

Future Trends Report
Based on Analysis of the Team's Chosen Community / Organisation in Mid-Term and Final Evaluation

Community / Organisation Studied: Healthcare

STEP 1. Identify Challenges

Read the Future Scene carefully and generate ideas for challenges, concerns, and possible related problems. Choose the 5 most important challenges and write them in the space provided. Include applicable research with appropriate in-text citations.

Challenge #1:

Unethical Practises: We have observed that more than 50% of our 100 survey participants at NUH Hospital has indicated that they would be unsettled if AI surmounted healthcare. The root of the problem is that: robots cannot differentiate between ethical and unethical practices and might take actions that are the betterment to the patient but not ethical. For example, an AI system might propose for a surgery to be done for the patient even when the patient is weak and has health conditions. "An AI system might infer a proposed treatment is futile without taking into account a patient's individual circumstances." ("Forbes Insights: Rethinking Medical Ethics", 2019)

Challenge #2:

Organisational Barriers: We have observed that more than 50% of our 100 survey participants at NUH Hospital betokened that Organisational Barriers would likely be an impediment in the advancement of AI. One of the problems is that rival organisations may not concur to different information that they have accumulated to further improve AI due to market competitiveness. Additionally, countries may not optate to different sensitive information about their people's health with organisations or other countries to improve AI. Furthermore, the patient's data might be hacked or leaked. "Fifteen million patient records were breached during 503 healthcare data breaches in 2018, nearly triple the amount of reported incidents from the previous year, according to the Protenus 2019 [Breach Barometer](#)."

Challenge #3:

The Black Box in AI: The problems of black-box algorithms are that robots make inexplicable decisions. In a healthcare context, where the decisions made could mean life or death, the consequences of algorithmic failure could be grave. AI is still struggling to expound the underlying logic behind the relationships that they've found making us unable to predict and explicate their decisions. "Medical malpractice and product liability that will arise with the use of "black-box" algorithms because users cannot provide a logical explanation of how the algorithm arrived at its given output" (Rigby, 2019)

Challenge #4:

Lack of interaction between doctors and patients: Many of our current working generation (ages 30-49) will become the main intake of patients in hospitals in 2030, and according to our survey results, the majority of that generation is opposed to having AI supersede doctors due to a lack of interaction between the doctor and the patient (55%). "Physicians will remain better at dealing with the patient as a whole person, which involves knowledge of social relationships and normativity...Robots cannot understand our concern with relating illness to the task of living a life, which is related to the human context and subjective factors of disease"

Challenge #5: Growing elderly population: We have observed that the number of elderly citizens in Singapore today is estimated to be about 440,000 and it would double by the year 2030, about 900,000. One of the problems is that many health complications would arise as people age. The current system in the healthcare industry is not designed to tackle large numbers of aging patients. Additionally, the current healthcare system would not be able to treat many patients with acute illnesses at once. If there were many patients, the hospital might be short on staff and that may cause disastrous consequences. "But as people reach their seventies or eighties we tend to see much more complex health issues like chronic illnesses. Our healthcare system wasn't really designed to deal with this."

STEP 2. Craft the Underlying Problem

Incorporating Challenge(s) # 1, 2, 3

Given that there is a high probability of AI being perceived as “unethical”, as well as the masses in the Healthcare community not understanding the way AI works, AI will therefore be both distrusted and feared. How do we increase the people’s trust in AI, and to allow the Healthcare community to accept AI, so as to allow the Healthcare community to keep up with Industrialisation 4.0 and incorporate AI into Healthcare so as to assist us better in hospitals in 2030?

STEP 3. Produce Solution Ideas

Generate solution ideas to the Underlying Problem in Step 2. Choose the 5 most effective solutions and write the elaborated ideas in the space provided. Include applicable research with appropriate in-text citations.

