Task 1

A) With the main difficulties being fast delivery and real-time package tracking I think these problems have some overlap. Ideally I would have a look at the processes today and analyze it to figure out the weak points of these processes and where they could be improved. Lacking the information to do this I will instead have to make assumptions about the process. I assumed that delivery speeds are consistent of 3 main parts: package in -> sorting -> delivery. Package in is where mail and packages are delivered from customers to sorting centers. I assumed that this operation is run by UPS wholly. Sorting is where packages arrive at a sorting center to be directed to the right gate for further transport. Delivery is from a sorting center to customer/final destination. For UPS I have assumed this is done mostly by truck.
With all this my proposal is: using machine learning to optimize the flow of packages in the sorting centers. By using machine learning optimization we can identify and improve problems leading to slower sorting speeds. This increases the speed at which a package can be sorted to the right gate within acceptable margin of error.
The same technology can be used to optimize delivery routes and pick up routes. Using data collected and optimization, machine learning could make a route that is faster both by ordering the destinations to allow for the shortest route but also by predicting traffic patterns to optimize the flow of the route improving speed of delivery. This could also improve fuel mileage. For delivery out to customers in big cities trucks might also be an outdated technology. Autonomous trucks could run much longer than trucks that need drivers, but trucks are big and in many big cities traffic is a real problem when delivering packages. Options like electrically assisted bicycles with compartments for package carrying is one solution. But there is other tech I would implement; fully autonomous cars and trucks are not yet legal on the public highway but for delivering packages autonomous drones can be used. These drones will get GPS coordinates, fly there and carefully drop off the package, notify that the package has been delivered and fly back to the sorting center.
To the problem of real time package tracking. The problem is that traditionally packages have only been tracked when they are scanned for example when entering or leaving a sorting center. This means that from the trip in the truck from the sorting center to your home there would be no tracking. Leaving big empty spaces in the tracking. A way to solve this is to create an internet of things, linking sensors with the internet. The sensors would be GPS trackers that allow tracking of the delivery vehicle your package is in. Tracking in the sorting center is harder but it is easier and I think more useful to the customer. Tracking the package in the center would not be useful to the customer but instead if there is a progress bar telling you how far into the process the package is. This would be very easy really; if we know the average time a package takes to make it from hand-in to delivery truck we can have a progress bar that starts when the package is scanned when entering the sorting center and is timed with the final percent only filled in when the package is scanned when leaving the sorting center.

B)

The emerging technology I will be using is machine learning and autonomous drones.

C)

As a CIO I would be responsible for exploring business opportunities, strategies and new technologies that can be used to improve the business processes. I would also be in charge of developing the systems and architectures needed to implement the opportunities, strategies and technologies in our business processes.

D)

If my business lacked the skills needed to implement the proposal the main ways to fill this I would look into is; hiring new talent or partnering with a company that already has the skill needed. The main benefit of hiring in talent is that communication would be quicker and easier. I would have more direct control and changes can happen quicker leading to a more agile process. Of course hiring someone is time consuming and costs money, the new employee(s) would also need to be paid and looked after. Partnering with a company can reduce costs and they will already have a structure in place that works. They could also show previous work as a guarantee. The drawback is that the process would be split and move out of my control.

E)

My proposal would positively impact goal 13 of The Sustainable Development Goals. This goal is about climate action and my proposition would lead to less trucks doing deliveries and lead to more optimized use of the trucks. Of course the drones are electric and are only as low emission as the power grid it is plugged into. Buying solar panels to charge them would solve this.

Task 2

A) One way to make interactive labs that are cooperative could be to make a VR environment where experiments could be executed. VR headsets could be provided or for a cheaper option is using a cardboard box that your smartphone slots into and using a divider makes a VR effect. The drawback with the cardboard VR is the lack of hand controllers, other controllers can be used but the immersion would not be as strong as with a dedicated VR headset with hand controllers.
B) Way to control students during exams could be eye tracking software that would follow the students eyes making sure they do not look down at their phone or away from the screen for too long. This could be combined with dedicated software that locks the computer only allowing the exam to be on screen. This way the student can not use other devices to cheat and can also not google the answers during the exam. Problem is of course that a student would just excuse themselves to the bathroom and google the answers from the toilet. Limiting the time away allowance is one way. The problem here is if the student lives in a house with others and a toilet queue forms. They could return and go to the bathroom later but exceptions and mistakes will be made. Of course you could monitor the local network using the dedicated software but again this leads to the problem, what happens if the student lives in a house with others. Will they all be logged and spied on too? If not, how will the student's phone be logged? Can they cheat through a roommate's computer? The problem of not being able to control the environment the student is in makes it very hard to stop cheating. And that's not taking into consideration privacy, security or

ethical concerns. I think the best solution is having the students use a dedicated software that locks the computer to only allow the exam to be open and have them connect to a VPN that logs internet traffic. Combining this with an eye tracker to stop people using peripheral devices to cheat. I think this is the best solution.

Task 3

A) One way is to use machine learning to help diagnosing the patient, this would lead to lower rates of misdiagnosing. This could be combined with a shippable handheld ultrasound device. The patient can perform the ultrasound themselves and machine learning can diagnose using the images. Another thing is robot assisted surgeries, being more time effective and safer. These use a robotic arm that is controlled by a doctor, it contains a camera that can give the doctor a closer look. Implementing more digital video consultations for patients that do not need a physical examination. Looking into the processes and paperwork healthcare workers do and make sure this is optimized.
B) Machine learning and controllable high precision robot arms are the emerging technology needed to make this work. High speed low latency video chatting software would also be needed to make remote consultations work optimally.
C)
D) The hospitals would need to partner with private companies that can use this as a chance to do research and development and improve their products.
E) Goal number 3 would be the main goal this would affect. The goal is about increasing access to healthcare and I think this solution could do that.

Task 4

A)
B) One example of how the pace of digitalisation has rapidly increased during the covid pandemic is video appointments with doctors. It has long been talked about how in the future we will have digital appointments with doctors. During the pandemic this became a reality. Unless you needed a physical examination you would simply get in a video call with your doctor. This is digitalisation that for years had been planned with the pressure of the pandemic it became reality quickly.
C) Technical debt is when a business does only the bare minimum of digitalisation to save money or time. This is not the best solution but it fixes the problem for now. This means that later when more change is needed, maybe even because of the previous solution, that change needed becomes bigger as the “technical debt” needs to be repaid. So an easy fix now leads to a bigger fix being needed later.
D) Some of the leading indicators of failed digitalisation is that projects will need restarting or do not ever reach completion or if it is completed it does not achieve its goals with respect to business value. Signs that the transformation is in danger is the project lacking top-down support. Another is that the focus is very internal and not looking at trends within the sector and with little consideration to the customers experience and need. Another bad sign is when plans are not followed and what is really being done in the real world does not match the plans for the project. Ignoring the cultural change that needs to happen and instead only doing a technological shift.

E) Lights-out manufacturing is a fully autonomous manufacturing process, in some cases a full factory that could run without any or with limited human interaction. For digital transformation it makes a lot of sense to use autonomous manufacturing, this could improve a business with longer production hours. Robots also do not need benefits, planning schedules to keep lines running would no longer be needed and the factory could be more optimized with respect to using the floor space. It also means a lot of health and safety laws can be ignored as the workers are all robots. This would save a lot of money and the optimization you can do if you mix robots with machine learning and data processing could lead to big gains in production speed. The only drawbacks are that robots are expensive in the short term and not suited for all kinds of manufacturing. Politically replacing human workers with robots could be highly unpopular and might lead to reputational loss in the short term at least.