for the score. Also important for the support service provider is if a training course or workshop for the researcher has been offered in the last twelve months, in examining the data for potential usage trends by the service, because any user, be it staff or researcher, can attend one of these workshops. For this instance, it covers better readings, speed access, remote access to the data, viewer speed and user interface, efficiency in paging, and improved layout. Their level of importance to the respondents in their association with satisfaction is also asked for those same services. These experiences also have a question on their satisfaction with the brand and a required enhancement to a comparable service for the panel. Depending on the service these have large significant differences. For a number of the leading services, until they need to take advantage of the upgrades before they are willing to completely change to this new service, our users have been trialing UMD for several years both in parallel and mostly migrating large usage. Consisting of over a hundred groups with a broad spectrometry background, the University of Edinburgh, School of Chemistry has been using mass spectrometry in several areas of food research. In this sense, develop a better and established system to normalize and make comparable GCMS data with the assay of urine samples.

### 9.4.2. AI-Driven Personalization

Today's digital world provides access to countless products and services. In such a competitive environment, the real challenge companies face is to provide customers with services tailored individually to their needs and preferences. Personalization is a customer-oriented approach to service provisioning, through which companies may

address the unique requirements and individual traits of each customer. AI techniques can be used to tailor individuals' experiences and support the delivery of personalized service packages by drawing on user-specific behavior as well as customer context. AI-driven personalization has become essential in industries such as financial services, education, human resources, e-commerce, and healthcare, as it can help firms achieve better customer retention and satisfaction by offering personalized services and keeping organizations notified about certain preferences or user peculiarities. The technologies that enable narrow AI personalization are divided into proximity models and collaborative and content-based filtering models.

Proximity models can be used to rank items based on user search words and to recommend items based on their attributes and user profiles, such as the title, length, language, and description. The primary goal of AI mechanisms and personalization methods is to offer solutions as unique and specific as individuals are, while always keeping in mind privacy when gathering and using personal data. AI-driven personalization depends on the exploitation of extensive user information to provide a better, more personalized service experience, rather than a standardized one. As such, the use of AI technologies for commercial or societal purposes raises important ethical and legal issues. Companies must respect their clients and ensure they maintain the proper level of trust to exist and evolve. In practice, this means mapping personalized use cases on the remaining human values, and data minimization and privacy are the most complex of these values. Balancing personalization with the right to privacy can be rather challenging. Providing unique and exclusive experiences for each customer is, of course, possible for AI systems, but transforms personal data into a must in a new fashion: the more data you obtain, the better the personalization you achieve. The requirement for personal data minimization is thus in complete collision with the AI personalization trend.

### 9.5. Dynamic Performance Management

Dynamic performance management can be made possible through applying artificial intelligence, such as machine learning, deep learning, and automated heuristics. By employing these AI facilities to underlying service components, dynamic performance management is feasible as many metrics can be monitored directly and in real-time. This feature allows for the identification of future performance problems when services might be affected and directs feedback not only to higher-level objectives but also to the improvement of day-to-day action levels. At a workplace level, immediate feedback directs staff in terms of the service behaviors required or how the system should be adapted to meet the changing performance prescription. Here, we can see the immediate

reinforcement that can motivate, make staff aware of day-to-day changing requirements, and enable them to know their required contribution toward a rapidly changing service model. Moreover, the information from the system is used to inform top management about the sorts of trends, system capabilities, and operational anomalies that contribute to internal and external system performance status. Having real-time operational data is an important competency as there is a move from reliance on traditional benchmarking approaches to the concept of competitive advantage through information. Yet, there is a warning that the benefits of this technology-driven learning are not guaranteed, and substantial discontinuities between our old and emerging psychosocial contracts at work may come at some cost, particularly for certain demographic sections of the workforce. One of these may be intolerable workplace surveillance and judgment machines working without free will in societies that have grown up with modern notions of human rights and the presumption of innocence. Once again, these ethical and practical judgment issues only seem to reinforce the need for continuous feedback loops that do more than remind amoral technostructures that employees can be both a means and an end to organizational success. In particular, we argue that some form of routine corrective forum, such as regular performance feedback meetings, needs to be embedded within the feedback-rich culture we have constructed from organizational expert systems. The implications for retaining service quality on a psychological contract and also on a bottom-line level are great. One small computer company has gone so far as to argue that real-time performance management could almost rid us of the job of 'management', a notion which would consign the work of many in the organizational behavior field to the margins of history. Firms are already promoting some of the elements of this approach by promising the sort of dynamic bespoke monitoring service that could bring to understanding costs and output measures, and a range of AI-based optimization solutions aimed at calming 'Economies in Tumult'. The vision for high-quality service proponents has been to couple a system of dynamic performance metrics and improvement-oriented feedback with AI-based data-mining systems aimed at identifying meaningful patterns and trends in behavior.

