Exam spring 2022

UPS - Chief Innovation Officer

UPS needs to address two customer experience challenges:

1. Fast delivery
2. Real-time package tracking

Fast delivery

Fast delivery consists of picking up goods from various locations and delivering them to various locations in the shortest time and cost efficient way possible.Assuming that we only look to optimize truck routes where that is the only mode of transportation available.

Such a problem is similar to the problem of the traveling salesman. The first step is to make sure that the company is using the latest algorithms to solve this type of problem within the field of operation research. The traveling salesman problem was formulated back in the 1960 however it is an NP-hard problem in combinatorial optimization. So it will be important to use the right algorithms and have the computation power in the cloud to solve the problem fast such that the driver knows in real time which optimized route to pick.

The time it takes to drive from A to B is a function of speed limit, road traffic (level of congestion), any accidents or the probability of such that might happen on the route. The company needs to use road cameras and other surveillance and collect real-time data on road situations to guide the driver to take the shortest and quickest route.

Also any vehicle breakdowns will have a major impact on delivery times. Therefore using machine learning to predict breakdowns and use condition based maintenance could be applied to improve the uptime/utilization of the vehicle

If the driver needs to drive over long distances such that the driver requires rest, optimisation in terms of having drivers ready to take up the next leg of the journey could help improve the delivery times. Long term, autonomous trucks will offset this problem. And something the company should consider.

Optimization algorithms should also consider how to pack the truck, i.e. bulky items that need to be offloaded at the next stop are packed such that it is easy to offload.

Real-time package tracking

Real-time tracking can be divided into two major categories. Tracking of packages within a distribution warehouse and tracking packages loaded onto a truck. I will address both. Warehouse tracking: Scanning products when they are initially received, scanning them throughout the warehouse process, and then again when they are being shipped onto trucks, and make this information available in a cloud application where users and customers can have access.

Warehouse and Storage Tracking Technology
(source: https://www.blumeglobal.com/learning/real-time-tracking-technology/)

Bluetooth Low Energy Beacons for Location Tracking
Bluetooth Low Energy (BLE) beacons are battery-powered beacons that transmit their location to any Bluetooth-enabled devices in range. Smartphones, tablets, and other technology can detect each unique BLE beacon and provide an approximate location. The iBeacon protocol and hardware, developed by Apple, makes use of BLE technology. Due to limited range and accuracy, BLE beacons are of limited use to larger supply chains, warehouses and logistics providers.

Ultra-Wideband Beacons for Location Tracking
Ultra-Wideband (UWB) beacon technology is among the most accurate solutions for real-time location and tracking within a warehouse or storage location. UWB systems work by placing UWB "anchors" around a space to be tracked, providing an invisible "grid" that can monitor the warehouse. UWB tags can be attached to specific products or assets, and the UWB anchors will track where every tag is located. This is represented in the UWB software, allowing fast and accurate position reporting.

UWB technology is often used on forklifts, carts, and other equipment in a warehouse environment. This allows warehouse managers to track high-value equipment—UWB can easily be combined with RFID, barcode or other tracking technology to identify all the items being transported by that equipment. The high level of accuracy provided by a UWB solution means it can be an expensive option, but for accuracy and speed, it is unmatched.

Radio Frequency Identification for Location Tracking
Radio Frequency Identification (RFID) has long been used to track inventory levels and locations of goods in warehouses. Although RFID technology remains popular, it does have some limitations, especially for passive RFID tags:

RFID tags are often only scanned when they go through a certain point, e.g. being delivered to the warehouse or placed on a shelf
RFID gates and readers can be expensive to purchase and deploy
RFID passive tags have very short ranges

Because of these reasons, RFID tags are typically used more for inventory management and stock level tracking rather than real-time location identification.

Barcodes for Location Tracking
Although barcodes are a passive way to track location and inventory levels, they are still some of the most ubiquitous technology available. Barcodes are inexpensive and easy-to-implement and can be combined with other tracking technologies to provide low-cost inventory management and limited location management.

