AI IN HEALTHCARE:

Keeping the Patient at the Center of Innovation

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Objectives

- **Specify the impact and application of AI across various industry players by providing context, limitations, case examples and regional trends.**
- **Detail the main trends of AI in Healthcare.**
- **Share successful cases we have undertaken of AI implementation in various healthcare sectors.**
- Explain how **AI is advancing industry capabilities,** enhancing patient experience, healthcare accessibility, patient health prevention, and increasing efficiency in processes, data management, and decision-making.

AI Trends in Healthcare

- AI trends in Healthcare and their impact on patients

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Impacts and Uses

- **Ecosystem map:** Context and **AI application** across various players: Health Providers, Health Insurers, Pharmaceutical Industry, Community Pharmacy and Technology Companies
- **Patient Journey:** AI application throughout the Patient Experience
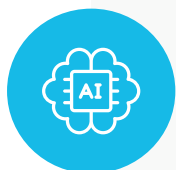- **Success Cases:** AI-Driven Projects transforming the Patient Experience

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Key Challenges and Roadblocks

- Topics to consider and cover while implementing or analyzing AI applications for the Health industry

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Outlook / Conclusion

- **Positive Impacts of AI integration, current situation summary and prospects ahead** per each one of the actors in the ecosystem

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Key objectives and triggers

Navigating the landscape of human biology alongside the complexities of patient care systems presents an ongoing challenge. With the utilization of cutting-edge technologies such as artificial intelligence (AI) and wearable sensors, we are seeing a transformative shift towards improved patient outcomes and wider access to life-saving genomic treatments.

As healthcare spending continues to intensify, the imperative for innovation in digital health becomes ever more apparent. Digital health stands poised to remedy longstanding inefficiencies within healthcare systems, paving the way for a more streamlined and effective patient care experience.

In this paper, we embark on a journey through Artificial Intelligence applications in health, with a keen focus on its profound impact on patients. We delve into the promise of AI in enhancing patient experience, improving overall health outcomes, and revolutionizing customer service within the healthcare sector.

Drawing inspiration from breakthroughs in digitizing medicine, particularly the convergence of digital health technologies and AI, we explore the immense potential for AI to reshape healthcare operations. By digitizing processes and introducing automation, AI stands as the missing link in the transformative digitization of healthcare, promising to streamline operations, enhance data management, and unlock invaluable insights from vast datasets.

1 AI Trends in Healthcare

Artificial intelligence is rapidly transforming Healthcare, with advancements ranging from disease prediction to personalized treatments. This section highlights six key AI trends illustrating how these innovations are shaping the future of medical practice.

1. Disease prediction and prevention

Predictive algorithms application to identify patterns in health data and predict the emergence of diseases, allowing preventive interventions and a proactive approach to healthcare.

2. Chatbots & Virtual assistants

Implementation of chatbots and virtual assistants in homecare assistance, outpatient or lifecycle care settings with the objective of providing instant information and remote monitoring.

3. Improved telemedicine

Integration of AI solutions into telemedicine platforms to improve remote diagnosis, patient monitoring and remote clinical data management.

4. AI-assisted diagnosis

Use of algorithms and learning models to diagnose diseases by analyzing medical images, such as X-rays, tomography scans, and MRI scans.

5. AI-assisted surgical robotics

Development of advanced robotic systems that use AI algorithms to improve precision and efficiency in surgical procedures.

6. Personalized treatments & High Precision Medications

Development of AI systems to analyze clinical and genomic data in order to personalize treatments and improve the effectiveness of therapies. Definition of the exact treatment based on the patient's symptoms, behavior, and characteristics.

1. Disease Prediction and Prevention

Early Detection and Diagnosis

AI algorithms can analyze biomarkers, imaging data, and other diagnostic indicators to detect early signs of disease onset or progression. For example, AI-powered screening tools can analyze medical imaging scans, such as mammograms or chest X-rays, to identify suspicious lesions or abnormalities indicative of cancer at an early stage.

Case:
In 2020, a pharmaceutical company teamed up with a British company to use their online symptom checker to assist patients with digestive health conditions. 'The tool was able to give a Level 1 diagnostic, offering people fast recommendations and next steps on IBS (Irritable Bowel Syndrome), a condition that's often undiagnosed, under-addressed and improperly treated,' said a referent of Global Head of Business Data & Analytics.

Lifestyle Interventions and Behavioral Modification

AI-driven digital health platforms leverage behavioral analytics and personalized recommendations to promote healthy lifestyles and prevent chronic diseases. For example, AI-powered wellness apps analyze user data, such as activity levels, diet, sleep patterns, and stress levels, to provide personalized recommendations and interventions for improving health behaviors.

Case:
A technology company leverages data from wearable devices to power its new cloud-based healthcare API, integrating healthcare data standards such as FHIR, DICOM, and HL7 with machine learning. The goal is to streamline the integration of individual exercise data with electronic medical records, allowing everyday movement and workout data collected by wearables to be incorporated into patient profiles. This could unlock new insights into conditions like diabetes and hypertension.

Public Health Surveillance and Outbreak Prediction`

AI algorithms allow monitoring of real-time health data, including disease surveillance data, social media feeds, and environmental sensors, to detect disease outbreaks and monitor population health trends. By identifying clusters of cases, tracking disease transmission dynamics, and forecasting disease spread, AI-powered surveillance systems enable early warning and rapid response to emerging public health threats, facilitating preventive measures and protect public health.

Case:
A public health initiative partnered with a local organization to conduct large-scale tuberculosis (TB) screenings using mobile vans equipped with advanced technologies, including artificial intelligence (AI), across three districts in Northern Lima, Peru. The vans were stationed at 214 locations, offering TB services for eight hours a day. Anyone over the age of three who visited the van received a chest X-ray, which was instantly analyzed by AI software.

2. Chatbots & Virtual Assistants

Personalized Interaction

AI algorithms can analyze user data, including medical history, symptoms, and preferences, to personalize interactions with healthcare chatbots and virtual assistants. By tailoring responses and recommendations based on individual characteristics and needs, AI-enhanced virtual assistants can provide more relevant and effective support to users, leading to improved user satisfaction and engagement.

Case:
A Chinese healthcare platform provides online consultations with healthcare professionals through text, chat, or video, along with appointment scheduling and prescription refills. The platform employs advanced AI algorithms to analyze user inputs, symptoms, and medical history, generating tailored health assessments, recommendations, and treatment plans. To broaden access, it has established clinics featuring independent consultation rooms and smart medicine cabinets equipped with AI systems trained to diagnose and recommend treatment for common diseases.

Health Monitoring and Management

AI-powered virtual assistants enable users to monitor and manage their health by offering real-time feedback, reminders, and personalized guidance. For instance, AI-driven chatbots can support patients with medication adherence, track symptoms and vital signs, and provide lifestyle recommendations tailored to individual health goals.

Case:
A US-based drug dispensary partnered with a company to implement smart pill dispensers that monitor dosage times and tablet quantities. This system helps track patients' medication adherence by providing secure data and reminders accessible to healthcare providers, patients, and their caregivers. It also allows community pharmacies to enhance patient engagement by contacting them quickly to resolve adherence issues or monitor side effects.