### 9.5.1. Real-Time Performance Metrics

According to service management, there are two main concerns: "development and ongoing support" of the service provision towards the fulfillment of customer expectations. Real-time performance indicators and data are now a mainstay of service quality and performance management. Many organizations are running service management operations that are informed by a wide portfolio of real-time performance metrics displayed on visualization walls, browsing dashboards, or recording performance trends viewed on pages. Real-time data collection conveys extremely

valuable insights into the effectiveness of the services and customer experiences as well. Performance measurements presented in real-time, and communicated unambiguously as actions shall be initiated (or not), create actionable metrics. Actionable metrics couple threshold alerts for performance indicators at the service management's periphery, such that releasing leadership is freed to rapidly respond to service performance issues or to guide no further action.

Fig 9 . 2 : **AI Personalization and Privacy Balance**

Importantly, the moment when a phenomenon is measured or occurs should likewise be the moment that engages the process into a particular action. Actionable measurement is the breaking point. What actionable measurement tells us is about the true capability of the systems that are present. The "adoption of a real-time approach translates into increased agility to respond to changes, proactiveness, and the ability to implement automatic systems to deal with interactions, making the whole organization more efficient and responsive. Financial markets are another example where real-time data from several arenas are reviewed and used to make decisions about buying and selling securities. In healthcare, several hospitals are using Emergency Department (ED) wait time data available to guide individuals seeking ED attention elsewhere, ostensibly to

facilities with shorter wait times. For events, the timing and release of a speaker's after-presentation evaluation form data is closely coordinated with the audience's state of mental acuity. Data quality, false characteristics of the measurements, or process confusion around the data are noteworthy problems that can arise. For services or service systems in which the indicators are exposed broadly to customers or internal stakeholders, transparency and a culture of continuous improvement help organizations address such concerns.

### 9.5.2. Feedback Loops and Continuous Improvement

Customer feedback is vital for continuous service improvements. The question is how AI technologies can assist in capturing useful feedback from end-users discussing various service quality aspects or the performance of systems generating such services. A wider question for organizations is how why, and where to use that feedback when deciding what training to provide, process changes, or how best to direct technology investments and software development efforts. When, and if, agencies need to or should use, or ignore, consumer feedback in the sense of relevant indicators and sentiment on performance and satisfaction is an important but only partially addressed question.

Feedback allows fine-tuning of emerging capabilities through repeated active learning loops, including both the collection of user-system and user-user interaction logs; feedback in the form of explicit input through multiple feedback channels and implicit input having predictive, preventative, or intervention consequences. Some of these data collection channels are visible on the user interaction side, including user surveys of satisfaction, willingness to 'use again', 'recommend again', and attribute wording of services, interfaces, and websites; phone call and email logs; and formal letters of complaint; online forum discussion threads; usability studies using screen capture, webcams, and interviews. However, more and more user-system interaction points are invisible in terms of analytics where they can be collected without human intervention, traffic shaping, or reasonable use agreement issues, e.g., downloads per user, rate limits, etc., botnet-generated traffic both prospectively and retrospectively looking for patterns of command and control signals going undetected behind privacy layers.

