MIT MANAGEMENT EXECUTIVE EDUCATION

MIT CSAIL

MIT SLOAN SCHOOL OF MANAGEMENT

MIT COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE LABORATORY (CSAIL)

MODULE 1 UNIT 4
Assignment

DELIVERED IN COLLABORATION WITH getsmarter™

Learning outcomes:

LO5: Apply a framework for realizing strategic advantage in business.

LO6: Analyze an organization's use of technologies in support of its strategy.

Plagiarism declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

2. This assignment is my own work.

3. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as their own work.

4. I acknowledge that copying someone else's assignment (or part of it) is wrong and declare that my assignments are my own work.

Name:

1. Instructions and guidelines (Read carefully)

Instructions

1. Insert your name and surname in the space provided above, as well as in the **file name.** Save the file as: **First Name Last Name M1U4 Assignment** – **e.g., Lilly Smith M1U4 Assignment. NB:** *Please ensure that you use the name that appears in your participant profile on the Online Campus.*

2. Write all your answers in this document. There is an instruction that says, "Start writing here" under each question. Please type your answer there.

3. Submit your assignment as a **Microsoft Word document only**. No other file types will be accepted.

4. Do **not delete the plagiarism declaration** or the **assignment instructions and guidelines**. They must remain in your assignment when you submit.

PLEASE NOTE: Plagiarism cases will be investigated in line with the Terms and Conditions for Participants.

IMPORTANT NOTICE: Please ensure that you have checked your program calendar for the due date for this assignment.

Guidelines

1. There are **5 pages** and **1 question** in this assignment.
2. Make sure that you have carefully read and fully understood the question before answering it. Answer the question fully but concisely and as directly as possible. Follow all specific instructions for the question (e.g., "list," "in point form").
3. Answer the question in your own words. Do not copy any text from the notes, readings, or other sources. **The assignment must be your own work only.**

In the final module of this program, you will create a roadmap for transforming an organization using AI technologies. In each assignment included in this program, you will be required to complete activities that will inform your thinking for the completion of that final roadmap. A high-level overview of the structure for the roadmap is shown below. In this assignment, you will be working on certain aspects of the "Current state" section.

1. Executive summary
2. **Current state**
3. Proposed initiative
4. Plans of action and criteria for success

2. Question

Consider a working environment. It could be your current organization, an organization where you have previously worked, or a fictional organization. Think about the role of technology in the organization and how it assists managers and other employees with efficiency and productivity.

Now, think about the strategies the organization is currently pursuing. Write a report of between **300 and 500 words,** detailing the current state of your chosen organization. Use the following questions to guide your thinking:

- Does the organization rely on cost leadership, differentiation, or focus?
- How might AI technologies contribute to (or be inconsistent with) these strategies?
- Which strategy would you choose to emphasize in your chosen organization?
- How could AI potentially fit in with the strategy you have chosen?

- Are you able to use any of these three strategies to innovate in ways that may bring new value to the organization?

Note:

Your report should include a section detailing how AI (or other technologies) is currently being deployed in your chosen organization, as well as a section that outlines the organization's strategies. Ensure that your writing is coherent and clear.

Start writing here:

1. **Does the organization rely on cost leadership, differentiation, or focus?**

The organization is an outpatient surgical practice that conducts diagnostic/therapeutic interventional spinal procedures in addition to minimally invasive spine surgery. It is located in a four thousand square foot two floor elevator connected building in which there is a state-of-the art patient pre-operative area, an operating room and post-operative area.

One of the main strengths of the organization is its optimal use of time and resources (human/technological) in the efficient safe and effective delivery of patient care in the context of and while operating the facility to optimize its commercial and business success. The leadership recognizes that a strong economic position provides a solid foundation for the continued provision of high-quality patient care, and in this recognition, it has developed processes whereby the same type of procedures are conducted on the same day in order to minimize turnover time in between cases. This model permits the safe/effective performance of procedures in an overall shorter time frame, thus reducing operating costs while maintaining patient volume/satisfaction and economic strength.

2. How might AI technologies contribute to (or be inconsistent with) these strategies?

The principal goal of providing interventional pain and minimally invasive spine surgical procedures is to reduce pain/disability and improve patient functional activity in the most cost-effective evidence-based manner. Every patient's genetic construction and medical condition is unique and thus in theory the optimal treatment plan should specifically tailored to that patient's unique genetic-medical-pathological configuration, such that the 'perfect key' (treatment) is used for the 'perfect lock' (pathological condition). There currently exists no such process in medicine, and AI technologies could be employed in the development of such patient specific treatment The specificity of these treatment plans would, with the collection of clinical data from millions of patients, cause a particular patient with a particular condition with specific features to have an optimal treatment outcome by receiving a highly particularized version of a more general treatment, be the condition degenerative or malignant.

3. Which strategy would you choose to emphasize in your chosen organization?

Machine learning, pattern recognition and predictive techniques would as applied to the collected genetic/clinical/disease condition/prior therapeutic interventions/patient outcome date, cause the generation of individual patient specific treatment plans. In essence, the delineation of patient specific diagnostic/therapeutic plans as to optimal patient outcomes would increase cost-efficiency of the healthcare system while making improved patient outcomes its principal purpose.

4. How could AI potentially fit in with the strategy you have chosen?

The incorporation of AI into the IT system of the business would involve the following steps:

1. Data collection, organization and transfer – Within the business, the current systems in which clinical and business data are identified, and communication links between these systems and the AI tools are created. The existing data is organized and standardized for transfer into the AI tools, using criteria/classifications pertaining to clinical, business and patient outcome parameters.

2. The questions and or prompts provided to the AI tool/s will be along the lines of for example: **"What is the optimal treatment plan for a 47-year-old smoker male with a two-year history of back pain, numbness in left leg with a family history of diabetes, a father who underwent failed back surgery and a mother who died of bone cancer at age 44?"**

3. Rubric

Your Module 1 assignment will be reviewed according to the following rubric:

	Criteria not met	Criteria met	Good	Exceptional
Question 1: *The role and deployment of innovative technologies*	No submission. OR The response does not demonstrate insight into the role and deployment of innovative technologies in the chosen organization.	The response attempts to provide insight into the current role and deployment of innovative technologies in the chosen organization.	The response provides sound insight into the current role and deployment of innovative technologies in the chosen organization.	The response provides deep insight into the current role and deployment of innovative technologies in the chosen organization.
Question 1: *The impact of AI on the organization's strategies*	No submission. OR The response does not clearly describe the strategies the organization currently emphasizes and how AI might impact cost leadership, differentiation, or focus.	The response attempts to describe the chosen organization's current strategy and how the use of AI might impact cost leadership, differentiation, or focus.	The response provides a good description of the chosen organization's current strategy and offers some insight into how AI might impact cost leadership, differentiation, or focus.	The response provides a rich and thoughtful description of the chosen organization's current strategy and offers deep insight into how AI might impact cost leadership, differentiation, or focus.

Structure and logic of writing: *Clear and logically structured submission that adheres to the word limit*	No submission. OR The response is unstructured, unclear, and lacks succinctness.	The response is logically structured, clear enough to comprehend, and mostly succinct.	The response is well structured in terms of logic, clarity, and succinctness.	The response is exceptionally well structured in terms of logic, clarity, and succinctness.

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MIT COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE LABORATORY (CSAIL)

MODULE 2 UNIT 3
Assignment

DELIVERED IN COLLABORATION WITH getsmarter™

Learning outcomes:

LO4: Recommend an application of machine learning that is appropriate in an organization**.**

LO5: Evaluate the strategic, technical, and other aspects of an application of machine learning.

Plagiarism declaration

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Name:

1. Instructions and guidelines (Read carefully)

Instructions

1. Insert your name and surname in the space provided above, as well as in the **file name.** Save the file as: **First name Surname M2 U3 Assignment** – **e.g., Zadie Smith M2 U3 Assignment. NB:** *Please ensure that you use the name that appears in your participant profile on the Online Campus.*

2. Write all your answers in this document. There is an instruction that says, "Start writing here" under each question. Please type your answer there.