Health Education and Empowerment

AI-powered chatbots and virtual assistants provide personalized health education and support, meeting users' informational needs while empowering them to make informed health decisions. These systems offer access to evidence-based resources, answer health-related questions, and guide users on preventive care and wellness strategies. By leveraging AI, virtual assistants enhance health literacy and promote patient empowerment.

Case:
From a healthcare service in the UK, an app leverages AI-based virtual assistant technologies to help users access physiotherapy and mental health resources, as well as gain trusted advice and treatment from healthcare professionals, leading to increased usage of physiotherapy resources and significant savings of clinicians' time. This allowed users to self-manage their healthcare during the Covid-19 pandemic while reducing the risk of infection.

3. Improved Telemedicine

Patient Care Efficiency and Enhanced Telemedicine Uptake

AI-based API integrations in telemedicine platforms can lead to enhanced patient triage and medical diagnosis, while streamlining the online consultation processes and making it more user-friendly. Ahead of teleconsultations, customized questions that mimic the diagnostic approach of human clinicians can help to better equip both patients and healthcare professionals, improving efficacy of telemedicine consultations- They also enable patients to prioritize access to care over the need for human interactions with their healthcare providers.

Case:
A Mexico-based online healthcare service provider partnered with a tech company to integrate a personalized symptom checker. This tool guides users through a tailored checkup, collects basic health data, and translates it into triage levels. Accessible in both the doctor's panel before teleconsultations and in the patient's electronic records, it has led to increased patient satisfaction and reduced the need for traditional primary care visits, thereby enhancing the value of each online interaction.

Enhanced Patient Inclusivity

AI-powered language translation in telehealth platforms can facilitate communications between patients and healthcare professionals who speak different languages, improving delivery of care and patient outcomes. Moreover, verbal or written communication in native languages in pre-registration forms may be effectively documented in the desired language of the healthcare provider. Multilingual chatbots may further ensure inclusivity for patients.

Case:
In 2020, a tech company invested USD 100 million in a telehealth provider to integrate machine translation into its chatbot. This allowed to assist patients in their preferred language, and provide live translated captions of conversations as well as medical transcription services, consequently improving telehealth user experience

Follow-up and Continuity of Care

Following a telemedicine consultation, AI-driven notification systems systems can help patients adhere to treatment plans, schedule follow-up appointments, and track their progress over time. These systems can send automated reminders for medication refills, lab tests, and preventive screenings, ensuring continuity of care and improving patient outcomes.

Case:
A start-up based in the US has created an AI-driven, FDA-registered digital platform that connects mental health providers to patients between visits and post-discharge. Patients check in by answering traditional healthcare assessment questions, as well as sharing information through recorded video, audio, text, or hybrid responses. The platform analyzes interactions and summarizes them into actionable clinical takeaways for care teams, facilitating prompt interventions.

4. AI-Assisted Diagnosis

Medical AI Wearables

Continuous monitoring of parameters such as heart rate, respiratory rate, blood pressure, and oxygen saturation offers a comprehensive view of a patient's health.
AI algorithms integrated into wearables analyse this continuous stream of data to identify patterns, trends, and anomalies that may indicate underlying health conditions or changes in health status. This enables early detection of abnormalities, remote monitoring beyond clinical settings, and personalized health insights.

Case:
While smartwatches and fitness trackers remain popular, specialized firms offer wearable biosensors, such as disposable adhesive patches that continuously monitors vital signs including ECG, heart rate, respiratory rate, temperature, and activity levels. The device uses AI-powered analytics to provide real-time insights into patients' health condition and detect signs of deterioration in clinical settings and remote monitoring applications.

Digital Imaging

AI-powered computer aided detection (CAD) can analyze medical images to flag areas for further evaluation, serving as a "second pair of eyes" for radiologists while enhancing resolution of images. Moreover, AI algorithms can better assess disease progression through quantitative image analysis by tracking changes in markers such as tissue density or tumor size while facilitating integration with electronic health record systems to triangulate imaging findings with clinical data and patient history.

Case:
Researchers at institutions have been working on AI-based systems to assist ophthalmologists in early detection and management of diabetic retinopathy, a common complication of diabetes.

In Vitro Diagnosis

Potential to reduce turnaround time for test results, enhance accuracy by detecting subtle patterns or abnormalities in complex biological data, reinforce quality control and identify issues with equipment, reagents or procedures, allowing clinicians to make better informed decisions.

Case:
In Southeast Asia, companies have developed AI-driven point of care testing (POCT) solutions for various applications, including infectious disease testing, cardiac biomarker analysis, and pregnancy testing.

5. AI–Assisted Surgical Robotics

Preoperative Planning and Simulation

AI-based software can assist surgeons in preoperative planning by simulating surgical procedures and predicting potential outcomes. Enhanced image analysis techniques, consolidated resources to strengthen practice, deep learning algorithms to identify abnormalities ahead of surgery are some examples of AI-driven planning. This enables surgeons to optimize surgical approaches, anticipate challenges, and tailor interventions to individual patient anatomy, leading to improved surgical precision and patient safety.

Case:
A US-based company uses AI to assess a range of medical imaging including CT scans, as well as clinical parameters and electrocardiogram data to search for suspected vascular diseases. The company also has FDA-approved algorithms to identify aortic pathologies, including acute dissection and Right Ventricular to Left Ventricular RV:LV ratio to identify right heart strain from pulmonary embolism, allowing for timely and better-informed decisions for preoperative planning.

Intraoperative Support and Guidance

Minimally invasive surgeries can lead to further accelerated patient recovery by leveraging on AI-based robotic systems which can provide real-time guidance and assistance to surgeons during procedures. By integrating AI algorithms with robotic surgical platforms, surgeons can benefit from enhanced dexterity, stability, and precision, enabling them to perform complex maneuvers with greater confidence and control.

Case:
Robotic cardiac surgery is conducted through very little incisions in the chest, cut with robot-manipulated tools and very small instruments with over 60,000 surgeons trained globally. Robotic surgery is used for several heart-related procedures, such as coronary artery bypass, valve surgery, cardiac tissue ablation, tumor removal, and heart-defect repair. AI algorithms assist surgeons in controlling robotic arms with precision, minimizing hand tremors and motion scaling.

Automated Surgical Tasks

AI-enabled surgical robots can automate certain aspects of surgical tasks, such as suturing, tissue manipulation, and instrument positioning. AI algorithms can analyze tissue properties, predict optimal instrument trajectories, and adjust robotic movements in response to dynamic surgical conditions, reducing surgeon workload and enhancing procedural efficiency.

Case:
A medical center in the Netherlands has used an AI-driven robot in microsurgery interventions. The surgical robot is particularly well-suited for microsurgery applications, such as vascular anastomosis (connecting blood vessels), nerve repair, and tissue transplantation. In one instance, the robot successfully sutured blood vessels ranging from 0.03 to 0.08 millimeters in diameter in a patient with lymphedema.