Then a discussion point would be the suitability, cognitive saturation, and beneficial congestion of feedback data words where manual coding would present an inordinate resource overhead. AI capabilities can greatly help with this form of digitized, analogized, scanimensionalized, audio analyzed, process fault signals, and user behavioral indicators which come in continually variable data, unstructured textual formats, offline forums, web scraping of consumer directories, and other data for AI

classification-coding correlations. Some organizations are beginning to use supplier and intelligence feedback loop tools, yet these tools currently span a myriad of evidence and techniques to provide the evidence leadership teams desire. There are also other bounce-back mechanisms where buyers are protected and trust mechanisms are in place to foster excellence and fairness in the auction or judiciary and legal advice systems. These subtle intertwining of satisfaction and quality mechanisms are aimed at mid-market consumers. Lots more could be said about seller-buyer feedback before purchase, voting with money as leverage there, and other buyer-power feedback loops.

### 9.6. Case Studies

Case studies on AI as it is applied in various service sectors present ideal material for this paper. We can thoroughly analyze, in the light of these case studies, how AI can be utilized successfully for value creation and quality of service. Not many large organizations have implemented AI practices at scale yet, but most are piloting or using the technology in specific service contexts. Moreover, several start-ups are developing AI solutions. Education. Applications in these contexts are primarily focused on the customer service experience. The role of AI in this sector, at the moment, and where AI has been integrated into organizations, has generally been as part of the wider call center operation to assist staff in handling complaints or inquiries more efficiently and cost-effectively. Such AI can perform a limited range of activities, such as reading aloud e-learning material or providing clarification on course content by accessing text-based study guides. Tourism and Leisure. 'Personalization' is the key concept here at present. Here, AI is being developed to provide unobtrusive social companionship during the holiday breaks for those traveling alone. Increased market penetration for technologies such as financial services, including mobile banking, has in recent years led to a significant contact center professionalization. In turn, this has led to the creation of a higher tier of service center employees, supporting complex middle and back office operations for these organizations. For this sector, AI is often used in a Knowledge Management System context. AI is priceless for content creation, sometimes as 'bots' capable of simulating conversation between an agent and caller. Finance and Legal Services. AI is being used in various ways, including automated voice recognition systems, internet banking, mobile banking, workforce management technologies, web-based call routing, and voice protocols which can be used for voice browsing, profiling, and CRM systems. Real applications in this service sector include AI in the estimation of mileage for postal workers and the determination of costs when a courier is arranging shipment. Information Technology. AI is used mainly for Network and Systems Management purposes. Within the industry, AI is also sold as a systems management tool for service management monitoring and tracking. The common reality, however,

from both the materials and evidence given to us by the AI and IT consultancies who took part in our research is that AI in IT is less about service and more about maintaining IT and the infrastructure. This then led us to dismiss BFS as having any AI role. Retail. Uses of AI are in fairly straightforward areas like web interfaces, order tracking, and Customer Relationship Management, although this is about to change. AI is used in profiling systems that purportedly track and match supply/demand in a dynamic global sourcing community. This system uses an auction selling bid and ask system, linked to the telephone system. However, the companies in question do not conceive this as an AI application even though it uses AI techniques.

Lessons to be Learned from the Case Studies All AI examples we found from our research are keen to highlight ROI and the cost-saving processes they initiate. In practice, some applications have more emphasis on this over value creation. Few of the services we found cite ROI as a main driver; rather, it is cited as the benefit of the process AI will help to initiate. Additionally, the potential benefits of the diverse applications vary from revenue generation, innovation, personalization, cost-saving, and service capability 'uplift.' Moreover, valuing the initial investment in AI was sometimes difficult, but still considered.

### 9.6.1. AI in Retail Services

AI, particularly narrow AI or domain-specific AI, has the potential to completely transform retail services. Systems able to understand and execute in real-time high-level tasks such as setting prices or ordering stock release human beings to focus on complex, multi-disciplinary challenges that can realize greater innovation and customer value. Despite its potential, there are still few uses of AI in retail services. Those systems that are in use tend to be for discrete tasks such as product recommendations. Yet, they often have a significant impact on sales. The applications of AI highlight how it can be used to make retail operations more efficient, relieve staff so they can focus on higher-value work, and provide a better customer experience.

