INFORMATION TECHNOLOGY PROGRAMME

INFO712 Management Information Systems

Assignment 3
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Cover Page

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Chosen Industry and Company Context Overview -Healthcare Sector

The healthcare industry is one of the very critical and regulated sectors globally, characterized by rapid technological evolution, growing patient expectations, and increasing pressure to deliver efficient, secure, and patient centric services.

Over the past decades, the healthcare organisations has faced the rising demand for digital care options like telemedicine, electronic health records, real-time patient monitoring, and data-driven decision-making.

Also,the compliance with evolving cybersecurity and privacy standards like HIPAA, GDPR, and national health data regulations it has become must as cyberthreats targeting healthcare providers continue to rise.

Despite this, many long-established organisations are still operating with legacy systems, manual workflows, and fragmented data infrastructures that limit operational efficiency and create security vulnerabilities.

Considering, a mid-sized healthcare service provider - **Med Care Services Ltd,** which has been operating for last 20 years in general outpatient care, diagnostics, and chronic disease management. The company has more than 350 staff members across three clinics, serving around 45,000 active patients annually. Its core processes include patient registration, appointment scheduling, lab test management, medical record handling, billing and insurance claims, and routine patient communication.

Over the years, Med Care has been relying on disparate legacy software systems and significant manual processes, especially in administrative and clinical documentation workflows.

Due to growing market, from digitally advanced healthcare networks and online-first clinics, Med Care has been struggling to maintain service speed, data accuracy, and patient

satisfaction. Operational inefficiencies like long wait times, paper-based data entry, and limited integration between departments has added to internal bottlenecks.
Recently, the company has experienced a data breach, exposing limited patient and operational information due to outdated security protocols and unpatched legacy systems. It highlighted major gaps in cybersecurity posture, system integration, and data governance.

The leadership now has started working on the urgent need for modernization, prioritizing the transitioning to a unified digital health platform, automating critical workflows, adopting cloud-based infrastructure, and strengthening cybersecurity practices.
Now, Med Care's objective is to enhance patient experience, improve internal efficiency, and remain competitive in a fast-digitizing healthcare landscape.

The diagrams below illustrate the above descriptions:

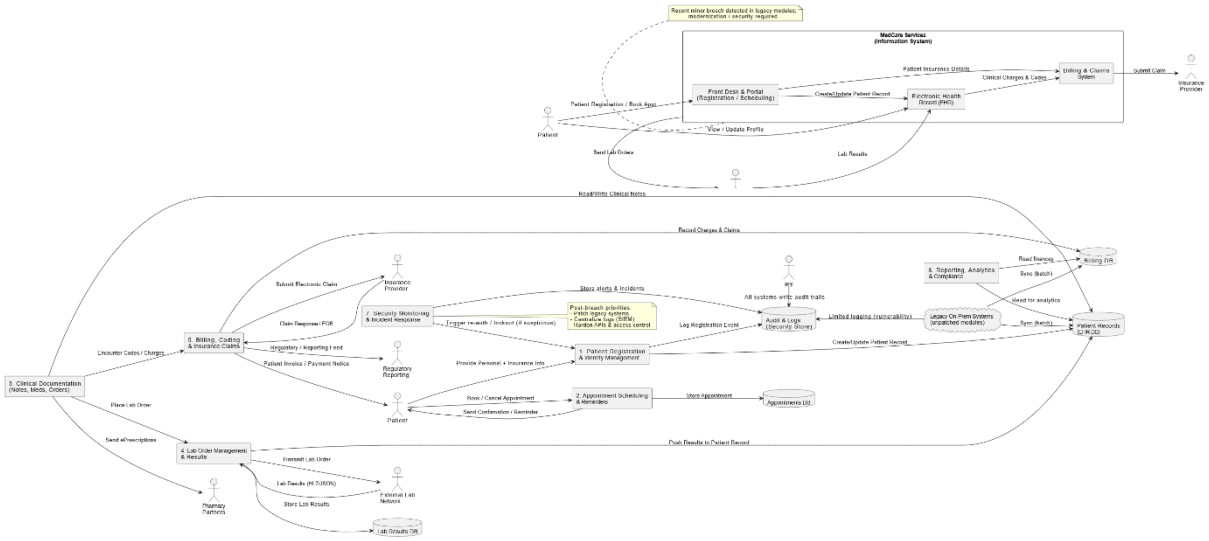

DIAGRAM 1

SECTION A: INDUSTRY ANALYSIS

Answer To Q1-

Identifying and analysing the key business processes and proposing and justifying the re-engineering plans for Med Care services ltd.