3. Submit your assignment in **Microsoft Word only**. No other file types will be accepted.

4. Do **not delete the plagiarism declaration** or the **assignment instructions and guidelines**. They must remain in your assignment when you submit.

PLEASE NOTE**: Plagiarism cases will be investigated in line with the terms and conditions for participants.**

IMPORTANT NOTICE: Please ensure that you have checked the Online Campus for the due date for this assignment.

Guidelines

1. There are **5 pages** and **1 question** in this assignment.
2. Make sure that you have carefully read and fully understood the questions before answering them. Answer the questions fully but concisely and as directly as possible. Follow all specific instructions for individual questions (e.g., "list", "in point form").
3. Answer the question in your own words. Do not copy any text from the casebook, readings or other sources. **The assignment must be your own work only.**

In the final module of this program, you will create a roadmap for using AI technologies in an organization of your choice. Although this assignment does not map directly to a section in the final roadmap, it is intended to inform your thinking for the Proposed Initiative section.

In Module 1's assignment, you discussed the current state of an organization of your choice in terms of its deployment of technology and AI. Now that you have a better understanding of the nature and capabilities of machine learning, consider how it could be applied to your chosen organization, and answer the question that follows.

2. Question

As Professor Jaakkola's mentioned in Video 1 Part 1 of this module's video set, machine learning as a discipline tries to design, understand, and use computer programs that learn from experience (e.g., data), without being explicitly programmed for specific modeling, prediction, or control tasks. Professor Malone outlined the following requirements for using machine learning:

- The issue can be formulated as a machine learning problem.
- There is enough relevant data available to feed into machine learning algorithms.
- The system has enough regularity (i.e., not chaotic and unpredictable).

Consider the working environment you have chosen to focus on during this program. Identify three plausible problems or situations in your working environment, or elsewhere, that could be solved using machine learning.

For each of the problems or situations you identified, write a paragraph in which you briefly outline the example and explain how it satisfies the three requirements for using machine learning.

Note:

Despite Question 1 having three parts, we encourage you not to exceed the 550 words limit for the question as a whole and ensure that your response is coherent and clear.

Start writing here:

1. <u>Improper insurance denials for evidence-based patient diagnostics and or therapeutic interventions</u>

Within the modern-day American healthcare market, there exists a finite pool of patient premium-based capital, the 'purse holder' of which is the insurance industry, a corporate industry whose only mandate is to generate as much profit for its shareholders and executives, a mandate furthered by denying as much care as possible. Within this market, the physician/hospital/medical device/outpatient surgical centers and many other so called 'stakeholders' compete for the finite pool of capital, a fight that has traditionally been won by the bigger corporate 'dogs', an imbalance that over the last two decades has relegated physicians and their reimbursements to the lower strata of the market. It is indeed an imbalanced/perverse system in which those without whose expertise/services the system would be caused to seize, are those who receive the smallest percentage of the patient premium pool. The market share is 'upside-down' and although AI has been critical in the insurance industry's last two decades of market manipulation, the democratization of AI and its 'playing-field' levelling effect has the potential to reverse the distribution such that physicians become the major so called 'stake holders' in the market.

There is fundamentally a war within the market, in which the insurance industry has used/uses AI to facilitate the development of strategies that deny patient care and then deny the reimbursement of physician provided care that had been previously authorized. In understanding the market from the perspective of strategies-tactics of war/battles, and in the context of AI, the first step in developing a counter strategy is to identify the specific tactics used by the insurance industry. At the core of the insurance industry's strategy, one developed in or around 2007 by McKinsey, was the 'deny, delay, defend' mantra within care/reimbursement denying terms such as **"not medically necessary"** were introduced into the healthcare lexicon. The term is effectively meaningless, without definition and is not part of the centuries old corpus of medical terminology, and exists nowhere except in the tactics of the for-profit insurance corporations.

In practice this term is incorporated into letters/reports denying care authorization and or then reimbursement of previously authorized and provided care. Thus, there exists a vast body of almost two decades of data, in which this term exists. Now, within medicine most physicians either don't contest these resource intensive denials or do so in a limited and unsuccessful manner. However, there is a small cohort that has fought these denials with letters/lawsuits/appeals/arbitration and have mostly prevailed, and thus there is sufficient data as to what evidence/facts/arguments/law do constitute an effective counter-strategy, one that essentially undermines the **"not medically necessary"** foundational term of the insurance industry's 'deny, delay, defend' strategy.

The insurance industry has since at least 2007, consistently and in a very organized and systematic manner advanced this strategy within the healthcare market, such that within the system the denial of care/reimbursement is substantially more predictable than not. Moreover, the predictability of denial of care/reimbursement is far greater than it was five years ago, and it would be a certainty in the future if AI did not now present an equivalent framework for the development of a counter-strategy. The ultimate goal of the insurance industry is to hold onto 100% of the patient insurance premiums and to pay for no medical care by issuing insurance policies with deductibles/co-pays that force patients to pay out of pocket for care for which they have already paid. Tied into this scheme is the insurance industry's ongoing corruption and capture of government legislative function in which it writes and causes the enactment of rules/regulations/law that bind the population under threat of civil/criminal penalty to purchase so called health insurance.

The insurance industry's AI machine has an approximately twenty-year 'head-start' on physicians and certain other healthcare market competitors, but in that time, it was possible to identify the contours of its strategy and to some extent the strategy's internal architecture. Without this intervening time the data now necessary to educate the physician's counter AI machine would not have come into existence.

2. <u>Continuing optimization of medical and surgical plans to increase the practice's overall good to very good patient outcomes and decrease the complication rate</u>

In the early days (1600s) of western medicine, when knowledge of the disease and therapeutic options was limited, and many practitioners were working 'in the dark', quite often the only way to know if a proposed treatment was effective or not was to use the 'try and see' technique. As western medicine progressed through the centuries and with the keeping of records by some practitioners, patterns emerged of what was effective and what was not, but the process was, for obvious reasons, slow. The implementation of electronic medical records in or around the 1980s accelerated this process by permitting, as was evidenced in the medical literature, the identification of not just loose associations but specific statistically substantiated cause and effect relationships, whereby more certain conclusions as to treatment effectiveness could be rendered. However, from the 1980s onwards the rate of increase in the level of certainty, that although having achieved a substantial and actual level of certainty over the prior 100 years, did slow as it reached the outer limits of the available technology. It was never and still is not possible to predict with complete certainty the outcome of any specific treatment on any specific patient, which is why treatment consent forms require patients to attest to their knowledge, understanding and acceptance of this fact. Within the current consent process and its explication of risk and relative uncertainty is the element of human error, the clinical incidence of which peaks at the inexperienced commencement of a physician's career and the faculty-compromised old age-related conclusion. With the exponential machine learning effect of increasing data input/feedback, it would become possible to provide a patient an exact analysis of the short-term outcome of any intervention and ultimately a medium and long-term analysis, the latter two setting forth a series of outcomes depending upon the absence/presence and or commission/omission of environmental and or other life factors. For example, a 50-year-old male lung cancer patient, having successfully undergone surgical/chemo/immune therapy would be provided by a lung cancer data educated AI machine a precise statistical analysis of what conditions would need to exists for him to live symptom free for 1 … 2 … 3 and so on years.

DATED: OCTOBER 27, 2024

RICHARD ARJUN KAUL, MD

3. Rubric

Your Module 2 assignment will be reviewed according to the following rubric:

	Criteria not met	Criteria met	Good	Exceptional
Question 1: *Identify three plausible machine learning problems*	No submission. OR The response does not identify three problems or situations that could be solved using machine learning.	The response attempts to identify three problems or situations that could be solved using machine learning.	The response identifies three problems or situations that could be solved using machine learning. The choice of situations shows sufficient critical engagement and understanding of machine learning.	The response identifies three problems or situations that could be solved using machine learning. The choice of situations shows substantial critical engagement and understanding of machine learning.
Question 1: *Three requirements for using machine learning*	No submission. OR The response does not outline how the examples fit the three requirements for using machine learning.	The response attempts to outline how the examples fit the three requirements for using machine learning.	The response adequately outlined how the examples fit the three requirements for using machine learning.	The response demonstrates critical insight into how the examples fit the three requirements for using machine learning.
Structure and logic of writing: *Clear and logically structured submission that adheres to the word limit*	No submission. OR The response is unstructured, unclear, and lacks succinctness.	The response is logically structured, clear enough to comprehend, and mostly succinct.	The response is well structured in terms of logic, clarity, and succinctness.	The response is exceptionally well structured in terms of logic, clarity, and succinctness.