In terms of efficiencies, one of the most developed applications of AI in retail is inventory management. This responds in real-time to store-level demand and events, as well as adaptation to local weather. Automated inventory, as with many uses of AI, frees up staff who can direct them to other activities. A common use for staff is as customer interaction points. A well-established application of AI in customer service is the chatbot. Chatbots provide information on products and store locations, real-time shopping advice, help locating products on the shop floor, and even advice on clothing. An area of significant consumer interest is personalized recommendations. Retailers are

guiding shoppers to a product that is not just suitable for what they want but also fits in with their style or will go with products they already have. There has been rapid development in visualization software that overlays customers' homes with proposed purchases. Extending this, an application of AI could provide shoppers with situational information and support that is optimized for the environment they are in or the objective they have. Management decisions taken more rapidly increase a store's overall agility.

### 9.6.2. AI in Healthcare

Artificial intelligence (AI) has the potential to revolutionize the healthcare sector. AI is no longer only a technology for automating routine operational tasks. Instead, AI can be imbued with expertise by frequently practicing a skilled task, quickly consuming and understanding a great volume of examples, and capturing the accumulated experience of a profession. This would allow AI to produce outcomes that are superior to the average provider in terms of patient outcomes, cost-effectiveness, and/or care experience.

Numerous examples of AI in healthcare are transformational. First is the application of AI in diagnostics, especially radiography, pathology, dermatology detection, and so on. Second is patient management, ensuring that on-call doctors are treating patients who need them first, proactive care (monitoring patients at home, gaining early insights into complications before they escalate, and virtual assistants for advice). Third is treatment solutions, where AI is increasingly identifying the potential to create more personalized treatment solutions. In the realm of secondary support functions, AI can also predict patient intake and throughput in hospitals and care pathways for above-normal periods for the optimization of patient flows. These are not simply research projects or small experiments, but large-scale rollouts in the real world applied to a significant problem.

However, AI in healthcare is not without challenges; health data privacy is difficult to maintain and hard for healthcare AI companies to access. Additionally, it faces ethical challenges such as truly unbiased algorithms and reconciling the collaborative role between AI and healthcare practitioners. However, the overall healthcare spend on technology goes to show the growth potential of this space. With AI, healthcare organizations can provide better patient experiences at a lower cost. High-value care is simple to define but difficult to achieve; it is the combination of improved clinical outcomes, patient experience, and operational efficiency.

### 9.6.3. AI in Financial Services

Artificial intelligence (AI) is revolutionizing financial services. In the financial services sector, many financial institutions use AI to power chatbots and assist with customer service. AI is also effectively used in the credit and lending space to more accurately assess risk and identify lucrative lending opportunities. Additionally, AI can access data far more efficiently than any human; this makes identifying potential credit risks much faster and thus cheaper too. For example, stock trading strategies can be executed in an automated fashion by having AI identify patterns in the stock price over time to deploy capital when necessary, making it easier to trade profitably. AI is also used in some stock trading applications to avoid fraudulent transactions.

However, using AI in this field is not without its unique set of challenges. Many financial institutions are highly regulated and must balance these rules with state and federal regulations as well as the benefits that AI can provide. Additionally, one of the major barriers to using AI in financial services is the need to keep the client's data secure. AI tools in banking, more than in many enterprises, often have direct access to highly sensitive information like social security numbers, bank account and routing number sets, and similar data that is invaluable to fraudsters. This should prompt financial institutions to carefully examine what AI they use and to assess the trade-offs between operational efficiency, customer service, and data security. Furthermore, machine learning approaches using customer data alone may over-represent certain groups in the data, leading to biases in the model predictions. This not only poses a challenge to the banking sector but also demonstrates the importance of approaching and using data with ethics, security, and AI governance in mind. This upfront regulatory approval requirement should underscore the need for assembling a data compliance team as part of an enterprise's AI governance.

## 9.7. Challenges and Limitations of AI in Service Management

Despite all its potential, there are many limitations and challenges in using AI to manage services. First, given the complexity and context-related elements of delivering services, AI technology is far from being perfect. Most AI algorithms are designed for specific tasks, and usually, they are black boxes, meaning that it is not clear how the system arrives at its decisions and that decisions are difficult to verify and challenge. In addition, integrating systems for AI decision-making with existing service front-to-end management systems is a costly, daunting task. Furthermore, when collecting big data about customers and their behaviors for AI, care must be taken to keep the data private

and secure. This is particularly challenging in an age when identity theft and data breaches are increasing in value.