1. **Patient Registration & Appointment Management**

Current issues-

Totally reliant on manual data entry and paper forms

Long waiting times and huge appointment errors

No automated reminders which lead to high no-show rates

Re-Engineering Plan-

Implementing a cloud-based patient portal for self-registration, online bookings, and real-time appointment updates

Integrating the digital identity verification such as biometrics, two-factor authentication.

Deploying a AI-driven scheduling tools to optimize provider availability and reduce bottlenecks

Introducing an automated SMS/email reminders by using tools like Twilio or may be Azure Communication Services

Justifying the benefits-

Will reduce the administrative workload

Will have less errors in patient data

Will have higher appointment attendance rates

Will have improved patient experience and faster service intake

A) Clinical Documentation & Patient Care Workflow

Current issues-

Fragmented electronic and paper-based records

Delays in documentation and poor interdisciplinary communication

Limited remote monitoring capabilities

Re-Engineering Plan-

Adopting a modern Electronic Health Record (EHR) system like Epic, Cerner, or Azure Health Data Services with integrated clinical pathways

Using a voice recognition & AI documentation tool such as Nuance Dragon Medical, Microsoft Copilot) which will reduce manual typing

Deploying a IoT-enabled patient monitoring devices for chronic disease management

Implementing a telehealth platform for video consultations, remote triage, and digital prescriptions

Justifying the benefits-

Will have faster clinical decision-making

Will improve accuracy of records

Will reduce clinician workload and burnout

Continuous care for chronic patients, enhancing the outcomes

A) Lab Orders, Test Results & Diagnostic Workflow

Current issues -

- Manual lab orders vulnerable to errors
- Results delivered via scanned PDFs
- Delayed communication between lab and clinicians

Re-Engineering Plan-

- By Implementing the HL7-FHIR-based interoperability to digitally exchange lab orders and results
- Integrating an automated lab result routing directly into EHR
- Using the AI diagnostic support to flag abnormal values for faster clinical response

Justifying the benefits-

- Will reduce the turnaround time
- Will improve the patient safety
- Will have high-quality data for analytics and reporting

B) Billing, Claims & Financial Management

Current issues -

- Manually coding and claim submissions
- High claim rejection rates due to missing data
- Limited visibility into financial performance

Re-Engineering Plan-

- Introducing an automated medical coding system
- Deploying an integrated billing platform with real-time insurance eligibility checks

- Using a\\\\\\\\\\\\n RPA (Robotic Process Automation) to automate repetitive tasks like invoice generation and payment posting
- Building an interactive dashboard by using Power BI or Tableau for financial insights

Justifying the benefits-

- Will reduce the claim errors and revenue leakage
- Will fasten the reimbursement cycles
- Will enhance the financial transparency for strategic planning

C) Cybersecurity & Compliance Management

Current issues -

- Legacy systems highly prone to breaches
- Lacking the centralized audit logs
- More reactive rather than proactive monitoring

Re-Engineering Plan-

- Implementing a cloud-based SIEM solution for real-time security analytics
- Enforcing the zero Trust security framework with role-based access control
- Applying the automated patch management and vulnerability scanning
- Encrypting the all data using AES-256 and TLS 1.3 standards

Justifying the benefits-

- Will have higher resilience against cyber threats
- Will be compliant with regional health data regulations
- Enhanced patient trust and operational stability

Overall enhanced Impact on Efficiency and Competitiveness

The proposed re-engineering will transform the Med Care Services Ltd into a digitally enabled, patient-centric, and secure organization. Automation will reduce the manual workloads, IoT will improve the clinical accuracy, cloud platforms enhance interoperability, and AI will enhance the decision-making.