Solution #1:

Be more transparent about AI technology: We, Team Nanocare, will work with AI companies, and encourage them to allow their system to observe how people behave in various situations and figure out what people actually value, allowing the system to make decisions consistent with our underlying ethical principles. With AI learning from humans, they can hence emulate the actions of humans. This allows the AI to learn which values humans treasure and place importance on, as well as learn which actions humans do are considered “ethical” and “unethical”. With this, AI will be more ethical as it learns from humans, and henceforth, a more ethical AI will allow the Healthcare community to be able to trust AI better.

Solution #2:

Monitor the actions of AI: We, Team Nanocare, will propose to governments, as well as AI companies, to create more transparency for AI. AI’s actions are currently quite mysterious as we are unable to explain why AI makes certain choices. We are also uncertain what AI is doing with the data they collect, or even what data they are collecting. Hence, if governments and organisations reveal to the public what data the AI is collecting, as well as what AI is doing with the data, this will allow the public to be more clear in how AI works. This can especially boost trust of AI in healthcare as hospitals have much of one’s personal and confidential data, and therefore knowing what data is being collected about them, what are the Healthcare groups doing with the data, can help the Healthcare community trust AI more with their private data. Governments and AI organisations can also have AI to explain the choices of AI to the Healthcare communities, as some methods used by AI are too complicated for even the professionals in that field to comprehend. This allows the Healthcare community to understand AI’s choices better and thus, trust AI more.

Solution #3:

Make a “backdoor” in AI to control what the AI does: We, Team Nanocare, propose to have AI manufacturing companies also create a “back door” in the AI’s algorithm so as to allow humans to edit or “erase” the deep learning of AI so as to purposely impede AI so that humans can edit the algorithms of AI with ease. This can allow us to be able to change AI according to our will, so as to ensure that we control AI and that AI does not go out of control. This allows us to override the information AI has learnt so as to allow us to be able to assure the public that actions deemed unethical by the public can be erased, and that humans do have the power over AI in critical moments such as during a surgery.

Solution #4:

Involve more humans in the technology of AI: We, Team Nanocare, propose to the Ministry of Health (MOH), to conduct programmes on the boundaries of AI. These lessons are aimed at the public so as to increase public awareness on how AI works. These lessons can also reveal what data AI collects, as well as what AI does with the data. This can be a platform for organisations to make AI more transparent. These programmes can range from carnivals to lectures. This allows the Healthcare community, as well as other communities, to be educated on AI. They can learn what AI can do and what AI is unable to do, clearing up misunderstandings about AI. This allows clarity in AI's abilities, dispelling some false and exaggerated rumours about AI, such as over-estimating AI like when "the school bus-sized, cumbersome Electronic Numerical Integrator and Computer (Eniac) was presented to the media at a press conference, journalists described it as an "electronic brain", a "mathematical Frankenstein", a "predictor and controller of weather" and a "wizard", which was found to be false. The countless fiction books written on AI also do not help AI's case. These fiction books often portray AI as overpowered beings and also often portray them as evil beings. Hence, these programmes can help clear up much of the misunderstandings of AI so as to let the communities know what AI can do, and hence, the communities will understand the boundaries of AI better, which helps in the other efforts to make the communities trust AI.

Solution #5:

Courses to allow citizens of Singapore to bridge the gap between AI and Singaporeans by introducing them to how to work and understand AI better. (AI and us): Courses to encourage cooperation between AI and Man: We, Team Nanocare, propose to the Ministry of Education, as well as the Ministry of Manpower, to conduct trainings and special courses for humans to work with AI. The Ministry of Education can create new courses in universities or even secondary schools, to learn about all about AI, so as to train a batch of students that will be able to work collaboratively with AI. The Ministry of Manpower can also re-train workers that jobs have been displaced. These courses can train the workers to know how to work collaboratively with AI in various fields. One example can be having both human surgeons and AI surgeons work together in a surgery. This can allow both humans and AI to share the power of decision making. Humans and AI working hand in hand is a win-win solution as both humans get new jobs and AI is incorporated so as to assist humans in harder tasks like performing surgeries in narrow areas. Having a human in the decision making process allows the Healthcare community to trust having tasks performed on them by AI as a human is assisting them.