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MODULE 3 UNIT 3
Assignment

DELIVERED IN COLLABORATION WITH getsmarter™

Learning outcomes:

LO4: Decide if an application of natural language processing is appropriate in an organization.

LO5: Evaluate the strategic, technical, and other aspects of an application of natural language processing.

Plagiarism declaration

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Instructions

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Guidelines

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3. Answer all questions in your own words. Do not copy any text from the casebook, readings, or other sources. **The assignment must be your own work only.**

In the final module of this program, you will create a roadmap for using AI technologies in an organization of your choice. While this assignment does not link directly to a section in the final roadmap, it is intended to guide and inform your thinking on using natural language processing (NLP) to achieve cost leadership, differentiation, or focus in your chosen organization.

Now that you have a better understanding of NLP's nature and capabilities, consider how you could apply it to your chosen organization and answer the following question. Ensure that your answer is coherent and clear.

2. Question

In her videos, Professor Barzilay discussed the progress of technology in understanding and generating natural language. She discussed the capabilities of machines, highlighting types of NLP used to generate natural language, such as text summarization, machine translation, spam detection, sentiment analysis, and information extraction.

Consider at least one platform or system, such as a website, CRM, ERP, Twitter account, etc., that is frequently used by your chosen organization, or any other platform that you have encountered, and address the following points:

- State the platform or system that you have chosen to focus on. You can state multiple examples.

- Suggest one or more types of natural language processing you can employ to enhance each platform or system you identified.

- Briefly explain how you would apply NLP to each platform or system you identified and how the application would enhance its functionality or extract information that could be valuable to you, your organization, or any other user or customer.

(Max 500 words)

Note:

To complete this assignment, use the same organization you chose for your Module 1 assignment.

If you cannot identify a platform or system in your chosen organization, you could consider an industry example such as the Online Learning Campus used for this program.

Start writing here:

1. State the platform or system that you have chosen to focus on. You can state multiple examples:

The platform is a username/password accessed online portal through and onto which

(i) administrative staff enter information provided to them by patients that relates more to the business-insurance side of the practice (patient demographics/patent current insurance coverage/patient prior insurance coverage/patient claim history/patient claim reimbursement percentage history and other claim code related history).

(ii) patients enter information related to their past/current medical and surgical history.

(iii) physicians enter information pertaining to the clinical/surgical details of the care provided to the patient and of their outcomes to the care.

(iv) administrative/billing staff enter information pertaining to claim reimbursement, details that include things such as when the claim was filed, the amount claimed, the CPT billing codes used, and then the subsequent course of that claim with the insurance carrier. These can range, although rarely, from complete reimbursement within 30 days to complete non-reimbursement at the end of a claim-denial-in house appeal-arbitration-litigation that can take anywhere from 2 to 5 years. Within this spectrum there can be and are various forms of claim resolution, in which the clinician is provided generally anywhere from 10 to 30% of the billed amount. It is often the case that even if the patient has an outcome as close as possible to a cure, the claim will either not be paid or will be paid years later at a fraction of the billed amount.

2. Suggest one or more types of natural language processing you can employ to enhance each platform or system you identified:

In the application of AI and its various tools to an American interventional spine/minimally invasive spine surgery practice, the two fundamental goals pertain to optimization of patient outcome, with the ultimate goal being to eliminate the entire symptomatologic expression of the underlying causative condition AND to optimization/increased efficiency of the economic condition of the practice and the enhanced customer/patient service experience of all persons/entities/patients interacting with the practice.

With these goals in mind and in the context of the online data input portal, the following types of NLP might facilitate the achievement of these goals for the within stated reasons:

(a) text mining techniques – there exists within the practice the files of tens of thousands of patients, and within each file, on average there exists thousands of pages of clinical notes. These clinical notes contain information ranging from the initial history, examination, differential diagnosis and recommended treatment plans. The size of the patient's file is related to, amongst other things, the chronicity of the patient's condition, whereby the patient's ongoing condition of pain/disability requires ongoing outpatient care, and with each so-called point of care, further clinical information is added to the existing corpus of data. A central question in the treatment algorithms pertains to whether the patient's condition is improving, remaining the same or deteriorating, or put otherwise what is the pattern of the progression of their condition, and how does this relate to the pattern of treatments instituted. Text mining would associate the words/phrases of clinical conditions **with** the words/phrases of diagnostics **with** the words/phrases of treatment interventions **with** the words/phrases of patient outcomes, the purpose being to identify at the commencement of the physician-patient interaction what diagnostic/treatment interventions will result in the best patient outcome. Despite advances in clinical medicine there still exists a 'let's try it and see philosophy' whereby if one therapeutic intervention does not work, another is implemented until theoretically the desired effect is achieved. The problem with this approach pertains to the risks inherent in all forms of medical/surgical intervention of iatrogenic injuries, the therapeutic based causation of which complicates the clinical picture, such that in some situations, the underlying pathology remains untreated. The use of text mining on the decades-worth of data has the potential to eliminate this process and cure, as opposed to simply manage/palliate the pain and disability associated with the musculoskeletal-neurological conditions that exist within the practice. Such an AI assisted cure could potentially obviate the need for opiates and other central nervous system stimulants/depressants currently utilized in the musculoskeletal-neurological arena.

A corollary to the mining of text data as identified above, could be the collection of all audio and video data generated from every patient interaction with the physician and or non-physician members of the practice. The data of the audio/video interactions has greater fidelity to the specific nature of that patient's condition than simply text, whether it be patient or physician generated, and that increased fidelity would facilitate the development and implementation of a therapeutic plan for the specific expression in that patient of a general condition, thus optimizing clinical and economic outcome.

DATED: NOVEMBER 3, 2024

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RICHARD ARJUN KAUL, MD

THE END

3. <u>Briefly explain how you would apply NLP to each platform or system you identified and how the application would enhance its functionality or extract information that could be valuable to you, your organization, or any other user or customer</u>:

3. Rubric

Your Module 3 assignment will be reviewed according to the following rubric:

	Criteria not met	Criteria met	Good	Exceptional
Selection of platform/system features *The participant's submission identifies one or more pertinent and plausible platform or system features where NLP could be applied.*	No submission or attempt.	Participant has attempted to describe examples of platform or system features where NLP could be applied.	Participant has described examples of platform or system features where NLP could be applied. The choice of examples shows sufficient critical engagement and understanding of NLP.	Participant described examples of platform or system features where NLP could be applied. The choice of examples shows substantial critical engagement and understanding of NLP.

Use of NLP applications *The participant's submission clearly highlights the type of NLP used for each system/platform mentioned and outlines how the suggested application of NLP could enhance the system/platform's functionality or be of value to any potential users.*	No submission or attempt.	Participant has attempted to outline how the chosen type of NLP could enhance the system/platform's functionality or be of value to any potential users.	Participant has adequately outlined how the chosen type of NLP could enhance the system/platform's functionality or be of value to any potential users.	Participant has demonstrated critical insight into how the chosen type of NLP could enhance the system/platform's functionality or be of value to any potential users.
Organization of writing *Submission is structured clearly and logically, while remaining within the required word limit.*	No submission or attempt.	Submission has some logical structure and is clear enough to comprehend.	Submission is structured well in terms of logic and clarity.	Submission is structured exceptionally well in terms of logic and clarity.

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MODULE 4 UNIT 3
Assignment

DELIVERED IN COLLABORATION WITH getsmarter™

Learning outcomes:

LO3: Investigate how an organization can use robotics to achieve cost leadership, differentiation, or focus.

LO4: Decide if an application of robotics is appropriate in an organization.