When AI examines historical data and trains or teaches an algorithm how to make decisions, this always carries the risk that the algorithm picks up human biases. Already, studies have shown that AI and machine learning can make biased decisions; for example, hiring decisions may be biased against women, the homeless, and certain ethnic groups. Thus, using AI may inadvertently make services unfair. Another key challenge of AI in customer-facing services is the need to adopt the principles of responsible AI, including ethics, transparency, and explainability. As firms gradually adapt to use automation and AI to link services with smart digital systems, the business will demand a new digitally savvy and data-literate workforce. Digital transformation takes time and requires resources, including education, retraining, and upskilling of workers. They need the training and new skills required for services to be enhanced by AI, and they need to understand the growing reliance on science and technology.

### 9.7.1. Data Privacy Concerns

A significant issue in employing artificial intelligence (AI) based systems is the issue of data privacy. AI systems generally process extensive personal data obtained from different sources including subscribers' billing records, location updates, call detail records, and cell phone records, among others. Without stringent operational procedures, there are risks that such data may be breached, or worse misused, as a result of deploying AI-based applications. There are many misconceptions in this area. Some people view AI as a major contributor to privacy concerns, while others see it as a potential solution to the data protection dilemma. AI and privacy do not have to be mutually exclusive. They can converge to establish a privacy-friendly smart application ecosystem. The vast majority of people believe that privacy concerns and data protection are major stumbling blocks for AI-based systems.

In the face of these misconceptions, one has to be clear: AI and privacy, especially data protection and regulatory compliance, can go side by side. This sharing of responsibilities has to be both legal and ethical. In AI-based systems, there are both physical and virtual touchpoints—tangible touchpoints in the form of personal data and the applications that use AI, and the non-tangible components, which are in the software applications where AI is deployed—all requiring thorough protection of the subscribers' personal information. Therefore, in all these touchpoints, data protection principles should be adhered to. AI-based systems developers should follow regions where stringent data protection regulations are in place. There are also technology solutions

such as federated learning and edge-based AI to ensure robust yet personalized applications through data protection. The principles of data minimization and data protection thus become part and parcel of various elements. Ethical data practice care should be a guide while deploying AI-based systems. Automated ways are being developed to help in ethical data practices. Users should know the purpose of data collection, usage, and automated decisions behind AI. Therefore, one ethical principle of data analytics is the requirement of consumer consent, as well as transparency. In a nutshell, AI provides or should provide, effective privacy models if privacy-enhancing technologies are role-based and follow a set of privacy directives.

### 9.7.2. Bias in AI Algorithms

The introduction has focused on the potential benefits of artificial intelligence in managing a range of service management processes. While acknowledging these prospects, it is our obligation as service researchers to also discuss some of the potential challenges and threats that can originate from artificial intelligence and its implementation. One of these challenges is the issue of bias. AI algorithms are increasingly used in service management and can affect, among other aspects, the quality of a service, the decision-making process related to the service, the service sophistication, the service offering, and the customer experience.

There are many sources of bias in algorithms. Bias can arise during data collection, where individuals are not represented proportionally based on their characteristics or due to outright discrimination or lack of consideration for parts of the population. Thus, datasets on which many AI algorithms are trained are less representative, e.g., of minority groups or other populations. Similarly, indirect discrimination can occur if, for example, historical data is used that integrates previous discrimination that occurred. Moreover, the algorithm, due to its design, can create bias – potential discriminatory treatment – even if the initial data is not at all biased. Practices that result from AI algorithms can hurt service quality and provision in diverse ways. Bias in algorithms, for example, accusing individuals of being more likely to re-offend, can lead to severe consequences. There is also a clear customer aspect to this, especially for firms that position themselves or pride themselves on being fair as well as for diverse customer bases. Regarding accountability for decisions that artificial intelligence-based services make, it is also essential to mention that AI algorithms can be particularly complex and difficult to explain or understand. Moreover, people responsible for the decision-making processes are often difficult to identify or hold accountable.