STEP 4a. Select Criteria

Generate criteria to determine which solution idea does the best job of solving your Underlying Problem and/or addressing the Future Scene situation. Select the 5 most important criteria for measuring solution ideas and write them in the spaces provided.

The criteria for choosing our solution would be:

1. Cost of implementation

This criteria is to ensure that the solution to the underlying problem is cost effective so as to entice the target organisation or the government to take actions and to prove that our solution will allow the target organisation and the healthcare community to reap more benefits from our solution in the times to come than the financial investment in our initiative.

2. Ethicality of implementation

This criteria is to ensure that the solution is ethical so that the general public will be more acceptive of our chosen solution. This would allow the public to gain trust in AI and increase the effectivity of our solution.

3. Time taken for implementation

This criteria is to ensure that the time taken to implement the solution should be minimum so that the impact would be the greatest. If a long time is spent on developing the solution, the public would already have a fixed mindset on AI, and it would be harder to change their mindsets.

4. Effectiveness of implementation

This criteria will determine which solution solves the problem best. If the solution is not as effective, the public will continue to be distrustful of AI.

5. Ease of implementation

This criteria is to ensure that the solution is easy to be implemented. Some factors that would affect the ease of implementation would be: the amount of manpower needed, technology and specialties needed, difficulty of outreach to the public. This is to allow the solution to be easier to implement, increasing the chances of the target organisation agreeing to our solution.

STEP 4b. Apply Criteria

List the solution ideas from Step 3 on the grid. Use each criterion to rank the solutions on a scale from 1 (poorest) to 5 (best). The weighting for one important criterion may be doubled if necessary.

Step 3 Sol'n #	Solution Idea	Criteria					Total
		1	2	3	4	5	
#1	Increase transparency of AI technology	5	4	4	4	5	22
#2	Monitor the actions of AI	4	5	2	3	3	17
#3	Make a "backdoor" in AI to control what the AI does	3	5	3	5	2	18
#4	Involve more humans in the technology of AI	3	4	3	2	3	15
#5	Courses: (AI and Us)	5	5	5	4	4	23

STEP 5. Develop an Action Plan and Evaluate its Feasibility

Develop your top-scoring solution idea into an Action Plan. Thoroughly explain how the Underlying Problem is solved, how the plan will be implemented, and how the community / organisation will be affected. Explain how this Action Plan is feasible with secondary research consulted, preferably also with primary research (feedback from chosen community / organization)

Action Plan derived from solution #5:

We, Team Nanocare, will work with the Ministry of Education and the Ministry of Manpower, to provide training courses and special programmes so as to encourage and help more people to work with AI in healthcare. These courses and programmes seek to help integrate humans into AI fields of healthcare and hence, allowing us to create more jobs in new healthcare industries, as well as allowing the Healthcare community to trust AI more, since there is a presence of humans.

AI and Us in schools is a course that can be implemented in Universities. It can be one of the Healthcare courses offered at Universities. This special course allows students to learn knowledge, as well as get hands-on experience on how to work hand in hand with AI in the medical field. They will learn things like how AI works in healthcare, as well as the normal medical knowledge that other courses also teach, which are needed to be in the healthcare industry.

AI and Us at work is a course that allows workers that have previously worked in the healthcare industry, but have been displaced due to various reasons, to be able to reintegrate into the healthcare industry with this course. This course is also offered to current healthcare industry workers. This course can help them learn new skills and hence, can help them re-enter the workforce. This course also helps the current healthcare workers to learn new skills and also be able to adapt to new changes.

These courses can be conducted by AI experts, and as more students graduate from the course, even have former students to teach and share their valuable experience in the course and working field.

