Exam 13.05.22

Industrial Digital Transformation

Question 1

a)

One potential solution that deals with the two points given is the creation of two apps. A user facing, package tracker app, and a worker facing package/parcel scanner.

The user facing app would provide for the user a real-time (or near) tracking of their packages.

The worker facing app would provide a tool on a work phone (or other device) to quickly scan packages (and log information) be it in distribution centers, when loading on trucks, or when delivering to customers.

b)

Emerging technologies utilized to implement this solution includes:

- Cloud Computing: providing server space and computation for thin clients (the apps). Specifically, Infrastructure as a Service (IaaS)
- Software frameworks like React Native: allows for quick development of MVP and deployment to customers and workers.

c)

My role as a CIO within the UPS is to serve as the leader of the digital transformation that the company is after. My job is to manage UPS' portfolio of different technologies, and overall to ensure that other C level managers do not have to think/worry about technology. My job will most likely not be about implementing the different technologies required for the transformation, that will be up to the Chief Technology Officer (CTO) etc., but instead to serve as the leader and initiator of transformations as well ass sponsoring digital transformation processes and efforts.

d)

There would be two main ways of dealing with the gap in the skills required by my solution.

The first is to utilize in-house training classes. All team members need to be familiar with and up to speed on the technologies and frameworks required by the solution, as such, providing training classes is an effective way of achieving this goal without having to increase the size of the team (and cost).

The second, is to utilize cross-training. In this situation we would team up new hires, that are familiar with the new frameworks and technologies, with existing team members that are familiar with the inner workings of UPS' development structure. By teaming them up, one part will be able to teach the other what they lack, without rising tension in the team by giving the new hires immediate lead responsibility.

e)

The Sustainable Development Goals this solution positively impacts would be goal 8 (Decent Work and Economic Growth) and goal 9 (Industry, Innovation, and Infrastructure).

Goal 8 would be due to the worker facing app, which would make work less tedious (reading labels on packages, etc.), and faster and more efficient.

Goal 9 would be impacted due to the tracking of packages and faster delivery times leading to less strain on the infrastructure, improved delivery times to small business users, and overall increasing innovation in the sector.

Question 2

a)

One possible solution to the problem of access to labs during remote learning would be a tool/website that allows students to work in a simulated lab. An example of a similar solution in electronics is Tinkercad, which allows users to run code on simulated Arduinos and circuits. A similar solution could be built for chemistry labs. For example, simulating different reactions of common chemicals used in classes. Though not actual fluid and chemical simulation (computationally expensive) but visualizations that correspond to user input and shows the results of correct amounts of chemicals added to a mixture (as an example).

b)

One solution to the problem of monitoring student activity during exams could be either a browser extension (relatively easy to circumvent with a different browser) or an application running on their machines that monitors activity (again, relatively easy to circumvent with a different device).

Such a solution would provide a way to monitor student activity and display a pop up / warning should the student get close to an activity or site that might qualify as cheating.

As mentioned in the parentheses, there are some issues with the ease of circumventing these solutions. However, the tools required for complete lockdown of a student's devices would risk encroaching on data privacy and security of the student's home network, since it would require a network wide lockdown, which could again be circumvented via 4G/5G.

c)

For the solution I provided above, a framework like React Native would be needed to create the user facing portion of the application. Since this solution exists on device, no cloud computing would be needed.

There is the possibility of using machine learning to monitor student activity and study behaviors associated with cheating / circumventing anti-cheat measures. In this event, some form of cloud computing (IaaS or SaaS) would be needed to analyze all the incoming data as well as to train machine learning algorithms to detect suspicious activity and minimize false positives.

d)

The challenges that might impact online learning:

One of the main challenges is communication. In a traditional learning environment one can simple approach the teacher (or classmate) with a question. This can be more difficult in an online environment. If the tool used by the school is poor, communication can be slow, inefficient and messages can be easy to miss. It is easy for questions by fellow students to be lost among dropdown menus, and emails that automatically gets tagged as spam. This communication issue also exists in voice-over-protocol services, as issues with tech can slow down lectures and group work.

Another challenge is participation, though somewhat a part of the challenge in communication, the lack of participation in for example zoom lectures is a challenge. When students are just listening on the computer it is easy to "zone out" of the lecture, and conversely, it is easy for a teacher who

presents both to an in-class audience and a digital one, to overlook the participation of the digital students.

e)

Both solutions would target goal 4 of the sustainable development goals which is “Quality Education”. This since the first solution would provide easier access to a lab like experience which is need in certain subjects like chemistry or physics. The second solution would also help towards this goal as it would provide a more even “playing field” by reducing the effects of cheating in exams and tests.

Question 3

a)

A possible solution to the staffing problem would be remote meetings with doctors. Thus, a tool would need to be developed that provides safe and easy access to remote consultations. This would allow for some or many doctors to work from a centralized location (i.e., not needing smaller hospitals/doctors’ offices to be fully staffed) instead of having to be spread out among many smaller locations.

b)

This solution requires the use of video calls, but due to the sensitive nature of what patients might share with their doctors existing solutions such as zoom would not be sufficiently secure. Thus, a custom software solution would have to be developed using cloud computing, specifically Infrastructure as a Service, which would provide the server space need to process the calls and store any potential data depending on the exact implementation of the solution (text chats, etc.).

c)

The main advantages of implementing this solution on the cloud is the portability and scalability the cloud provides. Portability means that the hospital can utilize “thin clients” that usually only contain an OS and a browser to access the cloud-based tools, and those “thin clients” can be laptops, desktops, phones and more. This provides excellent portability of the solution.