6. AI-Assisted Diagnosis

Tailored Treatments Based on Individual Characteristics

AI algorithms can analyze vast amounts of patient data, including genomic information, medical history, and treatment outcomes, to identify personalized treatment options that are more likely to be effective. For example, in the field of oncology, AI algorithms can analyze genomic data from cancer patients to identify specific genetic mutations or biomarkers that can inform targeted therapies, increasing the likelihood of successful outcomes while minimizing unnecessary side effects.

Case:
A US-based company uses AI to assess a range of medical imaging including CT scans, as well as clinical parameters and electrocardiogram data to search for suspected vascular diseases. The company also has FDA-approved algorithms to identify aortic pathologies, including acute dissection and Right Ventricular to Left Ventricular RV:LV ratio to identify right heart strain from pulmonary embolism, allowing for timely and better-informed decisions for preoperative planning.

Predicting Treatment Outcomes

By integrating data from diverse sources, including clinical trials, electronic health records, and patient-reported outcomes, AI can identify factors that may influence individual patient response to specific therapies. For example, researchers have developed AI models that can predict the effectiveness of antidepressant medications on individual patients.

Case:
Robotic cardiac surgery is conducted through very little incisions in the chest, cut with robot-manipulated tools and very small instruments with over 60,000 surgeons trained globally. Robotic surgery is used for several heart-related procedures, such as coronary artery bypass, valve surgery, cardiac tissue ablation, tumor removal, and heart-defect repair. AI algorithms assist surgeons in controlling robotic arms with precision, minimizing hand tremors and motion scaling.

Adapting Treatment to Patient Responses

Through continuous analysis of patient data and monitoring of treatment outcomes, AI algorithms can detect changes in patient conditions, identify potential adverse events, and suggest adjustments to medications. AI-powered monitoring systems can track vital signs, biomarkers, and patient-reported data in real time, alerting healthcare professionals in case of any deviations, enabling timely interventions and adjustments to the treatment plan.

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2 Impacts and Uses

The 'Customer' / Patient at the Center of Healthcare

Artificial Intelligence (AI) is revolutionizing healthcare by transforming medical services and enhancing patient care. This paper explores AI's impact on individual health and the **healthcare system,** addressing the following key questions: What goals do we aim to achieve with AI in health? How is AI reshaping healthcare delivery? Who are the **innovators** driving this change?

The Evolution of Healthcare

AI is a **driving** force in healthcare, advancing from **therapeutics development** to **operational efficiency. Technologies like AI, robotics, big data analytics, remote monitoring, telemedicine,** and **mobile apps** are transforming patient care and enabling a shift from **reactive** to **proactive** care models.

Empowering Patients

The focus is now on **patient empowerment,** emphasizing **shared decision-making, personalized medicine**, and **holistic wellness**. This shift promotes patients as central figures in their health journey.

The Role of AI in Healthcare

AI **boosts innovation** in **precision medicine, remote monitoring,** and **personalized care**. By using AI algorithms and **predictive analytics,** healthcare providers can tailor interventions, optimize treatments, and improve **clinical decision-making**. Additionally, AI **streamlines administrative tasks,** accelerates **clinical trials,** and enhances **operational efficiency**. It improves care through **early diagnosis,** personalized treatment, and **chronic disease management.**

Healthcare Ecosystem Map

The healthcare ecosystem map highlights the interconnected roles of key players, each leveraging AI technology to enhance their operations. AI integration across the ecosystem drives advancements in patient care, operational efficiency, and innovation. The following sections will detail how AI is applied by each player, demonstrating its transformative impact on the healthcare landscape.

TECHNOLOGY SOLUTIONS

Healthcare Ecosystem Map – Patient Journey

The use of technology is focused on improving patient care, enhancing patient experience, facilitating data analysis, and positively impacting the cost of services provided.

Patient admission at insurer

Appointment Request

Medical Consultations

Prescriptions

R&D of drugs & procedures

Delivery of Studies And Reports

Performing Image Analyses And Studies

Waiting Rooms

Purchase of Medications

Diagnosis of Illnesses

Authorization and Payment Management

Patient Admission/ Reception

Waiting Rooms

Rehabilitation

Health Insurance coverage Changes

Medical Emergency and Urgent Care

Treatments and Surgeries

Control, Monitoring, and Prevention

Inquiries and Claims

Billing

Health Provider

Comunity Pharmacy

Pharmaceutical Industry

Health Insurer

* AI Usage Level, Wolrdwide

Application

Technology Solutions

Technology solutions are revolutionizing healthcare by providing AI-driven advancements that enhance patient care, diagnostic accuracy, and operational efficiency across providers, insurers, pharmaceutical companies, and community pharmacies.

In the fast-evolving sector of healthcare, tech solutions are essential in supporting the advancements made in artificial intelligence (AI) for health. From robust data analytics platforms to innovative telemedicine applications, these technological innovations provide the foundation for AI-driven healthcare developments, enabling enhanced patient care, diagnostic accuracy, and efficiency in medical processes.

IoT: Sensors and devices collect data, transmit it to a central platform for analysis.

- **Patient Monitoring:** gather real-time patient data, enabling remote health monitoring and early problem detection. 🔴
- **Medication Management:** help patients take their medications safely and on time. 🔴
- **Improving Hospital Efficiency:** automate tasks such as inventory management and location tracking of medical equipment. 🔴 🔵
- **Predictive maintenance & equipment linkage:** enhance equipment upkeep and connectivity through predictive insights and Augmented reality. 🟢

Robotics: Human–controlled or programmed robots perform specific tasks.

- **Robotic Surgery:** allow for more precise and less invasive surgeries, reducing patient recovery time. 🔴
- **Rehabilitation:** help patients regain mobility and muscle function after an injury or surgery. 🔴
- **Elderly Care:** care for the elderly and disabled, providing them with companionship and assistance with daily tasks. 🔴
- **Production processes and quality control:** enhance workflows and maintain quality with automated monitoring. 🟢

Machine Learning: Algorithms analyze data to identify patterns, predict outcomes, and make decisions.

- **Disease Diagnosis:** analyze patient data to identify patterns and help doctors diagnose diseases more accurately. 🔴
- **Treatment Personalization:** personalize treatments for patients based on their individual characteristics. 🔴 🟠
- **New Drug Development:** identify new molecules and develop new drugs faster and more efficiently. 🟢

Chatbots: Conversational interfaces interact with users adopting natural language.

- **Patient Care:** can be used to provide patients with information and support 24/7. 🟠 🔵 🔴
- **Appointment Scheduling:** can help patients schedule appointments with their doctors. 🔴
- **Patient Monitoring:** can be used to track patient progress after surgery or a medical procedures. 🔴

Big Data: Analysis of large datasets to identify trends, patterns, and relations.

- **Patient Data Analysis:** analyze large sets of patient data to identify patterns and trends that can help improve disease diagnosis and treatment. 🟢 🔴
- **Risk Prediction:** predict the risk of diseases for their patients and offer personalized analysis. 🔵
- **New Medical Device Development:** develop new medical devices that can help improve patient care. 🟢 🔴

🔴 Health Provider   🟠 Comunity Pharmacy   🟢 Pharmaceutical Industry   🔵 Health Insurer

Wearables: Wearable devices monitor user's biometric data and physical activity.