Year:	Actions:
2020	Proposal of AI and Us to the Ministry of Education and Ministry of Manpower.
2021	Drafting the course curriculum, scholarship deals, as well as promoting the courses.
2020-2030	Collaboration with Universities and Medical Facilities to provide scholarships and internships for course participants
2023	<ul style="list-style-type: none"> ● First batch of students from healthcare specializations in University (e.g. Duke-NUS Medical School) enrol in the course (19 years and above) ● First batch of workers enrolled in course (Open to all, both healthcare and displaced workers)
2023	<ul style="list-style-type: none"> ● Second batch of students enrol in course ● Second batch of workers enrol in course
2024	<ul style="list-style-type: none"> ● Third batch of students enrol in course ● Third batch of workers enrol in course

2025	<ul style="list-style-type: none">● Fourth batch of students enrol in course● Fourth batch of workers enrol in course● First batch of students graduate from course (work as interns)● First batch of workers graduate from course
2026	<ul style="list-style-type: none">● Fifth batch of students enrol in course● Fifth batch of workers enrol in course● Second batch of students graduate from course● Second batch of workers graduate from course● Graduated students and workers return to teach new students
2027-2030	<ul style="list-style-type: none">● Continuation of enrollment of students and workers
2023-2030	<ul style="list-style-type: none">● Constantly change the course material and lesson plan based on the development of AI in healthcare● Have just graduated students to teach the course based on their experience

Potential Assistors, Resistors, Challenges and Method to overcome

Potential Assistors: Government (Ministry of Education and Ministry of Manpower), Healthcare organisations

Potential Resistors: General Public (in case of poor response and resistance to collaboration), Universities (in case of poor response and resistance to collaboration), Government (in case of resistance to collaboration)

Potential Challenges:

- Poor response from University Students
Universities might not give recommendations of students and might also not inform the students that there is such a course, resulting in a poor response
- Poor response from the adult workforce
The adult workforce from the healthcare industry might not be informed of our course resulting in a poor response. They could also be reluctant in attending the courses.

Method to overcome the Challenges:

- To overcome poor response from University Students:
 - Give scholarship deals or internship deal to medical facilities if the students perform exceptionally well during the course (e.g. Ng Teng Fong General Hospital) to entice students to attend the course
 - Collaborate with Singapore Universities and request that they recommend students to attend the course
- To overcome poor response from the adult workforce
 - Advertise the course on social media, radio and television
 - Give job opportunities to workers who perform well at medical facilities, or invite them to teach the course so as to have a stable job
 - Provide scholarship deals to help cover the cost of the course and in return the worker must reach a certain grade and teach the course after he graduates.
 - Boosts current workers' portfolio and help send a letter of recommendation for them to get a promotion or transfer to a relevant field with AI if they perform exceptionally well.

How does AI and Us address the underlying problem:

Our underlying problem is, how do we allow the Healthcare community to trust and accept AI, especially since they have been perceived by many negatively as unethical.

Our Action Plan solves the underlying problem as it trains batches after batches of students and experienced workers to be able to adapt to the new use of AI in healthcare, as well as how to work with AI.

The AI and Us in schools provide an entirely new course for medical students to take. By taking this course, they can learn hands on skills, as well as knowledge about AI and the usual medical knowledge. Having learnt such things can allow them to work with AI.

The AI and Us at work can help displaced workers get back in the medical field again. They have the experience, but lack skills. This course can help them gain skills needed to work with AI, which many people do not trust.

Since many do not trust AI, but trust the traditional human more, this course seeks to train humans to be able to work with AI so as to serve humans better. AI is indeed in certain ways more effective than humans. However, many in the Healthcare Industry distrust AI due to it being perceived as unethical, and hence they feel unsafe with AI performing tasks, such as surgeries, on them, leading to the unacceptance of AI, despite the unprecedented pace at which AI is developing due to Industrial Revolution 4.0. With this course to train more humans to work with AI, this allows those previously afraid of AI to trust AI and accept them more as there is a human working with the AI robot. This results in the decision making process having to go through two individuals, the AI robot and the human doctor. This allows the healthcare industry to trust AI better and hence accept them more.

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