To pursue an application-oriented, ethics-by-design approach is highly advised to ensure that AI does not produce biased outcomes, but ethical principles that are put into practice can diverge immensely from one organization to another. In terms of regulations, if they do not exist, organizations should still understand their responsibility and take proactive measures to ensure fairness and equity in the design and flow of their AI. This increasingly necessitates understanding how AI systems work, including what data they use, how decisions are made, and how accountability is structured.

## 9.8. Future Trends in AI and Service Quality

Documented technological trends that are predicted to shape the service quality field in the next 10 years provide a tentative glimpse into the future of service quality creation. These trends touch upon recent and cutting-edge theoretical and practical advancements in artificial intelligence. By utilizing new non-text-based AI technologies to create a more personalized and effective service system, service operations can be revolutionized. Thus, a future trend of creating personalized service quality demands and the preservation of well-designed service systems that empower proper automatic actions could revolutionize our service operations and the management of service quality.

Recent system-driven and non-text-based AI trends primarily include machine learning, which has now grown to a point where it could change the interaction between service operations and service quality. Advances in modeling big data and little data are expected to have unique features and capitalize on these unique features to genuinely contribute to a special future of service operations and service quality. We broadly term these trends as "Adaptive Service Design" and "Machine Learning for Personalization." Both of these trends reveal that service quality should shift to operating systems in two key ways rather than monitoring impartial textual transactions. The first way emphasizes an adaptive organizational design (attracting a continuous learning process), and the second focuses on micro-personalized service quality based on machine learning methods.

Together, "Adaptive Service Design" and "Machine Learning for Personalization" expose the urgency of considering organizational adaptability. Firms that cannot respond to these revolutionary technological developments will face a constantly changing market environment relying on the creation and commercialization of new technologies. The AI advances are not straightforward, as embedding AI capabilities either in a pre-designed service system or optimizing an operational process within the prescriptive theory that informs operational decision-making is complex. It is still early days in the

automation of AI capabilities, which might be especially difficult to implement for service delivery systems that aim to achieve corporation-customer co-production and value creation. Such systems will need to be extensively tested due to the propensity for unintended consequences within systems theory, as well as ethical considerations. The sensitive and interactive environments in which many services are delivered may be a long way from being simple to replicate in automatic communication contexts. Financially, those firms that do not harness the competitive potential of these AI trends have been suggested to watch their decline. AI is also said to be transforming workforce capacities and capabilities so that workers can focus on newer, higher value-added tasks. However, this fails to acknowledge the deep underlying shifts in the market dynamics of consumption that are occurring from using the AI technologies suggested, and the subsequent reduction in demand for tasks supplied by firms and the requisite workforce. AI-driven personalized interactions with consumers are at the very front of large-scale changes in the fundamental nature of demand. Firms that fail to keep up with the continuously evolving customer demands will be the firms that suffer top-line losses, and those industries working with them will also suffer.

### 9.8.1. Emerging AI Technologies

New and emerging technologies supporting AI include knowledge graphs, attention layers, advanced natural language processing, reinforcement learning, unsupervised learning, generative models, integrated perception and reasoning, AI-driven verification, validation, security, and testing, differentiable and modular program learning, mixing and correcting human inputs, and AI-driven test design. Knowledge graphs help to represent and reason over connections between entities. Combining the symbolic nature of the graph representation with learning-based approaches has the potential to induce new information to predict better outcomes. Attention layers allow the model to focus on particular parts of the input at particular times, which allows for computational greatness when the full sequence is not needed at each step. Hypermedia-based attention and predictive coding promise to make the computational overhead for visual transduction manageable. Reinforcement learning enables an AI model to learn from an environment that exposes it to feedback due to action. The method offers a system with an artificial sense of curiosity to explore strategies and learn from rewards.