- **Health Monitoring:** monitor patients' health in real time, such as heart rate, blood pressure, and physical activity. 🩺
- **Early Disease Detection:** can detect health problems early, such as heart arrhythmias or sleep apnea. 🩺 🤝
- **Motivation for Physical Activity:** can motivate people to be more physically active. 🤝

Disease Prediction: Analysis of genetic and lifestyle data to predict disease risks.

- **Genetic Data Analysis:** patients' genetic data can be analyzed to identify their predisposition to certain diseases. 🩺 💊
- **Lifestyle Data Analysis:** patients' lifestyle data, such as their diet and physical activity, can be used to predict their risk of developing diseases. 🩺 🤝
- **Early Intervention:** disease prediction can enable early intervention and prevention of chronic diseases. 🩺 🤝

Virtual Reality (VR): Simulated environment for training, rehabilitation, and therapy.

- **Medical Training:** VR can be used to train doctors to perform surgical procedures. 🩺
- **Patient Rehabilitation:** VR can help patients recover from injuries or illnesses. 🩺
- **Pain Therapy:** VR can also distract patients from pain and help them relax. 🩺
- **Remote support maintenance and training:** VR can enable real-time, interactive guidance and training for technicians and support staff. 🩺 💊

Wellness Tests: Tests to assess overall health and identify disease risks.

- **Health Assessment:** wellness tests can be utilized to evaluate an individual's health status and highlight potential health risks. 🩺 🤝
- **Disease Prevention:** Wellness tests aid in preventing diseases by identifying health issues at an early stage. 🩺 🤝
- **Health Promotion:** Wellness tests encourage healthier lifestyles by helping individuals adopt better habits. 🤝

🩺 Health Provider   💊 Comunity Pharmacy   🧪 Pharmaceutical Industry   🤝 Health Insurer

Looking ahead, we will now explore how these innovative technologies are being applied to revolutionize operations within health providers, insurers, pharmaceutical companies, and community pharmacies. Through the integration of AI-driven solutions, these key stakeholders are determined to enhance patient outcomes, optimize resource allocation, and drive efficiencies throughout the continuum of care.

Health Provider

Health providers are crucial in the healthcare ecosystem. The AI applications executed by this player address the shortage of doctors and nurses, enhancing patient care and streamlining healthcare operations. The following sections will explore the context and applications of these AI technologies in detail.

- AI for disease diagnosis and early detection of diseases
- Remote patient monitoring / virtual hospital
- Operational efficiency
- Shortage of doctors and nurses

AI Application

- AI is used to improve the accuracy and speed of disease diagnosis, treatment and prevention.

- AI helps reduce healthcare costs and personal physician shortages.

- The COVID-19 pandemic has accelerated the adoption of AI in healthcare for patient monitoring and disease detection.

1. An AI application developed in Argentina allows analyzing brain MRIs.

2. The software makes a quick and accurate diagnosis of neurological diseases such as Parkinson's, Alzheimer's and Multiple Sclerosis.

3. An Argentine hospital created an AI software to categorize breast density in mammograms to diagnose breast cancer at an early stage, when it is easier to treat.

4. An Argentine company created a platform that uses genetic testing data obtained from saliva to diagnose or predict the risk of developing diseases. The platform allows you to personalize treatments to each patient.

5. A Spanish company has developed a tool that leverages mobile phones to monitor measurements from devices used by chronic patients. The system alerts medical staff whenever a reading falls outside normal parameters.

Health Insurer

Health insurers are leveraging AI to improve efficiency and customer experience and reduce errors. AI optimizes processes, ensuring cost-effective operations without sacrificing service quality, and provides more personalized, patient-centered care. The following sections will explore these AI applications in detail.

- Efficiency of the health provider model
- Process efficiency

- Data management
- Fraud, abuse and error

- Higher costs
- Aging

🤖 AI Application

Improving efficiency and quality of service

- Insurers are increasingly using AI to optimize their processes, reduce errors and improve customer experience.

- Actions to improve costs or income should not sacrifice service quality. AI should also be used to provide more personalized or patient-centered care.

1. An AI medical assistant provides insurers with tools to direct patients to appropriate medical care efficiently, safely and cost-effectively:
   - Guide the patient from the onset of symptoms, offering possible diagnoses and suggesting the type of care required
   - Allocate resources efficiently and avoid unnecessary appointments
     ○

2. A conversational care assistant automates patient navigation and scheduling to improve user experience and access to healthcare:
   - A virtual assistant guiding patients through the healthcare process
   - Integrating electronic medical records and clinical workflows to improve care
     ○

3. A healthcare fraud and abuse management system identifies providers engaging in fraudulent practices:
   - Analyze data and detect patterns of behavior suspected of fraud or abuse
   - Compare complaints to patterns and generate alerts in case of unusual activity

Pharmaceutical Industry

The pharmaceutical industry uses AI to boost efficiency in drug development, support research, and discover new compounds, collaborating with tech companies to enhance R&D while prioritizing safety and quality. The following sections will explore these applications in detail.

- Digital Therapeutics (DTx)
- Use of AI in research, drug testing (cost reduction)

- Virtual Reality to research and produce new medicines
- 3D printing (ex. prosthetics)

AI Application

- **Efficiency and Precision:** AI drives drug and vaccine development processes, optimizing resources and accelerating diagnostics.

- **Cutting-edge Research:** Companies use AI for patient segmentation, disease prediction, and the discovery of new compounds.

- **Key Collaboration:** The industry partners with tech companies to enhance AI in research and development, always prioritizing patient safety and product quality.

1. A U.S. company leverages AI to analyze millions of chemical compounds, searching for drug candidates against various diseases. The platform has accelerated the discovery of potential treatments for Ebola and multiple sclerosis.

2. Another U.S. company uses AI to analyze biological data and design new pharmacological compounds. Thanks to this technology, a new drug candidate for idiopathic pulmonary fibrosis has been discovered in a record time of 18 months.

3. A UK company has developed an AI platform that analyzes biomedical data to identify new drug targets and predict the efficacy of existing drugs. The platform has enabled the discovery of a new drug candidate for amyotrophic lateral sclerosis (ALS), which is already in clinical trials.

Community Pharmacy

Community pharmacies use AI to enhance efficiency, precision, and personalization in pharmaceutical care. AI personalizes services, improves treatment adherence, optimizes inventory, enables telepharmacy, and accelerates drug discovery. The following sections will explore these AI applications in detail.

- Personalized Recommendations
- Medication Adherence
- Telepharmacy Services
- Inventory Management

AI Application

AI transforms pharmaceutical care with innovative that enhance efficiency, precision, and personalization.

- AI systems can analyze patient and medication data to customize products and services, such as over-the-counter medications, supplements, or preventive healthcare services.

- AI can help patients adhere to their treatments by sending reminders, managing medication schedules, and alerting about drug interactions.