LO5: Evaluate the strategic, technical, and other aspects of an application of robotics.

Plagiarism declaration

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Name: RICHARD ARJUN KAUL

1. Instructions and guidelines (Read carefully)

Instructions

1. Insert your name and surname in the space provided above, as well as in the **file name.** Save the file as: **First Name Last Name M4U3 Assignment – e.g., Lilly Smith M4U3 Assignment. NB:** *Please ensure that you use the name that appears in your participant profile on the Online Campus.*

2. Write all your answers in this document. There is an instruction that says, "Start writing here" under each question. Please type your answer there.

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IMPORTANT NOTICE: Please ensure that you have checked your program calendar for the due date for this assignment.

Guidelines

1. There are **6 pages** and **3 questions** in this assignment.

2. Make sure that you have carefully read and fully understood the questions before answering them. Answer the questions fully but concisely and as directly as possible. Follow all specific instructions for individual questions (e.g., "list," "in point form").

3. Answer all questions in your own words. Do not copy any text from the notes, readings, or other sources. **The assignment must be your own work only.**

2. Questions

In the final module of this program, you will create a roadmap for using AI technologies in an organization of your choice. In each assignment included in this program, you will be required to complete activities that will inform your thinking for the completion of the final roadmap. A high-level overview of the structure for the roadmap is shown below. In this assignment, you will be working on the "Proposed initiative" section.

1. Executive summary

2. Current state

3. **Proposed initiative**

4. Plans of action and criteria for success

Now that you have a better understanding of the capabilities of robots, consider how they could be applied to your chosen organization, by answering the three questions in this assignment. Ensure that your answers are coherent and clear.

Question 1

Consider the organization you have chosen to focus on during this program. Identify three to five organizational processes that could benefit from the use of robotics or RPA.

(Max. 50 words per process)

Start writing here:

1. PATIENT INTAKE – The current process, in which patients scheduled for procedures/surgery are admitted into the facility, involves a medical assistant and or nurse completing a lengthy series of standardized questions. This repetitive time-consuming task (15-30 minutes) could be conducted by a robot, with the answers as to medical conditions/medications/allergies etc. then being provided to the anesthesiologist/surgeon

via a notification of their submission onto the electronic medical file, to ensure there are no contraindications to the procedure/surgery.

2. **STERILIZATION AND PREPARATION OF SURGICAL INSTRUMENTS** – The current process requires the utilization of approximately six (6) man-power hours in which two to three surgical assistants and scrub technicians initially wash, dry and wrap the instruments in surgical towels, and then place the wrapped instruments in a sterilizing autoclave that heats/sterilizes the instruments, which are then removed using a sterile technique and placed on the surgical trays, while maintaining sterile technique. This repetitive time-consuming task could be conducted by a robot.

3. INTRA-PROCEDURE MANEUVERING OF FLUROSCOPIC C-ARM – An element for the performance of interventional and minimally invasive spinal procedures is the fluoroscopic (x-ray) imaging of the bony elements of the spine, as without this the procedures could not be performed. The current process involves the surgeon instructing the x-ray technician to rotate the C-ring of the machine in varying antero-lateral and cranio-caudal planes in order to visualize the bony landmarks relevant to the correct placement of endoscopes and interbody devices/screws. With adequate training on cadavers, robots could perform this manual task under direct instructions from the surgeon.

Question 2

Setting a vision or desired future state is the process for defining the pathway for a technology's deployment. Before using robots or RPA in your organization, you must determine what you hope to achieve. Using Porter's three generic strategies as a reference, explain how robots or RPA will impact cost leadership, differentiation, or focus to give your organization a competitive edge.

Describe your desired future state using robots or RPA in the organizational processes you discussed in Question 1.

(Max. 200 words)

Start writing here:

The guiding principles of the practice are to continually achieve improved patient outcomes in the most efficient, cost effective and commercially optimal manner. The implementation of AI and robotic technology would likely support these principles. A specific analysis of robot implementation under Michael Porter's three strategies is as below:

COST LEADERSHIP – The return on investment of reassigning the human man-power hours currently assigned to steps 1/2/3/ as above with robot replacement is a question that would require a period of three to six months of leasing a robot, to see if the indices of practice efficiency, patient outcome and commercial optimization increase with the robotic replacement model.

DIFFERENTIATION – A major complaint of intake patents is the inordinate delay from the point of entry into the facility and discharge in same day cases. The marketing of efficient

robot facilitated routine pre- and post-op administrative steps as facilitating the most expeditious treatment plan in the local market, and as being the first to market, will provide a distinct competitive advantage.

FOCUS – The interventional spine/minimally invasive spine surgery market already operates in a highly niches market, and so additions such as robots would not be inconsistent with the practice philosophy of efficiency and improved patient care. The patient cohort would welcome such advances.

Question 3

Consider the technical and leadership requirements for rolling out robots or RPA across the areas you identified in your response to Question 1. Consider the following questions in your response:

1. What is your role in implementing your proposed initiative, and why is this role essential?

2. Who else should be involved in implementing the proposed initiative, and what should their roles be?

3. How does the proposed initiative fit in with your organization's business and IT strategy?

4. What are some technical considerations and requirements for implementation?

(Max. 300 words)

Start writing here:

1. What is your role in implementing your proposed initiative, and why is this role essential? – The first and most important is to advise, encourage and reassure the staff that the addition of robots will make the organization more profitable, efficient and able to deliver even better patient outcomes. Staff will be trained and reassigned to areas of the business to do with market development and causing an increased flow of patients into the practice. So, for example, a scrub tech, whose day was once occupied with surgical instruments, will be reassigned to the business development section, where he will use his medical knowledge to effectively 'sell' the practice to would be referral physicians.

2. Who else should be involved in implementing the proposed initiative, and what should their roles be? The administrator, director of nursing and surgical staff. The shift to include robots will commence with the patient intake process, where there will be human oversight for approximately four weeks to ensure the system is functioning as required. Problems and glitches with robots will cause a recursion to humans until the problems are corrected, at which point they will be reinserted into the process. The robot interaction in the intake process will be filmed to ascertain steps to further optimize the process.

3. How does the proposed initiative fit in with your organization's business and IT strategy?

The implementation of robots for time consuming repetitive tasks is consistent with the surgical practice's guiding principles of economic efficiency and optimal patient outcome., both dependent on well-developed business and IT strategies.

DATED: NOVEMBER 8, 2024

RICHARD ARJUN KAUL, MD

THE END

4. Rubric

Your Module 4 assignment will be reviewed according to the following rubric:

	Criteria not met	Criteria met	Good	Exceptional
Question 1: *Where to use AI technologies*	No submission. OR The response does not describe tasks or processes where robotics or RPA could be applied.	The response attempts to describe tasks or processes where robotics or RPA could be applied.	The response describes tasks or processes where robotics or RPA could be applied. The choice of tasks and processes shows sufficient critical engagement and understanding of the AI technologies discussed.	The response describes tasks or processes where robotics or RPA could be applied. The choice of tasks and processes shows substantial critical engagement and understanding of the AI technologies discussed.
Question 2: *Desired future state*	No submission. OR The response does not describe a desired future state using robotics or RPA.	The response attempts to describe a desired future state using robotics or RPA and explains how these technologies will impact cost leadership, differentiation, or focus to give the organization a competitive advantage.	The response adequately describes a desired future state using robotics or RPA and provides a feasible explanation for how these technologies will impact cost leadership, differentiation, or focus to give the organization a competitive advantage.	The response insightfully describes a desired future state with the use of robotics or RPA and demonstrates critical insight into how these technologies will impact cost leadership, differentiation, or focus to give the organization a competitive advantage.
Question 3: *Technical and leadership requirements*	No submission. OR The response does not outline the technical and leadership requirements for	The response attempts to outline the technical and leadership requirements for rolling out an AI initiative.	The response adequately outlines the technical and leadership requirements for rolling out an AI initiative.	The response shows deep insight into the technical and leadership requirements for rolling out an AI initiative.

	rolling out an AI initiative.			
Structure and logic of writing: *Clear and logically structured submission that adheres to the word limit*	No submission. OR The response is unstructured, unclear, and lacks succinctness.	The response is logically structured, clear enough to comprehend, and mostly succinct.	The response is well structured in terms of logic, clarity, and succinctness.	The response is exceptionally well structured in terms of logic, clarity, and succinctness.

