INDUSTRIAL DIGITAL TRANSFORMATION IBE505 EXAM

QUESTION 1

a) UPS is a shipping and supply chain management company. When trying to improve delivery time and real-time-package tracking, we need to see at aspects of the logistical department:

Is there anywhere we can save time when handling packages? Are there fast and cheap solutions to improve the system? Is there a way to always track packages, so that the customer can keep a tab of their deliveries, as well as see that the company is indeed doing their best to make sure the customer is a priority? I would suggest a solution where each package is uniquely tracked and can update position and current situation (is it in transit/waiting at a service point/on its way to the customer?) There are systems today that deal with such questions – but they are often just updated when arriving a new point of the transit. A system resembling Apple Airtag/Samsung SmartTag Which also carries the info about the package could have an API easily available for customers through the web. You could also upload this data onto a blockchain, for permanent storage of the information. The data this system provides is available for UPS – for analysing of where packages are being slowed down, for example. This will in turn prompt changes in the chain where time can be saved – when you can track packages in real-time you also see where exactly things are a challenge – and where you need to focus your attention to find better solutions.

b) As mentioned above, smart tracking of packages is a solution here, as well as the blockchain – analysing the data provided could require machine learning to analyse huge chunks of data – and provide a way to visualize it, to see trends and where the challenges in the delivery chain are. UPS rely on ships, planes, and trucks to deliver packages, which are easily fitted with systems to provide a stable internet connection – or systems that send information when able to.

c) My role as CIO in UPS is to manage the technology portfolio of the company, as well as being the initiator, leader, and executive sponsor of the digital transformation efforts the company takes. I am a part of the corporate management, and I am there to help and advance the business areas of my company.

d) If there are skills gaps for implementing the innovative solution, there are ways to amend this situation. One way is to hire people with the necessary skills, either in newly created positions, or to teach/supervise existing assets in the company that have the capacity to acquire the skill set. There needs to be a balance between the potential income/revenue that the solution provides and the cost that this solution requires. Often there is already potential to adapt within the company, part of the solution is to identify whether is it worth it.

e) In case of my solution, it seems obvious that Goal number 9 (Industry, innovation, and infrastructure) will be reached, as well as Goal number 11 (sustainable cities and communities). Better tracking and faster deliveries help with the pressure on urban areas

when it comes to traffic/pollution/disturbing living areas. You could argue this would also help a bit with Goal 13, climate action.

QUESTION 2

a) There are already some solutions to this problem – digital twins provide digital copies of physical objects and lets the person viewing it see how it is affected by real life situations/environments, as well as safe stress-testing. There are also digital platforms that let you simulate electronic objects, for example – Arduino as an example, where you have an open-source electronic prototyping platform. Something like this will amend the lack of physical labs – when VR becomes an integral part of education this will also allow users to get a first person-view of structures and objects. By "touching" the objects (simulated in real-time) you also get an understanding of how the real thing reacts.

b) There is no way to 100% ensure that students are not cheating. Digitally there are ways to keep a track of students and their activities – from the ways they leave tracks in a browser session to tracking eye-movement through mandatory webcams during exams. This does however present itself with certain ethical and judicial problems – this is regarded as illegal supervision and way overboard for an educational institution (GDPR etc). I If I were to suggest a change – it would be to present the dataset for students to be used in exams. Full transparency – and lots of questions. Have multiple choice as the standard and set a time limit that makes cooperation futile – as well as presenting the candidates with different question sets – no one gets the same exam. Let chance decide who gets what question, and loop over the question set each time they click next – within these limits you will provide a unique experience for each candidate. As long as they are presented with the dataset before the exam you will get a fair and predictable result (those who have studied it well will get done in no time – if you rely on googling, you can answer some of it – but have not got time to achieve it all).

c) For the first solution regarding labs, I would say that VR and digital twins are the way to go – VR will eventually become easily obtainable – and for students it will be a way to study labs from home even when provided with physical labs at school. The second solution could be helped by using machine learning to analyse data from obligatory assignments when creating the exam, for example -which questions are answered more frequently, what are challenges for students, what is a breakpoint for students when it comes to question lengths, how many questions do you need in a dataset to provide a challenge, etc.

d) Stable internet connections, dubious sources, lack of eye contact – distracting things when trying to learn. Online learning also requires more self-discipline from each student – you are left "on your own," and without an understanding of instructions given and what expectations there are, there is the potential of inferior work. Resources available is also a

challenge – if everything is digital you need to be "on" for whenever you need to study – and this increases the need for effective time management. You need to rest between sessions.

e) The obvious one is number 4 – Quality education, through a remote delivery of education. You can attend and achieve degrees even when limited to a physical location far from the school. I would also suggest number 10 – reduced inequality. Often, a reason for inequality is the incapability of travelling and living near educational institutions – but if you can attend school through the internet (when you have the time), you can maintain a job/family life with fewer resources. This also touches on goal 13 – climate action. Less people travelling less will lead to less pollution. Students/pupils make up a lot of both private and public transport.