- AI enhances telepharmacy through virtual consultations with pharmacists, allowing patients to receive care remotely, which is particularly useful for those with limited mobility or in remote areas.

- AI can optimize drug inventory by predicting demand and preventing stockouts, resulting in better customer service and lower costs.

- AI accelerates drug discovery by analyzing large data sets, enabling the identification of more promising drug candidates and reducing development time and costs.

1. A U.S. company has developed an automated medication dispensing system:
   - Reduces human error and optimizes pharmacy space.
   - Improves real-time inventory management and ensures compliance with safety regulations.

2. A major Spanish company has designed a system to streamline the planning and execution of retail promotions in pharmacies:
   - Provides accurate forecasts to optimize inventory based on actual sales.
   - Allows for stock level management across the entire supply chain.
   - Enables the evaluation of promotion effectiveness.

Nextcontinent – Our expertise in AI

Given the fundamental role of artificial intelligence today, our AI service offering is designed to **deliver practical solutions** and tangible benefits. By making AI accessible, we help clients **achieve measurable improvements in efficiency, productivity, and overall performance.** We scale transformation through data and AI, ensuring strategic autonomy in core business operations. We empower businesses by scaling AI initiatives, integrating AI–driven automation, upskilling teams, and formulating holistic AI strategies for business growth.

We have global scope, and our expertise spans a wide range of applications as outlined below:

- Raising awareness about Artificial Intelligence
- Providing advanced analytics and insights: including machine learning and visualization
- Developing clustering algorithms: for customer base analysis and classification
- Creating multilingual SEO-oriented editorial article systems
- Implementing virtual assistants
- Offering chatbot and comprehensive support assessment services
- Utilizing AI accelerators: like GEDI, Otto, Predictor for maximum data value extraction
- Creating framework to deduplicate customers, products, and other objects using AI

We will illustrate this expertise by delving deeper into some of **our assignments** in the subsequent section.

Success case — Health Insurer

Error detection and Data quality management – Health Provider Database

The objective of this project was to manage and optimize the health provider database following some errors and inconsistencies in the data. This information is necessary for the management of key business indicators such as the cost of services, as well as for related processes like provider profiling, loyalty and fraud monitoring and detection. These improvements will ultimately enable the prediction of provider and beneficiary behavior.

Challenges

Having a reliable database of health care providers

Optimizing processes through technological innovation

Creating data quality indicators

Continuing to strengthen information governance and management within the organization
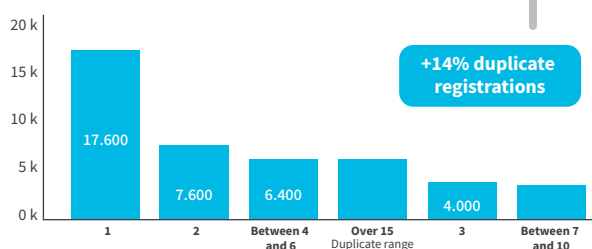
What We Do?

Systematic error detection

Correction/ Cleaning of data

Construction and Following of the Monitoring Dashboard

Identification of errors

Algorithm
Groups records by a key field and compares with other fields in each record

Analysis of error

Assurance of origin
Validations:
- Changes in systems
- Changes in the process
- Standardizing procedures and criteria

Periodical Analysis of the board

Result

250,000 Provider registers in force

Number of duplicates by error code

17.600	1
7.600	2
6.400	Between 4 and 6
	Over 15 (Duplicate range)
4.000	3
	Between 7 and 10

+14% duplicate registrations

Duplicate cases identified in the registers:

- Different codes for same provider
- Deficits in loading key data into registers
- Typing errors
- Patterns of kinship involving fraud and cohabitation database alerts

It Will Make It Possible To:

- Improve the calculation of the cost of benefits
- Optimize resources and freeing up equipment for higher value-added tasks
- Predict behavior

Success case ———————————— Health Provider

AI applied to Chest X-ray environment

ENTELAI

This customer, based in Lima, Peru, is one of the country's most important labor insurance screening centres. With a network of 9 sub-centers and remote facilities, they provide medical support to mine workers across the nation. They requested an automated system to enhance productivity, accuracy, and efficiency in screening their workers and patients, handling a volume of approximately 8,000 patients per month.
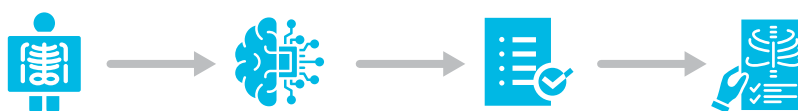
Challenges

Objectives:
- Screen all patients with a chest x-ray indication.
- Give a pre-diagnostic notion to technologists.
- Increase productivity and accuracy.

Challenges:
- Set-up all equipments involved.
- Set-up all equipment parameters/fields to be recognized in an automation workflow.
- Train and educate technologists and doctors on the new technology.

What We Do?

We selected one centre to assess the system's accuracy and demonstrate the impact of AI workflow on their routine operations. We carefully selected, configured, and set up all equipment and servers involved. Additionally, we provided training to both medical and technical staff. Subsequently, we initiated and conducted a three-month trial of the AI software in the initial phase.

The KPIs selected for this stage were: accuracy, discordance percentage and processing times (time needed for each report to appear in the doctor's worklist).

Result

We obtained the following results :
- 91% of results coincided with doctors.
- 8% of results did not coincide with doctors, with IA marking something that doctors did not advise.
- 1% of cases were not detected by IA.
- Processing average time: 10 minutes per patient.

Results are showing a consistence accuracy above 90% depending on the radiologic finding and shows a strong performance in terms of reliability. The time to review each patient is reduced as the reports are available in less than 10 minutes. That enables successful implementation of these algorithms, particularly in centres dedicated to work insurance screening and chest specialties.

Success case ———————— Health Provider

Orthopedics: Driving clinical, operational and commercial excellence

Orthopaedics is one of the most common specialization in healthcare and can represent a significant activity for Providers in the UK. Implants can account for 20-50% of total procedure cost. This solution for Orthopaedic data analytics allows hospital management, clinical teams and surgeons to obtain data transparency, generate actionable insights and drive substantial benefits in cost, quality and outcomes.

Challenges

Hospital management lack complete data or transparency to understand implant selection decision-making by Orthopedic surgeons within and across hospitals.

Implant cost, quality and outcomes vary significantly by implant brands and manufacturers.

What We Do?

STEP 1:
The algorithm "stitches" together data from multiple internal and external sources

Internal Source
- Patient Data
- Procedure Data
- Surgeon Data
- Cost Data

External Source
- Quality Ratings
- Patient Outcomes

STEP 2:
The algorithm automates hip and knee system categorization, whilst "pulling-in" Quality and Outcome data

STEP 3:
Data visualized in a dashboard format allowing insight to translate into action to improve the cost, quality and outcome by surgeon and hospital

Result

Savings

£4,000,000 (15-20%)

Matching the most appropriate implant system to the patient profile based on age, gender, activity level, etc.