Altogether, these advancements will increase the efficiency, reduce operational costs, elevate care quality, and will strengthen the company's position against digital-first competitors.

Answer to Q2-

Discussing, how Information Systems Drive Operational Excellence in MedCare Services Ltd

Information systems (IS) play a central role in improving efficiency, service quality, and strategic competitiveness within the healthcare industry. For MedCare Services Ltd which is an established mid-sized provider facing legacy system challenges,the modern information systems can transform fragmented operations into an integrated, streamlined, and secure digital ecosystem. By digitising and connecting core workflows like patient registration, clinical care, diagnostics, billing, and compliance, MedCare will reduce the errors, speed up service delivery, and enhance the overall patient experience.

IS supports operational excellence by enabling:

- Real-time access to accurate patient information
- Automation of repetitive administrative tasks
- Improved coordination across departments
- Faster, data-driven decision-making
- Stronger cybersecurity and auditing capabilities

Implementing an Industry-Tailored Enterprise System

To correct the inefficiencies and modernize operations, MedCare must implement a unified Healthcare Enterprise Resource Planning (ERP) system integrated with Customer Relationship Management (CRM) and Supply Chain Management (SCM) components. This holistic platform will enable the seamless communication across clinical, administrative, and financial systems.

1. ERP for Healthcare Operations

A healthcare ERP like Microsoft Dynamics 365 Healthcare Accelerator, SAP for Healthcare, and Oracle Health will integrate -

- Patient information management
- Appointment scheduling
- Resource allocation - rooms, equipment, staff.
- Billing and insurance workflows

- Inventory and supply chain processes

How ERP will Optimize MedCare -

- Single source of truth: -All departments will share the same patient and operational data.
- Automated billing & coding will reduce the claims rejection and will speed up the reimbursement.
- Resource optimization - ERP analytics help balance provider workload and reduce patient wait times.
- Integrated audit logs will simplify the compliance with health data regulations.

2. CRM for Enhanced Patient Engagement

A healthcare-specific CRM like Salesforce Health Cloud will support -

- Personalised patient communication
- Automated reminders and follow-ups
- Feedback collection
- Chronic disease outreach programs

Improvements for MedCare- services -

- will reduce the appointment no-shows by automated SMS or email reminders
- Enhanced patient retention through targeted communication
- Increased patient satisfaction with proactive engagement

3. SCM for Medical Supplies & Diagnostics

Healthcare SCM will ensure the accurate tracking of -

- Medicine stock
- Lab supplies
- Equipment maintenance schedules
- Procurement from approved vendors

Benefits for Med Care -

- Prevention of stockouts affecting patient care
- Automated purchase orders for low inventory
- Lower waste and expiry of medical supplies

- Reduced manual reconciliation by staff

Examples of Specific Improvements for Med Care -

a. Operational Efficiency

- Lab results automatically will integrate into the EHR through ERP, cutting the result delivery time from days to minutes.
- Staff scheduling will become automated, reducing overtime costs and burnout.

b. Clinical Quality

- Doctors will be able to access the complete patient histories from a single dashboard, enhancing the diagnostic accuracy.
- IoT-enabled vitals monitoring will feed the real-time data into the ERP for chronic care management.

c. Financial Performance

- ERP-driven coding automation will reduce the claims errors by up to 40%.
- Real-time dashboards will help to identify profitable service lines and bottlenecks.

d. Security & Compliance

- Centralised identity management and audit trails will reduce the breach risk and will support the investigations.

Concluding the above-

By adopting an integrated ERP–CRM–SCM enterprise system, MedCare will shift from fragmented, manual processes to a coordinated, data-driven healthcare operation. These systems collectively will enhance the efficiency, accuracy, patient experience, and financial stability which will enable MedCare to remain competitive in a rapidly digitalising healthcare sector.