MIT MANAGEMENT EXECUTIVE EDUCATION

MIT CSAIL

MIT SLOAN SCHOOL OF MANAGEMENT

MIT COMPUTER SCIENCE AND ARTIFICIAL INTELLIGENCE LABORATORY (CSAIL)

MODULE 5 UNIT 3
Assignment

DELIVERED IN COLLABORATION WITH getsmarter™

Learning outcomes:

LO3: Debate the ethical concerns associated with the adoption of AI.

LO4: Assess the risks and benefits of the human-machine partnership.

Plagiarism declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.

2. This assignment is my own work.

3. I have not allowed, and will not allow anyone to copy my work with the intention of passing it off as their own work.

4. I acknowledge that copying someone else's assignment (or part of it) is wrong and declare that my assignments are my own work.

Name:

1. Instructions and guidelines (Read carefully)

Instructions

1. Insert your name and surname in the space provided above, as well as in the **file name.** Save the file as: **First name Surname M5 U3 Assignment – e.g., Zadie Smith M5 U3 Assignment. NB:** *Please ensure that you use the name that appears in your participant profile on the Online Campus.*

2. Write all your answers in this document. There is an instruction that says, "Start writing here" under each question. Please type your answer there.

3. Submit your assignment in **Microsoft Word only**. No other file types will be accepted.

4. Do **not delete the plagiarism declaration** or the **assignment instructions and guidelines**. They must remain in your assignment when you submit.

PLEASE NOTE: Plagiarism cases will be investigated in line with the terms and conditions for participants.

IMPORTANT NOTICE: Please ensure that you have checked the Online Campus for the due date for this assignment.

Guidelines

1. There are **6 pages** and **3 questions** in this assignment.

2. Make sure that you have carefully read and fully understood the questions before answering them. Answer the questions fully but concisely and as directly as possible. Follow all specific instructions for individual questions (e.g., "list," "in point form").

Answer all questions in your own words. Do not copy any text from the notes, readings, or other sources. **The assignment must be your own work only.**

In the final module of this program, you will create a roadmap for using AI technologies in an organization of your choice. In each assignment included in this program, you will be required to complete activities that will inform your thinking for the completion of the final roadmap. A high-level overview of the structure for the roadmap is shown below. In this assignment, you will be working on the "Plans of action and criteria for success" section.

1. Executive summary
2. Current state
3. Proposed initiative
4. **Plans of action and criteria for success**

2. Questions

Now that you have thought about the ethical concerns surrounding AI and examined the impact of AI on the future of work and its implications for business and society, answer the three questions in this assignment. Ensure that your answers are coherent and clear.

Question 1

Consider the working environment you have chosen to focus on during this program, and the initiatives you have proposed in previous modules' assignments to introduce machine learning, natural language processing, and robotics into your organization.

- How might the use of AI in your organization impact employees, management, and jobs?

- Will any jobs be eliminated, or will new roles be created? Will there be any opportunity to upskill or reskill employees?

(Max. 200 words)

Start writing here:

How might the use of AI in your organization impact employees, management, and jobs? -

As stated in prior modules, the principal purpose of introducing AI into the surgical practice is two-fold: **(i)** optimize commercial metrics; **(ii)** optimize patient outcomes. All staff would need to be trained on how to educate the AI system through the introduction of non-clinical and clinical data. It would be necessary to develop a practice specific protocol, whereby a standardized, yet comprehensive set of questions/prompts is correlated with necessary subsets of data, in order to produce practical instructions on how to optimize commercial/clinical metrics. The introduction of machine learning/NLP/robotics would be conducted in simulated settings, and employees would be assessed prior to placement in the actual practice.

The application of machine learning/NLP/robotics will increase both the internal efficiency of the specific tasks of each group, and the communications between the administrative and clinical sections of the entire practice. This will lend towards commercial and clinical optimization.

The benefits to the employees of achieving these two goals include increased monetary compensation and an increased sense of job satisfaction/morale, factors that motivate the employees to continue to operate to their fullest potential.

Will any jobs be eliminated, or will new roles be created? Will there be any opportunity to upskill or reskill employees? –

Employees will not lose their jobs, as with their knowledge of the practice they will be re-directed to marketing the practice to referral sources in the local communities.

Question 2

In Module 1, you learned about the powerful combination of people and computers. Consider the following questions in your response:

- Do you see any opportunities in your organization where machines and people could work together to complete tasks or processes more quickly, or be able to do tasks that previously were not possible by computers or people alone?
- Which roles will machines play, and which roles will people play?
- How will tasks be divided between people and machines?

(Max. 200 words)

Start writing here:

Do you see any opportunities in your organization where machines and people could work together to complete tasks or processes more quickly, or be able to do tasks that previously were not possible by computers or people alone?

Administrative – The processes of patient intake/scheduling/appointment confirmation/post procedure-surgical telephone calls, which are currently conducted by medical assistants, could be co-conducted more efficiently in a setting where one medical assistant can oversee multiple AI machines performing the tasks, and intervening if the machine can either not complete the task or is performing it inadequately. This process will also permit identification of those aspects of machine function that require further learning and or NLP.

Clinical – The use of robots in the preparation, sterilization and organizing of the operating rooms will reduce the wait times in between cases, and permit procedures and surgeries to be conducted in a shorter time frame. This increased clinical efficiency will translate into patients having to spend less time in the surgical facility, which has been shown to be directly correlated with a lower incidence of post-operative infection and improved clinical outcome.

Which roles will machines play, and which roles will people play and How will tasks be divided between people and machines?

The overall division of roles will assign the strictly repetitive administrative and clinical tasks to machines and the partially repetitive/original ones to humans. For example, the human-to-human interaction required in marketing the practice is based on the building of human relationships with referral sources and could not, at least at this time, be achieved by AI machines and or robots. Similarly, certain technical components of procedures/surgeries require a dexterity and judgment that is the product of decades of surgical experience and the tactile sensory input from human fingers, the visual differentiation of tissue planes and the management of intra-operative complications.

Question 3

In Unit 2 of this module, you were introduced to the ethical concerns surrounding AI. Consider the following in your response:

- Are there any ethical concerns involved with the initiatives you proposed in your assignments for Modules 2 to 4?
- List two to three ethical considerations involved with introducing AI into your organization, followed by a suggestion of how you could avoid or mitigate these ethical concerns.

(Max. 50 words per consideration)

Start writing here:

Are there any ethical concerns involved with the initiatives you proposed in your assignments for Modules 2 to 4? -

This is an interesting proposition, in that in the human based practice of medicine, biases of race, sex, class and culture impact the nature, quality and type of care delivered to patients, whereas it would seem that these biases, depending of course on the machine's learning process, would be either mitigated or eliminated.

List two to three ethical considerations involved with introducing AI into your organization, followed by a suggestion of how you could avoid or mitigate these ethical concerns -

1. An impartial, unbiased and transparent collection and organization of data – This aspect of the process should be outsourced to data specialists with no commercial connection to the practice.

2. The drafting of prompts and questions that are not leading or suggestive of outcome – Within the organization there should be a question standardization process conducted by a committee composed of administrative and clinical staff and involving a patient representative.

3. The implementation of the AI answer/solution should be consistent with industry standards and the sense common to the industry – The final decision as to any operational part of the surgical practice should be the responsibility of the human/s, and if the AI answer/solution seems to be non-sensical, then it should be rejected.