Data transparency on revenue, cost, profitability, quality (e.g. ODEP ratings) and outcomes (e.g. revision rates)

Data driven analysis and actionable insights supported by easy-to-use Dashboard

Standardized processes to ensure consistent patient and surgeon experience

Hospital league table to drive operationall, commercial and clinical excellent

Success case — Health Provider

Anticipation of covid with demand forecasting algorithm

ROCKINGDATA

In the context of COVID-19, the hospital utilized a demand prediction algorithm to anticipate the surge in patients that the intensive care unit would experience due to the pandemic. This enabled strategic decision-making based on data to determine shifts and staff rotation, ensuring safer and more effective coverage of the situation..

Challenges

Difficulty in strategic decision-making

Limited hospital resources

Difficulty predicting demand

What We Do?

Self-training and learning

- Specific information of patients in the sanatorium, discharged patients, employees and historical data of the sanatorium
- Curves of the whole year
- Different restrictions implemented

AI Algorithm

Demand prediction algorithm for strategic decision making.

Make data-based predictions of how many people will be admitted with COVID-19 pathology in the next 15 days.

Result

Analyzing 3 months
of history of patients admitted with COVID-19 pathology

85% in the prediction of case demand, represented by the increase in patients.

With the implementation of this algorithm, the sanatorium was able to **predict 2 weeks** in advance the workload it would have.

It Will Be Possible To:

- Foresee what resources would be needed (beds, staff reinforcement, and others) to cope with the increase in cases.

Success case ——————— Pharma Industry

AI training for the Procurement Management team

Given the speed at which AI is advancing, companies are starting to research and learn about new technologies. In this case, a pharmaceutical company sought to learn about what artificial intelligence is and what its benefits are for the Procurement department.

What We Do?

The training was conducted for the company's purchasing management team, with managers from different countries attending. It consisted of:

- Explaining the main concepts of AI, models, and types of training.

- The difference between AI and Generative AI.

- What Microsoft Copilot is, its applications, and benefits.

- How AI can be leveraged by the procurement department.

- Which artificial intelligence platforms can be implemented in the world of purchasing.

- SAP's Joule module.

- Discovery and analysis of pain points

Result

4 Workshops → **8** Managers → **6** Regions → **Top 10** Pharma procurement pain points

BIG AND INNOVATIVE IDEAS TO IMPLEMENT BETWEEN 2024 AND 2027:

- New Platforms
- New APIs
- AI
- GEN AI
- RPA
- RPA + AI

3 Key Challenges and Roadblocks

Challenges and Roadblocks	Overview
Data Challenges	**Inconsistencies and quality issues of healthcare data:** Implementing AI in healthcare faces significant hurdles due to data inconsistencies and quality issues. Incomplete, inconsistent, and inaccurate data hinders AI's potential. Fragmented formats and standards impede interoperability and analysis
Security, Ethical, and Regulatory Challenges	**Handling sensitive health information by AI systems raises significant concerns about privacy, data protection, and the risk of data breaches:** safeguarding Protected Health Information (PHI) with robust privacy measures to meet legal standards, while also addressing ethical considerations raised by AI applications in healthcare, demands a deliberate and conscientious approach. Any data breaches, misuse, or unauthorized access to protected health information can have severe consequences
Infrastructure Limitations	**The absence of standardized infrastructure,** often costly and not easily scalable or accessible, presents a major obstacle to efficient AI model training and execution. Additionally, these point solutions typically lack integration with other systems, resulting in underutilized equipment and asset sprawl
Skills Gap	**A notable skills gap persists across key technical disciplines crucial for AI implementation.** Investing in staff education and upskilling is essential to harness the benefits of AI in healthcare. The evident demand for skilled AI and data science professionals is outstripping available talent, with more open positions than qualified candidates
Financial Barriers	**Financial barriers, including high initial investments, ongoing maintenance costs, and various other expenses** associated with AI integration, present formidable challenges to its successful implementation in healthcare, impeding widespread adoption

3.1. Data Challenges

Causes

- Fragmented and incomplete health data arise from decentralized systems, lack of standardization, data entry errors, workflow challenges, and reliance on legacy systems, hindering data accuracy and consistency. This is a common issue in the healthcare industry worldwide.

Impact

- Consequently, healthcare data is frequently incomplete, inconsistent, and inaccurate.
- Biased and inaccurate data can perpetuate healthcare disparities and compromise patient outcomes. The lack of consistency in data formats and protocols impedes the exchange and comparison of information among diverse healthcare providers.
- Without normalization, the accuracy and reliability of AI models may be compromised, leading to suboptimal performance and prediction errors.

Future Outlook

- There are ongoing efforts to improve data collection in the healthcare industry, continuously evolving to enhance the accuracy, efficiency, and ethical standards of healthcare practices.
- In Thailand, NSTDA partnered with the Public Health Ministry's Department of Medical Services, Mahidol University, to boost medical AI by improving data sharing, expanding datasets for AI training, and promoting R&D for accessible medical data, driving innovation in the sector.
- In the US, the Government Accountability Office (GAO) invested in data infrastructure, interoperability standards, and data sharing mechanisms across healthcare systems to enhance data quality and availability for advancing AI tools in healthcare development and testing.

Illustrative Case

University Hospital in Norway

- **Overview** :The hospital employs a digitalization process for Electrocardiograms (ECGs), a medical test measuring the heart's electrical activity, utilizing machine learning models to detect heart conditions.
- **Challenges :** However, the hospital faced challenges with low data quality in the records. This issue arises from healthcare data being noisy, incomplete, or inconsistent, presenting hurdles for machine learning algorithms reliant on high-quality input data.
- **Impact :** Poor data quality negatively impacts the ability to predict the health condition of the hospital's patients, particularly concerning heart conditions.

3.2. Security, Ethical, and Regulatory Challenges

Causes

- It is believed that past regulatory actions may impede the advancement of AI within healthcare, as these laws were not designed with AI in mind.
- The current regulations are struggling to keep up with the rapid development of healthcare AI technologies and improving regulatory frameworks.
- AI technology companies face difficulty in maintaining their technologies to meet regulatory standards due to the changes in the substance and scope of domain data.

Impact

- Laws obstruct the fast-paced improvement of AI technologies in healthcare with various limitations.
- Unstandardized AI technologies create inconsistencies in diagnostic outcomes over time.
- With the weak regulatory framework, there is no adequate protection of patient data, it can be collected without their consent.
- Also, the vague privacy policy that consumers may not fully understand, allows companies to secretly collect patients' data.

Future Outlook

- The outlook for addressing security, ethical, and regulatory challenges in healthcare hinges on proactive collaboration, innovation, and a shared commitment to advancing patient safety, privacy, and equity in the era of AI-driven healthcare.
- In the US, concerns persist regarding the integration of AI in healthcare. For instance, a study by the Pew Research Center revealed that 60% of Americans express distress when healthcare providers adopt and depend on AI technologies.

Illustrative Case

Hospital in Missouri, USA

- **Overview:** The hospital uses AI for predicting and managing bed availability, staffing, performing mammogram analysis, taking patient notes, and answering messages from patients.
- **Challenges:** Regulators are beginning to consider how to regulate the use of AI to prioritize benefits over potential harm. Once regulations are established, hospitals must comply with them.
- **Impact:** It raised concerns among patients as currently, hospitals are not required to disclose the involvement of AI in their healthcare management.