Answer to Q3

This section evaluates the current cybersecurity weaknesses at Med Care Services Ltd, along with suggested improvements for the healthcare sector. A recent security breach has revealed several threats and weaknesses tied to the outdated IT infrastructure and mismatched systems at Med Care Services Ltd. The organization continues to use old clinical and administrative platforms, which lack strong security measures like centralized monitoring, proper encryption, and regular updates. Cybercriminals in the healthcare field target sensitive information such as medical history, lab results, billing data, and patient identification details. This breach could lead to identity theft, insurance fraud, disruptions in clinical care, and fines for not complying with regulations like HIPAA, GDPR, and national health privacy laws. The main weaknesses at Med Care include outdated software that hasn't been updated, weak authentication methods, unclear visibility of network activity, and no network segmentation among internal systems. Relying on manual workflows and shared devices increases the risk of errors in data handling and unauthorized access. Additionally, staff members lack cybersecurity training, making them more vulnerable to phishing, ransomware, and social engineering. These are common threats in the healthcare sector. To improve security, Med Care needs to adopt a layered approach to cybersecurity. First, they should encrypt electronic health records, lab data exchanges, and communication channels using AES-256 and TLS 1.3 for end-to-end encryption. This will protect data from being decrypted even if intercepted. Implementing multi-factor authentication and role-based access control will further limit system access based on job functions, reducing the risk of credential theft. A Security Information and Event Management platform is necessary to centralize logs, identify real-time anomalies, and provide forensic analysis after a security breach. Combining this with an intrusion monitoring and prevention system can scan network traffic and stop malicious actions automatically. Automated patch management and vulnerability scanning tools will help keep systems maintained continuously. Additionally, implementing network segmentation will ensure that EHR systems, lab data, billing, and public-facing networks remain separate, reducing the risk of lateral movement during a breach. Regular cybersecurity training and awareness programs will strengthen the human aspect of defense. Overall, these solutions address operational vulnerabilities, protect sensitive clinical information, ensure compliance with regulations, and build lasting resilience against emerging cyber threats in healthcare.

Answer to Q 4

Cloud Computing

Relocating the principal systems, including Electronic Health Record (EHR), diagnostic data exchange systems, and appointment management apps, to cloud-based storage will provide Med Care with scalable and available infrastructure that is both secure and highly available. The system is subject to automatic backups, encryption, to-the-cloud, and a strong disaster recovery that cloud-based solutions inherently offer, in addition to simplified integration of systems across various clinical locations. This is especially vital in the healthcare sector, where demand is highly differentiated and clinicians need access to patient record immediately. Besides, cloud hosting enables the interaction

to standards, including HL7/FHIR, which makes it possible to speed up the transfer of clinical data between departments and outside vendors.

However, the introduction of cloud services requires careful planning in terms of data residency limits, vendor management protocols, the cost of migration analysis, and monitoring of the compliance on a regular basis. Under good control, cloud computing will be closely aligned with the strategic goal of modernization of the Med Care, reduction of down-time, speed of workflow processes, and improvement of patient services.

Virtualization

Virtualization will enable Med Care to manage countless legacy applications and server environments under one virtual infrastructure. This combination helps to reduce hardware expenses as well as resource usage and makes the maintenance of the system easy. Virtualized environments could be patched and updated at a single point and will help deal with many security vulnerabilities that have cropped up after the recent breach incidents. To both clinical and administrative staff, virtualization of remote access to systems allows access to them without exposing raw data to endpoint devices, enabling the provision of safe telehealth and remote care delivery.

The speed of the provisioning of the virtualized servers allows adding a new testing / clinical module without the need to have any extra physical resources, which makes the digital expansion less expensive. The obstacles that may be encountered are the upfront costs of the setup, the staff training that is necessary, and the necessity of ensuring that the virtual systems are able to maintain health data standards compliance.

Cloud computing and Virtualization can contribute directly to helping Med Care to evolve into integrated digital healthcare, improve the flexibility of operations, decrease the number of manual overheads, and enhance the security of the data and the ability to meet the needs of the modern patient care delivery.