DATED: NOVEMBER 16, 2024. RICHARD ARJUN KAUL, MD

3. Rubric

Your Module 5 assignment will be reviewed according to the following rubric:

	Criteria not met	Criteria met	Good	Exceptional
Question 1: *AI's impact on the organization*	No submission. OR The response does not describe the impact of an AI initiative on employees, management, and jobs within the chosen organization.	The response attempts to describe the impact of an AI initiative on employees, management, and jobs within the chosen organization.	The response describes the impact of an AI initiative on the chosen organization, showing sufficient critical engagement and understanding of the impact of AI.	The response describes the impact of an AI initiative on the chosen organization, showing substantial critical engagement and understanding of the impact of AI.
Question 2: *Combining people and machines*	No submission. OR The response does not highlight opportunities where machines and people could work together in the chosen organization, nor does it provide suggestions about how tasks or roles could be divided between people and machines.	The response attempts to highlight opportunities where machines and people could work together in the chosen organization, and provides suggestions about how tasks or roles could be divided between people and machines.	The response adequately highlights opportunities in the chosen organization where machines and people could work together, and provides plausible suggestions about how tasks or roles could be divided between people and machines.	The response insightfully highlights opportunities in the chosen organization where machines and people could work together, and demonstrates critical insight into how tasks or roles could be divided between people and machines.

Question 3: *Ethical considerations*	No submission. OR The response does not highlight possible ethical concerns involved with introducing AI into the chosen organization, nor does it provide suggestions on how to mitigate or avoid these concerns.	The response attempts to highlight possible ethical concerns involved with introducing AI into the chosen organization, and provides suggestions on how to mitigate or avoid these concerns.	The response adequately highlights possible ethical concerns involved with introducing AI into the chosen organization, and has made plausible suggestions on how to mitigate or avoid these concerns.	The response insightfully highlights possible ethical concerns involved with introducing AI into the chosen organization, and demonstrates critical insight into how to mitigate or avoid these concerns.
Structure and logic of writing: *Clearly and logically structured submission that adheres to the word limit*	No submission. OR The response is unstructured, unclear, and lacks succinctness.	The response is logically structured, clear enough to comprehend, and mostly succinct.	The response is well structured in terms of logic, clarity, and succinctness.	The response is exceptionally well structured in terms of logic, clarity and succinctness.

FINAL REPORT

EXECUTUVE SUMMARY – 500 words

The principal purpose for the development and incorporation of an AI model/program into the administrative and clinical sections of the outpatient interventional spine and minimally invasive spine surgery practice is to optimize patient outcome in the most cost-effective manner. We believe that this process will, through increased efficiency of current resource utilization, result in practice growth, increased revenues/jobs and increased competitiveness and market allocation. The program will be implemented in a staged and monitored manner to ensure a smooth transition from the current state of function to that in which the relevant, efficiency enhancing tools of AI become functionally incorporated into the technical fabric of the entire practice.

A guiding principle in the implementation will be the establishment of an open dialogue between the instructors, the employees and the artificial intelligence programs, such that the process for those not familiar with the language and concepts of artificial intelligence is rendered as seamless as possible, and the overall effort is one of collaboration and support.

The components of the overall strategy are as follows:

1. **IDENTIFICATION AND DEFINITION OF PURPOSE TERMINOLOGY AND KEY CONCEPTS (WEEK 1**)

The first week will involve six (6) hour daily meetings with the staff to explain the reasons as to why artificial intelligence programs will be gradually introduced into the surgical practice. All consultations, procedures and surgeries, except urgent ones, will be rescheduled for the following week, in order to permit the staff to concentrate on the initiation program.

Developing an understanding within the staff of the purpose of AI integration will be critical to its successful implementation. This reflects a recognition that most if not all practice staff have no prior experience of utilizing artificial intelligence, and people can become demotivated at the first 'hurdle' in the learning of a new process.

2. **COLLECTION AND CATEGORISING OF ADMINISTRATIVE, BUSINESS AND CLINICAL DATA IN COLLABORATION WITH AN INDEPENDENT DATA SCIENCE/MANAGEMENT COMPANY (WEEK (2)**

The majority of all data within the practice is in electronic format, and that which still exists in paper and or radiological plastic format will be converted. The twenty-year's worth of administrative, business and clinical data since the inception of the practice will be organized by each point of patient interaction. The CPT coding system will not be used, as it is too broad/blunt a categorization instrument to permit the generation of patient specific treatment

plans. The clinical data specific to each patient (symptoms/signs/radiological and other diagnostic tests) and to all the clinical interactions and patient outcome metrics will be entered as separate data points. The administrative data (age/sex/ethnicity/marital status/occupation/retired/address/insurance coverage/referral source/pending legal personal injury or disability cases/attorney information/prior legal proceedings/prior legal judgments/medical malpractice cases filed) specific to each patient (approximately 15 to 20,000) specific to each patient will be entered as separate data points. The business data specific to each patient will be entered as separate data points and will include the cost per patient interaction and the revenue generated per patient interaction.

The particularity of the administrative/clinical/business data is necessary for two reasons:
a. it will permit the machine to suggest what specific diagnostic/treatment plan is optimally suited to the unique features of a particular patient and the unique features of their disease condition, in order to ensure a clinical outcome that is optimized by specifically matching the diagnostic/treatment 'key' to the specific condition/disease 'lock'.
b. it will permit the machine to calculate the optimal cost required to provide a specifically 'tailored' and optimal treatment plan for each patient in order to achieve the best and most cost-effective outcome.

We believe this model of value-for-service will increase our competitiveness and thus share in the spine market and we believe that these increases will cause business expansion, revenue enhancement and job creation.

CURRENT STATE

General:

The practice functions (administrative/business/clinical) are conducted by humans using electronic devices and software to achieve its economic and clinical goals. AI is not used and has never been used. However, clinical outcome and gross business data has been collected, but there have been no analyses conducted to identify patient specific treatment plans and their relation to costs and revenue. One could say that the practice has been operating in a rather 'dimly lit room' in which one knows one is conducting tasks slowly and usually in the right manner, while knowing that if the bright light of AI were switched on, one could conduct the same tasks and more, with greater speed, efficiency and accuracy. This we believe is the best way to describe our current function.

Specific:

The following is a list of the human and non-human/IT elements of the business:

(i) administrative/business staff – receptionists, secretaries, accounts receivable specialists, business manager, marketing and public relations personnel.
(ii) clinical staff – medical assistants, radiological technicians, surgical technicians, nurses, anesthesiologists, surgeons.
(iii) the building in which the surgical facility is located is a four thousand square foot outpatient surgical center in which surgeons conduct interventional spinal procedures and minimally invasive spine surgery. It is AAAHC/Medicare accredited facility and operates five (5) days a week, with the ability to open on short notice for any emergencies. The IT system has been regularly updated over the last ten (10) years and there exists the ability to increase its capacity to accommodate the data storage and processing requirements of artificial intelligence.

None of the staff have had any prior experience with artificial intelligence, but all are experienced with the use of digital technologies, and we do not believe they will find the learning curve to be too steep.

PROPOSED INITIATIVE

The proposed initiative focuses on the three fundamental areas (administration/patient care/business-commerce) of the surgical practice, in which it is believed that the tools of AI (machine learning, NLP, pattern recognition, predictive technologies and robotics) would mitigate the current commercial and clinical inefficiencies of the practice. The implementation of these tools would result in increased revenues from increased market competitiveness and improved patient outcomes from the use of these AI tools in predicting what specific treatment plan would result in the best outcome for a specific patient, i.e., 'tailored care'. The two (2) elements of the principal goal are: **(i)** to use AI in the business functions of the practice to reduce relative overhead and increase relative profit in order to expand the business of outpatient interventional/minimally invasive spine surgery; **(ii)** use AI to produce the best clinical outcomes in the local and national markets, as gauged by industry accepted patient centric standards for the relevant conditions/diseases/procedures/surgeries.

AI is viewed as an important adjunct to increase the economic and clinical competitiveness of the outpatient interventional spine/minimally invasive spine surgery practice in the national market, and currently the competition in this niche area is almost non-existent. Thus, there exists the market seizing benefits of the 'first to market' advantage/tactic, and so a highly structured implementation plan (1 to 12 months) is necessary.