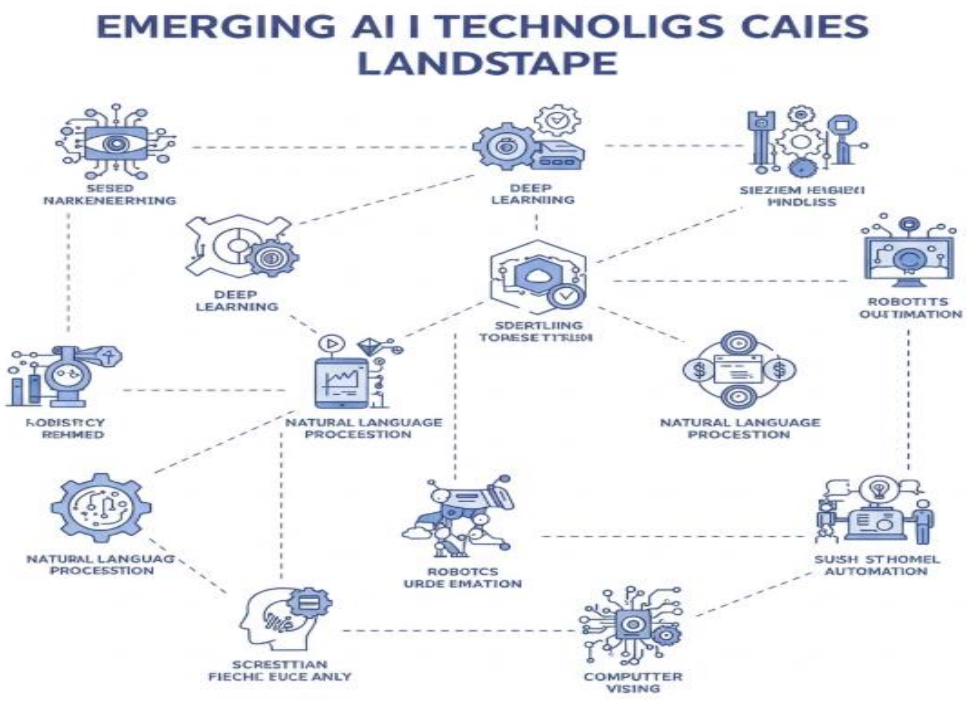


**Fig 9 . 3 : Emerging AI Technologies Landscape**

The significant potential for the practical application of the described new AI technologies is demonstrated by continuously improving service quality and performance. The adoption of new AI technologies offers great potential for achieving unprecedented levels of operational efficiency and effectiveness through increased automation, more accurate predictions, and personalized services. Such advances will enable innovative services that are only now starting to emerge and are underpinning the current race among organizations to become digital businesses that lead digitally transformed industries. Hence, for organizations seeking competitive advantage, it is becoming a matter of urgency to adopt such emerging AI technologies to develop data- and AI-driven organization-wide competencies for delivering better and more affordable products, services, and experiences. Some organizations are already beginning to adapt to a world of pervasive AI and cognitive systems. AI-driven automation is used by one European telecommunications provider to speed up error resolution and save seven million euros per year by reassigning workers to handle more complex tasks. Prioritize.ai uses NLP to automatically suggest software bugs to fix.

### 9.8.2. The Future of Customer Interaction

Increasingly intelligent chatbots and voice assistants are becoming more popular touchpoints for many services. Given this trend, we imagine a future in which AMCs will heavily rely upon chatbots and voice assistants as the primary touchpoint for their services. Current work on voice assistants is limited to voice synthesis and uses them as tutors, companions, or accessibility features. As voice synthesis technology improves, more personalized and intuitive voice agent avatars will become possible. Whether or not brand personality or identity is desirable is an open question, as ascribing identity to an AI mechanism can produce unintended negative consequences. Brand entities will eventually extend beyond voice assistants to encompass all customer communication channels, each with varying levels of control.

Likely, current discontent with the development of voice user interfaces and bot interactions leaves something to be desired. Indeed, the quality of an AI-based human interaction will be closely linked to the nature of any R&D in dialogue interaction management. This requires training engineers and product managers in effective, value-based engineering, and a clear representation of brand mission, identity, and target consumer values. There also exists a challenge in transitioning consumer interactions seamlessly across voice, text, and video notes for more complex service problems, just as there is today. The rest of the section will address the implications of these changing customers and increasing interactivity as they pertain to service management best practices.