SECTION B- INDUSTRY-FOCUSED APPLICATION

Answer to Q1-

Critical Analysis: briefing about how the Information Systems Are Transforming the Healthcare Industry and MedCare Services Ltd

Information systems have become central to the transformation of the healthcare industry, reshaping how services are delivered, how patient data is managed, and how care quality is measured. Traditionally, healthcare organisations—like the hypothetical MedCare Services Ltd—relied heavily on manual workflows, siloed record-keeping, and legacy software. These outdated processes created inefficiencies, administrative burden, and heightened security risks. However, industry-wide shifts toward digital ecosystems are redefining what operational excellence means in modern healthcare.

Across the sector, Electronic Health Records (EHRs), telehealth platforms, cloud-based ERP systems, IoT-enabled patient monitoring, and AI-driven diagnostic tools have become

standard components of digital transformation. These systems streamline clinical operations, reduce human error, and enable real-time data access—capabilities that legacy systems often lack. MedCare's recent issues—such as fragmented patient data, slow administrative processing, and a minor security breach—reflect challenges faced by many healthcare providers who have yet to fully modernize.

In healthcare, the importance of integrated information systems is evident in global examples. Organisations like Kaiser Permanente (USA) and NHS Digital (UK) have implemented unified EHR and ERP ecosystems that allow clinicians, administrators, and patients to seamlessly share information. These systems have drastically improved wait times, billing accuracy, and care coordination. Similarly, telehealth leaders such as Teladoc Health demonstrate how digital platforms expand access, reduce operational costs, and create new competitive advantages. These examples mirror the direction MedCare must take to remain relevant against digital-first competitors.

For MedCare, modern information systems—including ERP, CRM, and SCM integration—are not just tools for improvement but essential components of survival. An integrated system would centralize patient data, automate repetitive tasks, and improve the accuracy of billing, appointment scheduling, and inventory management. Real-time analytics would enable faster decision-making, while enhanced cybersecurity protocols would mitigate breach risks. Such capabilities allow MedCare to operate with the same digital agility as its competitors, enhancing patient satisfaction and operational resilience.

After all, information systems are transforming healthcare from a labour-intensive, paper-based sector into a digital, data-driven service industry. For MedCare, adopting these systems is important to meet regulatory requirements, elevate service quality, and maintain competitiveness in a rapidly modernizing environment.

Pre-Digital vs Post-Digital Operations at MedCare Services Ltd

Operational Area	Pre-Digital Operations (Before Modern IS Implementation)	Post-Digital Operations (After ERP–CRM–SCM & EHR Integration)
Patient Records Management	Paper-based files stored locally; difficult to retrieve; high risk of loss or duplication.	Centralised Electronic Health Records (EHR) with real-time access, secure storage, and audit trails.
Appointment Scheduling	Manual booking via phone; frequent double-bookings; long wait times; no automated reminders.	Online appointment system integrated with ERP/CRM; automated reminders; optimized scheduling and resource allocation.
Clinical Workflow	Clinicians access fragmented patient histories across multiple systems or	Unified clinical dashboard with full patient history, lab results, and imaging

	paper charts; delays in diagnosis.	integrated via FHIR/HL7 standards.
Billing & Claims Processing	Manual coding, paper invoices, high error rates, slow claim submissions, frequent rejections.	Automated billing & coding; ERP-driven claim submissions; validation rules reduce errors; faster reimbursements.
Inventory & Supply Chain Management	Stock checks performed manually; frequent stockouts or overstocking; little visibility over expiries.	SCM system automates stock tracking, expiry alerts, vendor procurement, and predictive ordering.
Patient Communication & Engagement	Communication mostly via phone or in-person; no follow-up system; high no-show rates.	CRM automates reminders, follow-ups, satisfaction surveys, and chronic-care outreach.
Security & Compliance	Weak access controls; inconsistent data backups; high risk of breaches similar to the recent incident.	Centralised identity management, encryption, SIEM monitoring, secure cloud backups, and audit logs.
Decision-Making & Reporting	Decisions made on historical data, spreadsheets, and estimates; limited visibility into performance.	Real-time analytics and dashboards (BI tools) drive data-informed decisions across clinical, financial, and operational areas.
Telehealth & Remote Monitoring	No remote consultation options; limited ability to support chronic patients outside clinic visits.	IoT-enabled monitoring, telehealth consultations, and digital care plans integrated with the EHR.
Collaboration Between Departments	Communication gaps between clinical, admin, and billing teams; information delays.	Fully integrated ERP–CRM–EHR ecosystem enables seamless data flow and cross-department synchronization.