3.3. Infrastructure Limitation

Causes

- Lack of standardized infrastructure hinders AI integration, making implementation across healthcare systems complex and inefficient.
- Graphical Processing Units (GPUs) are essential for AI training but face challenges due to high cost, limited scalability, and restricted availability in healthcare settings.
- Proprietary vendor solutions complicate infrastructure, leading to underutilized equipment and asset sprawl.

Impact

- Infrastructure limitations in implementing AI in the healthcare sector can hinder progress towards a more efficient, equitable, and patient-centered healthcare delivery.
- AI applications cannot alleviate the shortage of healthcare workers in developing countries, particularly across Asia and Africa.
- AI-driven screening systems, including cancer diagnostic tools tailored for rural regions, cannot be implemented.

Future Outlook

- Efforts to improve data infrastructure in the healthcare industry are continuously underway to enhance the efficiency, interoperability, and security of healthcare data systems.
- Leading tech companies in China are investing in AI-driven clinics customized for rural areas. This includes chatbots offering medical advice, engaging with patients, and providing online training for rural healthcare workers.
- The government of India has collaborated with several leading AI technology companies to implement AI projects with the motto of 'AI for all' in which there is no need to address the challenges of access, affordability, and shortage.

Illustrative Case

Hospital in Btangkok Thailand

- **Overview:** The use of 5G technology has enabled the hospital to incorporate various AI and robotics innovations into the hospital's operations and processes.
- **Challenges:** There is still some concern about the quality of IT infrastructure supporting these innovations
- **Impact:** It has been noted that the adoption of AI technology might pose challenges for hospitals accustomed to traditional data collection methods, as AI relies heavily on existing infrastructure and data management practices.

3.4. Security, Ethical, and Regulatory Challenges

Causes

- Business expertise in specific healthcare domains, data science, and AI engineering are three crucial skillsets needed for every AI initiatives.
- There is the gap between the educational knowledge of graduates and the practical skills required in the workplace.
- More than 1 in 3 healthcare providers face a shortage of workers with necessary IT skills.

Impact

- High demand for skilled professionals in AI and data science. The shortage of workers with the necessary IT skills hinders the effective implementation and operation of AI in the healthcare sector.
- The additional time allocated to understanding AI algorithms may further burden physicians, exacerbating burnout.

Future Outlook

- Healthcare tech professionals will see major role shifts, needing essential AI skills: understanding algorithms and integrating them into systems for optimal performance will become the norm.
- The healthcare jobs most likely to be automated are those focused on managing digital data, such as radiology and pathology, rather than those involving direct patient interaction.
- In the US, The U.S. Bureau of statistics is projecting a staggering 36% growth in data scientist employment from 2021 to 2031. This trend may have a a positive impact towards the healthcare ecosystem.

Illustrative Case

Hospital in the UK

- **Overview:** The hospital utilizes data for enhancing healthcare results and making data-driven decisions to improve healthcare services by hiring IT specialists, including Data Scientists.
- **Challenges:** However, NHS faced a lack of data scientists. It was difficult for the hospital to identify, hire, and retain people with data science skills critical to the operation of the hospital system.
- **Impact:** The hospital may face a cost surplus due to inefficient operations and systems, hindering its ability to provide exceptional healthcare services to its patients.

3.5. Financial Barriers

🗂 **Causes**	⊗ **Impact**	🔭 **Future Outlook**

Causes

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- There is the gap between the educational knowledge of graduates and the practical skills required in the workplace.
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💼 **Illustrative Case**

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4 Outlook / Conclusion
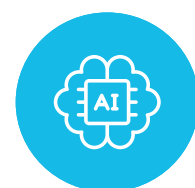
AI offers great potential to transform healthcare, improving diagnosis accuracy, operational efficiency and personalization of treatment. However, its effective implementation requires carefully addressing several challenges, such as data privacy, equity of access and ethical responsibility. It is essential that health providers consider how they can ethically and effectively integrate AI into their clinical practices, while keeping patient well-being at the center of their practice. In addition, collaboration between all relevant stakeholders, including clinicians, data scientists, regulators and patients, is essential to ensure that AI is used responsibly and benefits the greatest number of people.

AI is increasingly being used by health insurers to improve underwriting, detect fraud, manage customer care, analyze data to improve health, and automate internal processes. These applications have the potential to improve operational efficiency, reduce costs and improve the overall customer experience in the health insurance sector.

The integration of AI in Pharmaceutical Industry is not only accelerating the discovery and development of new medicines but is also improving operational efficiency and enabling a more personalized and effective approach to patient treatment. This promises to profoundly transform the industry in the coming years.

The implementation of AI in community pharmacies not only promises to improve operational efficiency and dispensing accuracy, but also offers the opportunity to improve customer care and clinical support. As technology continues to advance, we are likely to see even greater adoption of AI solutions in the pharmaceutical sector, which will bring additional innovations.

4.1. Health Provider

Insights

Positive Impacts of AI Integration

AI-Powered Brain images Software Revolutionizes Healthcare Diagnostics and Treatment
- The integration of AI in healthcare has the potential to revolutionize patient care by enhancing diagnostic capabilities to create more accurate treatment outcomes, enabling personalized treatment approaches to improve patient results, facilitating remote monitoring to reduce the need for in-person visits, and enhancing data analysis to provide valuable patient insights for health providers.

Current Situation

Disparate Adoption
- The adoption rate of AI in hospital varied widely across different regions and healthcare settings. Generally, larger hospitals in developed countries tend to adopt AI technologies at a higher rate compared to smaller facilities or those in developing regions.

Challenges
- The adoption rate of AI in hospitals is influenced by several factors, notably financial barriers. Limited healthcare budgets in regions, particularly in developing countries as the implementation and maintenance of AI entail substantial expenses.
- Furthermore, infrastructure limitations. The absence of standardized infrastructure and reliance on proprietary vendor solutions hinder progress in this domain.

Looking Ahead

Disparate Adoption
- The adoption rate of AI in hospital varied widely across different regions and healthcare settings. Generally, larger hospitals in developed countries tend to adopt AI technologies at a higher rate compared to smaller facilities or those in developing regions.

Addressing challenges and fostering collaboration for responsible AI integration
- AI holds significant promise for rephasing health providers. It represents a notable advancement in the field, with the potential to transform the delivery of medical services.
- To fully embrace AI in healthcare, it's essential to address various challenges, including concerns about privacy, ensuring fair access to AI technologies, and upholding ethical standards.
- Collaboration among stakeholders – such as clinicians, data experts, regulators, and patients – is vital to ensuring responsible AI integration and maximizing its societal benefits.

4.2. Health Insurer

Insights

Positive Impacts of AI Integration

Improving Efficiency and Customer Experience
- Health insurers are progressively utilizing AI to enhance underwriting, detect fraud, handle customer care, analyze data for health improvement, and automate internal operations. These applications hold promise for boosting operational efficiency, cutting costs, and enhancing the overall customer experience within the health insurance industry.