## 9.9. Conclusion

The necessity of experimenting with new AI-based solutions that are currently coming into the market must be emphasized. The extensive transformation of existing service management practices, business models, and organizational structures is at the same time our greatest challenge. We expect to avoid unintended consequences and appropriately capture opportunities in the context of the development of AI technology and its application to management practices, which will allow businesses to implement processes of service quality, processes of adopting AI to strategic needs, and functional and IT structures. This will allow individuals to rationalize considerations to establish strategic objectives and convert these objectives to project objectives. Staying alert and informed about this progress is an absolute necessity for the long-term success of any business and the individuals within it. We believe that the increasing use of AI technology in the areas of business-to-consumer service, business-to-business service, and public services is one of the best choices a service organization can make to improve

its performance and service quality. As always, the choice is yours. Within this paper, we have shown that significant progress in technologies has been made, which can lead to a new understanding of service management. This work has provided insight into the strengths and weaknesses of present-day approaches. We also consider that it discusses some future trends that need to be taken into greater consideration. Our findings thus further shed light on opportunities for strategic evolution in the light of AI and the challenges that need to be overcome. It also puts the focus on social awareness and the need to implement proactive instead of reactive measures. The conclusion indicates that the use of AI technology is more likely to result in growth in the "Knowledge Value Chain" and thus improve individual and organizational performance despite failing to deliver reliable answers to the management of services.

### 9.9.1. Key Takeaways and Future Perspectives

Key Takeaways and Future Perspectives

1 Key Takeaways

The contribution of this book and the corresponding conference focuses on the impact of AI on service quality and performance. There are numerous different directions to investigate, but at the core of each is the fact that AI is enabling services and service systems to move and perform more and more autonomously. AI has multiple roles to play in enabling autonomous service systems. Firstly, it can provide insights and early effects that impact the service system and can play a role in supporting human search when engaging in idea generation and service innovation activities. Secondly, AI can stimulate adaptation behavior, changing workers in both office and industrial settings to focus on those tasks that AI machines cannot do. The main challenge in moving the AI and service quality performance management area forward is related to the negativity that can be associated with AI. Many of the breakthroughs made possible with AI require the sharing of personal data and, as such, creators and operators using AI face increased accountability for their creations. Adoption of AI can lead to job loss, eliminate choice, and open the door to potential abuse of power.

With this critical eye in mind, it is also important in an area that shows so much promise to keep in mind the many efforts aimed at supporting adaptation and innovation under uncertainty in the past. As we have discussed in the book, the AI field is rapidly evolving, and the algorithms themselves keep changing. Thus, as a conclusion, a major part of any service quality assurance framework that emerges in or around AI should be focused on ensuring that subjects need to be agile, keep up to date with what is happening in the

field, and participate dynamically in a changing world that will demand their active engagement in shaping, steering, and regulating how AI evolves.

## 2 Future Perspectives

The ecosystem around AI services is evolving rapidly, and while we aim to provide some practical ways to navigate this landscape in this book, it is also worth considering possible future developments in the field. In this regard, we offer some insights into future possibilities for fostering AI development. The history of our technological digital future remains to be written. This disruptively changing ecosystem is expected to continue for the next few years. Discussion and events on these current industrial developments will deal with current and future challenges in the field of AI service quality and performance management to make AI development fit human needs and demands.

Along with providing an overview of the most recent trends in the AI area, the second interdisciplinary symposium in 2021 will deal with a discussion aimed at navigating through the turbulent situation in which AI is evolving, with a special emphasis on service quality and performance issues that AI can or should address. The celebration of the recent book and symposium as part of the European project on Assurance Services Adaptive Platform, which provides demand-response innovative solutions and transfer services in a virtual environment, will also seek to explore real-time technical and operational performance and quality of AI services. While an accent is given on future developments, it is worth noting that an account of the whole project, as well as a synopsis of the first DASS Success event in May 2019, can be found in the Assurance Services Adaptive Platform discourse paper.

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