Answer to Q 2-

The BI strategy is driven by the need to turn large data volumes comprising icons, operational & user information (referred as patient) of Med Care Services Ltd which is a mid-size health service provider company into decision-making that purposeful to the organization. Valuable data is generated in healthcare including patient demographics, trends of appointments, diagnostic information, treatment outcomes and more as well as billing patterns and resource consumption. But because of a Med Care's inefficient legacy systems and dispersed workflow, that data is currently going to waste. Such BI plan will help the company to take informed decisions, cost optimisation and better patient care.

BI data sources and their integration strategy

Integration of estimates pulled from essential systems for reporting purposes should be collected and organized into a central BI source, as follows:

- Electronic Health Records (EHR)
- Appointment & Scheduling System
- Laboratory Information System (LIS)
- Billing and Claims Management
- Patient feedback and satisfaction surveys
- Remote monitoring devices for chronic patients with the IoT

By setting up an enterprise data warehouse or a cloud-based BI solution (e.g., Power BI, Azure Synapse, Tableau), Med Care can unify those sources and run industry-standard analytic models.

Industry-Specific BI Insights for Healthcare

The BI programme will include 3 levels of critical health care indicators and those are:

- Non-attendance of appointments and the hours of appointment booking
- TAT and accuracy of laboratory orders
- Efficacy of treatment and trends in progress of chronic diseases
- Average patient waiting time and work allocation for servers
- Points of revenue leakage, Rejection patterns on claims and Payment cycles
- Risk stratification of patients (e.g., diabetes, hypertension, geriatric care populations)

How Med Care Uses BI to Make Better Decisions

BI will provide significant insights to tactical, strategic and operational decisions. Examples include:

Reducing Appointment Bottlenecks

For example, if the BI dashboards show morning slots to have 30% no-show rate, Med Care's system can launch automated reminders or overbooking techniques indicating that slot at that time.

Enhancing Staffing Decisions

Managers are able to decide on the best number of house officers based on patient throughput and clinic length in order to prevent both under- and over-utilization of staff.

Improving Clinical Outcomes

BI is able to identify the early warning signs of deterioration in chronic patients by correlating health-related IoT data (e.g. irregular blood pressure). Doctors can also intervene sooner, and hospital admissions decrease.

Increasing Efficiency of Revenue

When a BI report indicates that fully 22% of insurance claims for the select set of diagnostic codes are rejected because of missing codes, Med Care can fix this coding problem by either introducing and training staff on automated coding programs, or speeding up their reimbursement cycles for these claims by resentencing claims with missing codes.

Accelerating Lab Results

If BI shows there are delays with batches of samples for specific diagnostics then responsible managers change lab workflows or reassign technicians and do what they need to do speed results.

Strategic Impact on Med Care Services Ltd

A solid BI strategy will turn Med Care Services Ltd into a data-driven healthcare organization in which the leadership team will be able to make accurate and fact-based decisions rather than having to make decisions based on gut feeling. By correlating patient behavior, visit trends, diagnostics effectiveness, and financial information into one comprehensive picture Med Care has the capacity to greatly enhance patient satisfaction by decreasing wait times, optimizing scheduling accuracy, and providing individualized chronic care interventions. Operational efficiency at all three clinics will also be enhanced as BI reveals bottlenecks in clinical workflows, staffing and lab processes – enabling managers to redeploy resources more efficiently. BI allows for reduction of claim rejections and revenue leakage by pinpointing the black holes present in both coding and billing processes as well help you stay financially secure. Together, BI allows Med Care to improve quality of service, become more competitive in a digital world and streamline productivity.

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