ADMINISTRATION:

As set forth in prior modules, almost all of the administrative tasks surrounding the actual provision of clinical care can be conducted by artificial intelligence programs educated through machine learning and NLP to perform the repetitive tasks of this element of the practice-business. These tasks include, but are not limited to:

1. The initial appointment scheduling, where an AI voice activated machine will conduct a scheduling conversation with the patient, the details and manner of which it will have been taught by listening to the practice staff and from receiving data input. With time the AI conversation will become almost indistinguishable from that of the practice staff.
2. The initial patient intake at the facility, where a robot will collaborate with the patient in the submission of necessary demographic/insurance/clinical data, in likely a more efficient manner than the receptionist/medical assistant, in that it will not be distracted by other activities or conversations within the facility. The robot's interaction will be entirely focused on the patient, thus increasing the efficiency of this time-consuming administrative step. Increased administrative efficiency reduces patient frustration/anxiety which leads to improved clinical outcomes because it lower pre-procedure catecholamine and cortisol levels. This pre-procedure endocrine effect accelerates the healing process.

PATIENT CENTRIC:

Shortening of waiting time for appointment or procedure – The increased administrative efficiency consequent to the use of AI tools and robots will increase the number of patients that can be safely and successfully treated in a day. This change will shorten the operative waiting lists which will reduce the time from initial appointment to procedure/surgery. A significant contributor to patient morbidity is the delayed treatment of conditions, which if promptly managed will result in improved patient outcomes. For example, a patient with nerve compression due to a herniated lumbar disc will suffer greater nerve injury the more time there is between the diagnosis and surgical decompression. However, and as discussed in a prior module, quite often the delay is exacerbated by the insurance industry's policy of 'deny, delay defend' whereby critical care is withheld entirely or for a delayed period in order to maximize executive/shareholder profits of insurance corporations. The point of how AI can be used by surgical practices to combat this purely profiteering tactic of the insurance industry is addressed in a prior module and will be restated in this final report.

Automated AI managed system that provides the following functions: **(i)** 24-hour access to an AI taught physician robot that will answer questions from patients registered within the system, Regarding past or future care; **(ii)** calls patients the day before their appointments, procedures, Surgeries to confirm details of any pre appointment/procedure/surgery precautions the patient must take; **(iii)** call patients the day after the appointment/procedure/surgery and asks a series of standardized questions about their experience which requires patients provided a score of 1 (worst) to 10 (best) for each question. The system will conclude by asking if the patient wants to be called by a nurse and will confirm the date of the next appointment. These processes occupy automatable man-power hours that the practice would redirect to activities that grow patient volume.

BUSINESS/COMMERCIAL CENTRIC:

Marketing and Public Relations – The economic and clinical success of a surgical practice bear a direct relation to the volume of patients that either self-refer or are referred to the practice, and this relationship exists for many reasons. One, the more patients treated by the surgeons the more competent they become in those particular procedures/surgeries, and the greater competence causes improved patient outcomes, which enhances reputation, the enhancement of which increases referrals and thus commercial success. It is critical to the overall development of a surgical practice that there exists in conjunction with a strong clinical strategy an equally intelligent marketing and public relations strategy, the foundation of which pertains to proven patient outcomes.

The application of AI in, amongst other things, reducing administrative times and developing highly individualized treatment plans for patients are some of the factors that if intelligently incorporated into online/off-line marketing strategies will provide a distinct competitive advantage in both the local/national market in which the surgical practice competes, as

currently there exists no competition in this specific area.

Insurance issues – One of the largest impediments to the practice of medicine in the US is the for-profit insurance industry whose profit purposed shareholder obligations have caused a 'war' between the medical profession and the insurance industry. This point was raised in a prior module, with an observation that the increased accessibility to the medical profession of AI has the potential to 'level the playing field'. Some of the many tactics used by the insurance industry pertain to the phrase **"not medically necessary"**, which is a meaningless medically undefined term used as an excuse to deny care or deny payment if the care is provided.

Quite often, these denials are inconsistent in that the same procedure will be approved for a surgeon who is in-network with the insurance carrier while denied for a surgeon who is out-of-network. The denials are not based on scientific/clinical fact but on commercial/actuarial calculations conducted by the insurance industry. Oftentimes, physicians will abandon these claims, simply due to the administrative/legal burden, and it is in this 'frustration zone' that AI's pattern recognition properties can detect arbitrary inconsistencies that can be used to prove the denial is baseless and if necessary to initiate legal action when claim denials reach a certain volume.

PLAN OF ACTION AND CRITERIA FOR SUCCESS

The criteria for success are:

1. An improvement in patient outcome metrics (self-reported and independently observed/measured) by 5% from the previous year.

2. An improvement in the efficiency of administrative systems in that the time taken to the tasks of administration for one hundred patients is reduced by 10% from the estimation of the previous year.

3. An increase in revenue of 10% from the previous year.

4. An increase in job creation of 5% from the previous year.

5. An independent analysis of the interventional spine/minimally invasive spine surgery market to ascertain the practice's position (public visibility/patient volume/annual revenues/reputation) in the market since the incorporation of AI.

The implementation of the plan of action will extend over six (6) months and is as below:

1. Staff Education – Month 1 to 2 - The terms of the 'new' language of AI will be defined and explained in terms of function relative to the overall system. Similarly, the essential concepts will be described with the use of commonly understood analogies in conjunction with pictures and diagrams, and overly technical jargon will be used only when it is considered critical to the staff's understanding of certain concepts.

Staff will be trained in simulated settings, that extend from data input to prompt generation to AI response assessment to action. A central feature of the training will pertain to developing within the staff an understanding of the dynamic between the human and the AI program, and particularly in situations in which recognition of the AI program response appears inconsistent with the human's own experience.

Throughout the week, and as the course progresses, the instructor will periodically ask certain individuals to summarize their understanding of the taught material, to provide feedback to the instructor to ensure all staff comprehend one point, before continuing to the next.

The importance of having an educated and motivated staff is critical to the success of the plan.

All staff will be assessed on the how/what of AI applications to a set of commonly encountered standardized scenarios in the administrative/business/clinical sections of the practice, before being permitted to transition to actual cases. This element of the plan will ensure as smooth a transition, without the entry of complications into a patient's file, the rectification of which would require substantial time to undo.

2. Data Entry – Month 3 to 4 - This critical component of the plan will be conducted by a collaboration between an outside data science/management company with expertise in the healthcare sector, myself and senior member of the administrative/business sections, in order to ensure the initial data entry is performed according to industry standards. This initial step is crucial for many reasons, that range from configuring/educating the system as intelligently as possible to establishing sold legal defenses should litigation occur. Once all of the existing data has been entered, the staff will be trained on how to enter new data into the AI application, and their performance of this task will be periodically evaluated both internally by the internal IT staff and externally by the data science/management organization.

3. Activation of AI Programs – Month 4 to 6 – Each member of staff will be provided an instruction manual that covers every normal and abnormal functioning of the system, and will be required to attest to having read it prior to engagement with the system. An example will best illustrate how the initial interaction with the system and a patient should proceed:
The patient, having had all of his/her pre-scheduling administrative/business/clinical information collected by a robot, will meet with an administrative staff member to simply confirm the accuracy of the information. Having confirmed its accuracy, the patient will taken to the medical assistant, who will confirm the accuracy of the clinical information and ask the patient if he/she has any questions. The patient will then be walked into the pre-operative area, where they will change into a patient gown, and then a robot will measure their vital signs (blood pressure/heart rate/temperature), and will confirm their name, date of birth and the reason for their visit (consultation/procedure/surgery). A robot will enter their room and place an intravenous line in their arm, after which a nurse will enter to re-confirm their name, date of birth and reason for visit. The informed consent will have been obtained by the surgeon at the prior office visit. The patient will then be walked from the pre-operative area to the operating room, where he/she will be met by a human nurse who with the assistance of other human staff, place the patient on the operating room table. The human surgeon and anesthesiologist will then attend to the patient while he/she is anesthetized, and once a state of surgical anesthesia has been achieved the procedure/surgery as uniquely developed for that patient is conducted.