The scalability refers to the ease of adding new cheap thin clients to the cloud network rather than more expensive computers that can do more computing on their own. The cloud-based solution also

means that rather than having a major server/main frame per hospital providing the services of the solution, it can instead be hosted from centralized data centers that are easier to maintain and upgrade.

The four different cloud models are:

1. Public Cloud – access to cloud hardware and software via a cloud provider. User does not have to acquire and implement expensive hardware and software.

2. Private Cloud – cloud infrastructure implemented for only one company. May be managed internally by the company or externally by a third party. Gives greater control over the cloud infrastructure to the company but also increases expenses.

3. Hybrid Cloud – uses complex management tools to integrate both private and public cloud infrastructures to move workloads between the two based on specifications by the company.

4. Multicloud – uses cloud infrastructure from multiple cloud providers (or mixing one cloud provider's infrastructure and one SaaS vendor's software).

d)

Since hospital and healthcare providers lack the expertise to develop and finance such a solution, the primary way of creating this solution would be to outsource the creation of the tool to a software development company. With their expertise they could build the software need for the solution and then would either sell it or license it to the different hospitals and healthcare providers.

e)

The primary Sustainable Development Goal to be impacted by this solution would be goal 3, good health and wellbeing. This is since it would provide easier access to healthcare in a society that is struggling with staff shortages in hospitals and healthcare.

Question 4

a)

Defensive Strategies:

This type of strategies focuses on defending/protecting the business from major disruptors and competitors. An example given by the book is how after the emergence of Tesla, most car manufacturers started to provide their own electric vehicles. An example I can come up with is the sudden change in mobile phone design (all-screen rather than buttons and keyboards) after the 2007 launch of the original iPhone by Apple.

Offensive Strategies:

This type of strategies focuses on disrupting the rest of the industry that a company is working in.

An example of this strategy provided by the book is Tesla's strategy of pushing for electric cars for private individuals, and they are currently taking aim at the trucking industry (electric Semi) and in the far future taxis and ride shares via self-driving "robotaxis".

An example I can come up with is Apple's launch of the original iPhone. Before the iPhone most "smart" phones were designed with keyboards under a small screen. After the launch of the iPhone, companies that did not change their designs have basically disappeared from the market.

Another example is the iPod and iTunes, which completely changed the music industry and how music is delivered to the listeners, and likely paved the way for the current streaming industry of today.

Compared:

Comparing the two; Offensive strategies are riskier as they require new and untested technologies and innovations. Though, when successful, can provide incredible profits for the company that can first provide the innovation/technology.

Defensive strategies are on the opposite side, safer, as they do not require spending massive amount of money on technologies that might not pan out. However, a company that uses a defensive strategy must be on the lookout for a disruptor so that they can change their own business to utilize the innovations/technologies that are brought forward by these disruptors.

b)

There are two clear examples that showcase how the Covid pandemic has sped up the adoption of different technologies:

1. The usage of remote teaching/schooling has increased rapidly in the last 2 years. One such example is this very course, which has been done remotely in its entirety. The usage of remote teaching has caused companies like Zoom to suddenly become “household” names like Google and Microsoft.
2. Work from home. While at first one might think this might fall in a similar category to remote teaching, it does often use similar technologies like zoom, work from home also has seen the rise in tools like Slack and Microsoft Teams for specialized tools for teams to communicate from their homes.

c)

Assuming the questing was “Define technical debt” rather than “Define technical debit”:

Technical debt used to mean the debt that one accrues by taking shortcuts in software development leading to increased difficulties in maintaining old code and adding new functions to the old code, it now has also been used to include the usage of older obsolete hardware and software in business and organizations.

This new expanded definition means due to the rapid development of technologies, it is easy for companies and especially public agencies to fall behind on their implementations of technology. For example, with public agencies that have existed for decades and have faced budgetary restraints and cuts, they often lag behind the current trend in technology. Not only that, but once implemented, a public agency is more likely not to have the budget to replace this implementation in the future once it is obsolete. Thus create a technical debt.

d)

Leading indicators of failure:

The main indicator of failure, as seen in the class textbook, is a lack of an industrial digital transformation strategy. This is a major indicator of failure, as just having an interest in transforming a business is not sufficient. One must have a clear set, defined strategy on how to implement that transformation.

Some other indicators of failure include:

- The company board or the leadership does not seem to care for nor pay attention to the transformation. Top-down support is important for a successful transformation.
- Not using MVP's correctly and learning from mistakes and successes from said MVP's.
- Focusing to much on for example the immediate bottom line (an inward focus) rather than seeing and following industry trends.

e)

Lights-out manufacturing is where a production line (or entire factory) has been fully automated and the only employees on site are workers who focus on making repairs and doing maintenance on the automated machinery and tools. Industrial digital transformation is clearly driving this automation process as automating an entire production line requires complex technologies and solutions.

Automated Material Handling Systems are systems that provide the basic infrastructure and movement of materials through an automated production line.

With the automation comes the need for monitoring and control of the many different processes that take place in a manufacturing line, and workers from the business need to be able to view the process and its functions to check production status. But with the increase productivity that often comes with automation, comes an increase in data, so there also needs to be some automation in the data gathering and analysis. Not only to provide oversite of production, but to spot anomalies and errors in production, and to spot errors in the automated machinery for maintenance purposes.