To perform real-time package tracking when the package is located on the truck it is only necessary to know where the truck is located and when the package is delivered to the next warehouse or end-customer. To track trucks real-time you can use Global positioning system (GPS) which is off-the shelf services in todays world. Here is an example of: https://rio.cloud/en/solutions-for/vehicle-tracking

Role as Chief Innovation Officer

Source: https://lcgsearch.com/the-role-of-a-chief-innovation-officer-by-john-v-jazylo-partner/

The abbreviation should be CINO and not CIO which can be confused with Chief Information Officer.

A Chief Innovation Officer (CINO) is the designated person in a company who is primarily responsible for managing the process of innovation in an organization, as well as being in some cases the person who "originates new ideas but also recognizes innovative ideas generated by other people – both internally and externally."

The CINO is responsible for managing the innovation process inside the organization that identifies strategies, business opportunities and new technologies and then develops new capabilities and architectures with partners, new business models and new industry structures to serve those opportunities. The CINO should focus on breakthrough innovation. Successful innovative officers focus on delivering the key principles behind innovation – leadership, creating networks, harnessing idea development, leveraging the right incentives and building/managing an effective, transparent and efficient innovation process.

Garner reports have found that the traditional Chief Information officer has looked too much inward in the organization and have mainly been focusing on delivering short term efficiency goals. This leaves a gap in looking for long term solutions to innovate and connect deeply with customers and partners to find the solutions together.

Chief Innovation Officers (CINOs)
Lead their companies' efforts to find and develop ideas for new products. They also work to ensure that other executive officers recognize and support initiatives to encourage innovation. Most importantly, they are familiar with the process of turning fresh ideas into great products. Here is their roadmap:

Process
Chief innovation officers are not responsible for developing ideas themselves; but establish a process that enables other people to contribute. They may, for example, establish an internal website where any employee can contribute ideas for improving existing products or developing new ones. They also ensure that each idea is evaluated, with the most promising suggestions advanced for further development. They also monitor customer feedback, service requests and product review sites to identify recurring problems that require an innovative solution.

Sourcing
Ideas for innovation can come from outside the company. As such, chief innovation officers maintain relationships with universities and organizations that conduct research in areas of interest to their company. They may sponsor research projects or negotiate licensing agreements to use the research findings. Large organizations may provide facilities for start-up companies or independent developers to use their product development resources to take promising ideas forward.

Support
Chief Innovation Officers identify projects that have strong commercial potential and allocate budgets to test them in the market. They may develop prototypes and carry out small-scale tests in selected geographical areas or with selected customers. They use feedback from the tests to evaluate the response to the prototype and decide whether to take the project forward. If the tests provide positive feedback, they develop a business case, champion the new product and ensure that it receives adequate development and marketing resources for success.

Collaboration
To ensure that good ideas become the next generation of new products, chief innovation officers collaborate with all levels of the organization. They work with research and development teams to ensure that their efforts reflect customer needs as well as innovative thinking. As ideas move through the development phase, they work with product and marketing managers to ensure that the products get to market as quickly as possible so that they generate revenue and provide a return on investment. Chief Information Officers also work closely with senior executives to ensure that innovation aligns with corporate strategy and receives adequate funding.
Source: https://lcgsearch.com/the-role-of-a-chief-innovation-officer-by-john-v-jazylo-partner/

Bridge the gap in the skills required

I would perform a process similar to the one depicted below.

Source: Industrial Digital Transformation: Accelerate Digital Transformation with Business Optimization, AI, and Industry 4.0
Book by Ann Dunkin, Mahesh Chowdhary, and Shyam Nath

There are two main methods to fill the gap, either to source, develop and retain the skill internally or partner to gain access to the talent externally. Both come with their pros and cons.