The post-surgical patient is awoken and taken from the operating room to the recovery room by the human anesthesiologist who instructs a robot to connect the patient to the post operative monitoring machine (blood pressure/heart rate/temperature), place warming blankets over the patient and ensure the IV remains functioning till discharge. This permits the anesthesiologist and nurse to attend to incoming patients, instead of spending time by the patient's bed till he is fully awake and recovered. The robot removes the monitors, and prepares the patient for discharge by asking a series of standardized discharge questions to ensure it is safe to discharge the patient. The answers are reviewed by a nurse and the robot walks the patient to the exit waiting room where his/her human escort meets them and drives them home.

All the electronic data from the clinical interaction is automatically transferred into the AI system, as is the data from the follow-up visit in which the patient's response to the

procedure/surgery is assessed for its effectiveness. The input of this data permits an ongoing refinement of the therapeutic options recommended by the artificial intelligence program. This data is subsequently correlated with that pertaining to the cost and revenue generation of the procedure/surgery, in order to further define the cost-effectiveness of the procedure/surgery, which can then be compared to alternative options and correlated with patient outcomes.

The specific goal is to identify treatment options for a particular patient that produce the best outcome for the most cost-effective and market competitive price. This data would be of immense value to the insurance premium paying public/lawyers and would permit them to effectively dispute the insurance industry's pattern of claim denial.

By reducing the time, it takes to conduct a procedure/surgery from the point of patient entry to exit will increase the surgical capacity of the facility, in that more procedures will be performed in the same time period, while improving patient outcomes, the effect of which will enhance reputation and increase referral volume. These changes will achieve the criteria for success.

DATED: NOVEMBER 25, 2024

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RICHARD ARJUN KAUL, MD

RK Richard arjun Kaul

Grade item	Grade	Feedback
MIT Sloan + CSAIL Artificial Intelligence: Implications for Business Strategy Program 2024-10-09		

Grade item	Grade	Feedback
Non-reviewed items		
Module 1		
ASSIGNMENT 1.8 Assignment: The current state of your chosen organization	Complete	Good work Richard • Your report provides an insightful background to your surgical practice and its operations.. Applying Porters framework what would you say is your practice's dominant strategy? Would you say cost leadership ? Differentiation? • It also provides deep insight into the current role and deployment of technology in the company. You have done well to give a high level discussion on potential AI use-cases for future consideration. • Report is structured well in terms of logic and clarity. Well done on a strong start to the program. Rodwell Mangisi MIT Learning Assessor
AGGREGATION **Module 1 total Weighted mean of grades. Include empty grades.**	✔ **Complete**	
Module 2		

Grade item	Grade	Feedback
ASSIGNMENT 2.5 Assignment: Using machine learning in your chosen organization	Complete	Excellent work Richard • Very unique yet actionable and important ML use cases ranging successfully identified. I enjoyed reading on your counter strategy thesis for " not medically necessary" denial o claim. Your discussion shows substantial, critical engagement and appreciation of AI in particular Machine learning. • Successfully identifies and demonstrates critical insight into how the selected use-cases meet and satisfy the requirements suggested for using Machine Learning .Good work highlighting the availability of decades worth of required data for the algorithm training data. This is key to the success of the solutions. • Well-structured and logical report . Clearly highlights your understanding and appreciation of this weeks concepts. Rodwell Mangisi MIT Assessor
AGGREGATION **Module 2 total Weighted mean of grades. Include empty grades.**	✔ Complete	
Module 3		
ASSIGNMENT 3.5 Assignment: Using NLP in your organization	Complete	Good work Richard • Actionable NLP use-cases identified . The choice of examples and detailed discussion shows substantial critical engagement and understanding of NLP. In particular although not explicitly stated you have shown great appreciation of the key NLP concepts of information extraction, semantic search ,NLU and text classification. Good work! • You have also managed to demonstrate critical insight into how the suggested functionality could be enabled by an application of NLP and how this application could benefit physicians and patients. • Well written and logical report. Rodwell Mangisi MIT Assessor
AGGREGATION **Module 3 total Weighted mean of grades. Include empty grades.**	✔ Complete	
Module 4		

Grade item	Grade	Feedback
ASSIGNMENT 4.5 Assignment: Using robotics in your organization	Complete	Excellent work Richard • Robotics Focus: You effectively identified tasks and processes within your healthcare facility suitable for robotics automation, demonstrating a solid understanding of physical robots. • Strategic Vision: Your outline of the desired future state to continually achieve improved patient outcomes in the most efficient, cost effective and commercially optimal manner showcases a clear understanding of how robotics can align with your organization's strategic goals. • Implementation Planning: You've comprehensively considered roles, responsibilities, and the integration of these initiatives into the broader business and IT strategy. • Communication: Your report is well-structured and easy to follow. Rodwell Mangisi MIT Assessor
AGGREGATION **Module 4 total Weighted mean of grades. Include empty grades.**	✔ Complete	
Module 5		

Grade item	Grade	Feedback
ASSIGNMENT 5.5 Assignment: The impact of AI on people	Complete	Good work Richard • Your report describes the impact of an AI initiative on your organization, showing substantial critical engagement and understanding of the impact of AI. Clearly highlights how the job landscape will be changed as the types of jobs change and the AI/Human partnerships take shape. Well done in how you have highlighted the need to be thinking of reskilling as well as redirecting employees to new roles. This indeed mitigates job losses. A good change management strategy will also be key here for the sake of employee psychological safety as the worry for job losses is a real concern. • Insightfully highlighted opportunities in your organization where machines and people could work together, and you have demonstrated critical insight into how roles could be divided between people and machines. You show understanding of AI as assistant • Insightfully highlighted possible ethical concerns e.g algorithmic biases associated with introducing AI into your organization, and you demonstrate critical insight into how to mitigate these concerns. • Well-structured and logical report Rodwell Mangisi MIT Assessor
AGGREGATION **Module 5 total Weighted mean of grades. Include empty grades.**	✔ **Complete**	
Module 6		

Grade item	Grade	Feedback
ASSIGNMENT 6.6 Assignment: A roadmap for using AI in your organization	Complete	Excellent work Richard **Executive Summary:** You provided a clear and concise overview, capturing key points, surgery practice organizational context, and AI's potential strategic value. This self-contained summary is perfect for capturing the attention of busy stakeholders. **Current state assessment**: You effectively described your practice's current strategy implementation and technology adoption. Clearly highlights manual processes that could benefit from AI adoption. **AI Adoption:** Your proposal demonstrates a deep understanding of how AI can be leveraged within the organization. You've thoughtfully considered benefits, challenges, business requirements, and the impact on competitive advantage. **Roadmap:** You crafted a detailed and well-structured action plan with clear milestones and timelines. I must commend you for a job well done and taking the time to come up with such high quality work. A huge congratulations on completing the program! Looking forward to connecting and following your AI journey via LinkedIn. Rodwell Mangisi MIT Assessor
AGGREGATION **Module 6 total Weighted mean of grades. Include empty grades.**	✔ Complete	
AGGREGATION **Program total Weighted mean of grades. Include empty grades.**	✔ Complete	

MIT MANAGEMENT EXECUTIVE EDUCATION

executive.mit.edu

5 December 2024

Confirmation of Program Completion | Richard arjun Kaul, md

To whom it may concern,

This letter serves to confirm that **Richard arjun Kaul, md** successfully completed the MIT Sloan School of Management **MIT Sloan + CSAIL Artificial Intelligence: Implications for Business Strategy Program 2024-10-09** online program, delivered in collaboration with online education company, GetSmarter.

Richard arjun Kaul, md attended the entire **October 2024** presentation of the program and fulfilled the requirements to complete the program.

Please see the table below that outlines the modules covered:

Module	Grade
Module 1	Complete
Module 2	Complete
Module 3	Complete
Module 4	Complete
Module 5	Complete
Module 6	Complete
Final Grade	**Complete**

Kind regards,
MIT Sloan Executive Education

MIT MANAGEMENT
SLOAN SCHOOL

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
SLOAN SCHOOL OF MANAGEMENT

THIS IS TO CERTIFY THAT

Richard Arjun Kaul, Md

HAS SUCCESSFULLY COMPLETED THE EXECUTIVE PROGRAM

Artificial Intelligence: Implications for Business Strategy

November 2024

PETER HIRST
Senior Associate Dean, Executive Education

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