QUESTION 3

a) My solution is already suggested and currently worked on already – but still not implemented. Robotics and drones can mitigate some of the staffing problems that hospitals experience at times. By having patients connected through already existing equipment (sensors for pulse/oxygen levels), there is a way to predict and analyse data on patients on what their physical needs are (medicine, warmth, when they should sleep). Robots and drones can provide the physical way of administrating these solutions (injecting medicines in tubes/providing medicines for patients/enhancing the environment, dampening lights, warming the bed/cooling it).

b) Drones and robots are already well on their way when it comes to providing help physically and will become increasingly important for help care workers in the future. As humans live longer and need care for longer, there will be less people working with an increasing number of care patients in hospitals/care homes. Technology will play a crucial role of maintaining a worthy and stable care. Analysing a continuous data stream from patients as we monitor them closely will need real-time crunching of numbers, so machine learning could be implemented to predict how the patient is getting better/worsening, when potential crisis may occur. Being able to foresee when care will be needed will alleviate the increasing problem of dwindling human resources.

c) There are four different cloud models:

- Public cloud: provides access to cloud hardware and software through the internet, with no need for users to deal with hardware and software, which is managed by the cloud provider. This allows for multiple users to share the infrastructure.
- Private cloud: Exclusively operated for a business/user. Often hosted at the location of the company/user. Greater control of resources and security, less impact of sharing resources with other cloud clients.

- Hybrid cloud: integrated version of public and private clouds, allowing for storage of sensitive data and mission-critical applications on company premises, but also letting people use technology and management tools through the cloud.
- Multicloud: Using infrastructure and components from different public clouds and services from two or more major cloud providers. Hybrid multiclouds are becoming popular, allowing business to take advantage of different technologies/services with maximum flexibility while fulfilling requirements for security and regulatory compliance.

There are challenges when it comes to implementing this solution. The advantage is obvious; streamlining how hospitals log data and how to retrieve data would be a giant leap forward, as large institutions like these are notoriously known for being behind the technological advancements. Using the cloud as a way of storing data and developing applications would help a lot with how hospitals manage their resources, as well as freeing up time for administration/staff in a huge way. Easily available data is key for end-users that do not want to spend time with outdated systems that are infrequently updated/patched.

This does however also present us with a few challenges: patient confidentiality and patient journals are considered a hot topic. Who should have access, does the data need to be securely encrypted, is the data considered safe? Storing classified data like this on a public cloud presents the provider as well as the hospitals with challenges on how data is safely stored, how it is protected and what happens if it is compromised. It is also a huge task to manage all the data – hospitals are providers of big data, and the solution might get expensive fast.

d) Companies that are working with digital solutions need to be incentivised to develop these solutions. Whether it is offering them exclusive contracts for delivering the systems/products when it is fully developed or allowing them freedom when it comes to further use of the technology after implementation, there are many ways of stimulating companies to deliver a fully developed product in time.

e) In this case, Goal 17 is affected through my solution, with a healthy partnership between the public and private sector. Goal 3 as well, achieving good health and well-being.

QUESTION 4

a)

Defensive: protecting the business from competitors and disrupters when modern technologies/competitors arrive.
Offensive: Trying to disrupt the rest of the industry, by leaning heavily on the modern technology and pushing progress.

Example: Most car manufacturers in the US started producing electric car as a defensive strategy. They produce at a loss, and anticipate a growth in the market, whilst technology advances.
Tesla chose an offensive strategy; being the driver of technology and the forefront of making their brand known for technology and a status symbol, charging a premium price for their product. Progress in the automobile business has been driven by Tesla, being at the forefront of technological advances.

b) The explosion of use of remote conference work came as direct result of COVID-19, where suddenly, *all* meetings had to take place in a digital environment.
Other examples are how we shop remotely on the internet (huge boosts in numbers), learning through digital platforms became the standard (conference work, but also using platforms such as Discord), online entertainment (movies being released online instead of in cinemas), tv-shows produced, edited, and sent from remote locations/homes. The important thing is of course everyone working from home and having to adapt to digital resources only.

c) Technical debt refers to companies opting for the cheaper/easier solution in the here and now, instead of taking time and resources to fully research a more viable solution. This debt is the cost of reworking this solution in the future, and if not addressed, can result in "interest" later that makes it even harder to implement changes in the future.

d) Leading indicators of failure in an industrial digital transformation are lack of an IDT strategy (Industrial Digital Transformation), lack of top-down support, inward focus instead of focus of industry sector trends and the customer's perspective, a mismatch of planning versus doing and too much focus on the technology instead of the cultural shift the transformation is supposed to achieve.

e) Lights-out manufacturing is a production line which is fully automated, the only role of the people in the factory is maintenance and repair purposes.

Industrial digital transformation is driving lights-out manufacturing in a huge way, I will name some examples:

- Digital twins of production line to limit time-wasting and optimizing production flow
- Machine learning to predict factory scheduling and queues
- Digitizing process monitoring and control
- IoT and sensoring of data
- Machine learning applied to big data for yield management
- Deep Learning, for example used for inline inspection (detection of defects/identifying objects/perfection or products)
- Prototyping digitally

In short, there are many ways industrial digital transformation is driving lights-out manufacturing. When supervision, production and handling of products are managed by machines this leads to human resources being limited to a few key roles. With the emergence of sophisticated AI, we might be looking at fully automated production plants in years to come.