Current Situation

Disparate Adoption
- Currently, AI implementation within the health insurance industry is considered moderate, with around 60% of health insurance companies having either implemented or being in the process of implementing AI as part of their workflow, according to a study by Conning.
- AI in health insurance industry are usually for data processing, streamlined communication, and fraud detection. The study examines AI's impact on sales, underwriting, operations, claims processing, risk control, and pricing. AI algorithms enhance underwriting accuracy and efficiency by analyzing extensive data sets, facilitating faster decision-making and minimizing errors

Challenges
- The health insurance industry grapples with data access challenges and a talent shortage in data science expertise. While AI offers advantages, it should complement human judgment in claims handling. This underscores the need for ongoing training and the balancing of technology with human expertise

Looking Ahead

Addressing data access challenges and talent shortages in data science leads to increased adoption
- Over the past years, the insurance industry has rapidly embraced artificial intelligence, with a noticeable surge in adoption rates, signaling a strong trend towards future adoption
- As data access challenges and talent shortages in data science are tackled, AI's future in health insurance promises transformative improvements in operations and customer service. This includes streamlining administrative tasks, enhancing data analysis, improving fraud detection, and optimizing customer interactions. Evolving AI technologies offer insurers opportunities for innovation, efficiency, and enhanced outcomes for policyholders

4.3. Pharmaceutical Industry

Insights

Positive Impacts of AI Integration

Transformative Impact of AI Integration in Pharmaceutical Innovation and Operations
- Pharmaceutical manufacturing firms can benefit from adopting artificial intelligence (AI) technologies.
- The integration of AI in the pharmaceutical industry is not only accelerating the discovery and development of new medicines but also enhances efficiency, quality control, and drug discovery. It enables personalized medicine, optimizes supply chains, reduces costs, and facilitates drug repurposing.

Current Situation

High Adoption
- AI is currently being widely adopted in the global pharmaceutical industry, with over 95% of pharmaceutical companies investing in AI capabilities, according to a study by Scilife.
- Adoption levels and investment vary among pharmaceutical manufacturing firms. While some companies heavily utilize and invest in AI to enhance efficiency, quality control, and drug development, others are still in the nascent stages of implementation

Challenges
- However, challenges persist in its integration, including issues regarding transparency, data availability, biases, interpretation complexities, ethical considerations, navigating the intricate nature of biological systems, and a scarcity of clinical expertise

Looking Ahead

The future of AI is set for sustained growth and innovation, as existing challenges are expected to decrease
- The future of AI in the pharmaceutical industry holds significant promise and potential. As technology continues to advance, AI integration is expected to become more widespread and sophisticated. Pharmaceutical companies will likely leverage AI capabilities to further enhance efficiency, accelerate drug discovery, and improve patient outcomes.
- Advancements in AI algorithms and data analytics will help address existing challenges such as transparency, data availability, and biases. Collaboration among industry stakeholders, regulators, and AI experts will be crucial for navigating ethical considerations and ensuring responsible AI adoption.

4.4. Community Pharmacy

Insights
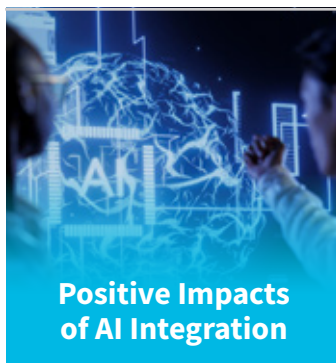
Positive Impacts of AI Integration

Improve work efficiency and assist Pharmacists' daily tasks
- Pharmacists use AI to choose the drug and dosages, perform administrative work, detect and prevent medication errors, assist in developing treatment plans, and predict drug demand.
- With the benefits, pharmacists have additional time to perform other tasks, and patients have a better quality of health due to fewer errors.

Current Situation

Moderate Adoption
- Pharmacists show positive attitudes and willingness toward AI and using AI in pharmaceutical tasks. They believe this AI will help them work more efficiently. A research from National Library of Medicine shows pharmacists' willingness to implement AI technology was high, with a median score of 72 out of 80.
- Even though more pharmacists intend to implement AI, there are a few specific AI-related software and hardware for pharmacists to utilize, and it obstructs AI adoption among pharmacists.

Challenges
- When pharmacists start using AI software and hardware, they need careful human monitoring to ensure everything works effectively, especially since this technology is still new. This need for oversight drives up the costs of using AI, as only a few companies can build these complex systems. Furthermore, many patients are worried about how their personal information is handled, fearing it might be used for business purposes. This concern makes the adoption of AI in healthcare more complicated.

Looking Ahead

Pharmacists and AI companies collaborate to enhance Community Pharmacy efficiency through AI integration and guidelines crafted by governments.
- There will be an increasing use of AI among pharmacists due to their interest in AI. Furthermore, governments pay more attention to AI in Community Pharmacy, and they are crafting guideline to streamline AI's integration into Community Pharmacy care.
- On the other hand, there should be more collaboration between pharmacists and AI companies to help develop AI for pharmacies to enhance efficiency and operation cost reduction, and these benefits will allow locals to access excellent healthcare.

Conclusion

In conclusion, while the expansion of artificial intelligence (AI) in healthcare promises significant advances, it also faces persistent challenges related to data quality and interpretation. To maximize its benefits and mitigate associated risks, it is essential to ensure close collaboration between regulators, industry and the scientific community.

It is essential to prioritize investment in connectivity and access to computing, strengthen education systems and foster cross-border collaboration to ensure effective and ethical implementation of AI. In addition, rapid progress in the regulation of AI, geared towards societal challenges, is imperative to mitigate biases and encourage accountability in its use.

AI is transforming healthcare towards more patient-centered and data-driven models. However, this requires a collaborative approach to ensure that all sectors of society benefit, and that ethical and equity concerns are addressed.

Although artificial intelligence (AI) has been around for a considerable period and its application areas have become more targeted, we cannot ignore its growing presence in various domains, including healthcare. If we commit to understanding and adapting to its evolving potential, we can drive significant improvements in health and well-being globally.

Who We Are

We are a major international network of consulting firms that we like to call *Citizens*.

12 citizens:
diverse, independent consulting firms

30 countries:
in Europe, Americas, Asia, Oceania and Africa

71 offices:
in most major cities in the world

3,000 consultants:
professionals in the global Nextcontinent network

Vision

Who do we want to be in 5-10 years?

We will be competing successfully in the top tier of the management consultancy market as a big, broad, strong international network of independent consulting firms, having aggregated all our strengths.

We will be known for maximizing results for clients through local and global expertise.

- Recognized as an attractive, alternative model to traditional global consultancies — differentiated by being more pragmatic, outcomes-focused, people-centred, tailored in approach, and attuned to local client cultures

- Seamlessly collaborating to innovate and deliver the results that matter most to our clients — unlocking value through synergy of worldwide expertise and local market knowledge

- Stronger together — each Citizen's independence strengthened through our global reach, blending world-class teamwork with agile, flexible, personalized service to local clients

Thank you

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Keeping the Patient at the Center of Innovation