Source, develop and retain key talent internally
In today's environment it is very difficult/costly to hire the best talent within industrial digital transformation. The first thing is to communicate to senior management that the cost of not hiring the best talent could have dire consequences for the company long term. One need just look to Nokia and Kodek for the horror stories. Once that is out of the way, one need to identity what motivates the best talent to chose a specific company to work for, that will be a combination of monetary incentives (salary and other benefit) but also the working environment and conditions, level of automay, and the possibility for the new employee to work with the best in their nice/industry. Travel or not travel, work from home or in the office, all these things needs to be identified. Also hiring an Executive search company to support in the hiring process would be a good idea.

Once the employee is hired, a large portion of the the employee time should be spent on learning (on-site or online courses), it could be to take part in mentoring programs and do

company training in many different areas across the globe. Depending on the score of the various courses the employee could get a bonus depending on grading.

Get access to talent outside the organization
Depending on the size of the organization and strategic choices made not all competences and capacity needs to sit within the company itself. For example, creating a digital IoT platform could be very costly. Kongsberg Maritime together with Kongsberg Digital have made a choice to create Vessel Insight IoT platform to connect OEM's, consultancy companies, software companies and so forth to the benefit of all. Such that a specific vessel owner does not need themselves to create such a platform but could leverate an already created platform tailored to their own need with a host of OEM' connected not only Kongsberg software and hardware.Similar Kongsberg takes part in partnership and consortium to deliver autonomous vessels, this is an innovation that requires talent across industries and businesses. To key to these platforms and collaborations are to separately cleary IP, where to compete and where to collaborate to the benefit of all.

The Sustainable Development Goals (SDGs)

UPS route optimization will lower emissions. Autonomous vehicles will let drivers take more rest and even find other jobs which creates less stress and fatigue on the back. O lot of drivers complain of back pain.

Covid-19

Augmented reality
Augmented reality and metaverse could help students meet in the lab, pick up items, disassemble and assemble objects together to study them, creating an almost if not better experience than reality. This technology has been implemented by OEM for service engineer training already.

Exams
The issue here is to find the balance between personal space and monitoring, we are trying to answer the wrong question.

In the extreme spectrum one can set up a camera in room in the house showing the computer and the student. Through remote assistance the university can take control of the computer and monitor and log all activities. And one can only allow for only one IP in the house to be active, namely the computer that is being used for the exam. Such that if the student needs to use the restroom, the student will not be able to use a phone or any other device connected to the internet. Also the phones would need to be blocked. All of this is technology possible, however it will feel like an extreme George Orwell 1984 world. No one would accept this.

The right question is:
How can the exam format and type of question together with the form of evaluation be changed to accommodate the new situation with home exams, such that suspicious actions, credibility and fairness are maintained.

c) Not relevant, it is the wrong question. See above.

Online learning
Online learning can be either one-way or two-ways. There is something magical that happens when people meet in a classroom face to face or in any physical environment. That has not been recreated in a one-way online learning environment. Also even after a traditional lecture with 200 students, a student might reach out to the professor at the coffee machine for a casual chat and some magic happens. That has not yet been created in any online course I have attended. However with the metaverse I think that both the office and the lecture room could be recreated in a virtual classroom / office where these informal interactions can take place as naturally as they do in any physical classroom today. This is something for the new generation, and who knows, 100 years from now, maybe the physical meeting space will be a distant memory, and people will ask why did they even bother to show up physically in the past.

SDG
If people stop showing up for physical meetings, be it office, student labs, or other gatherings. It will reduce the amount of transport needed, which is one of the main contributing factors to emissions. And even if we drive electric cars or any other transportation vehicle, it has required energy to produce the vehicle in the first place, which has mostly contributed to some level of pollution. One the whole the scarce resources on the earth will be in less demand for transportation.

However, when people stop meeting physically, there will be less demand for all sorts of service providers from taxi drivers, bus drivers, people working in kiosks and kantines, cleaning staff and so forth. Which might have a negative impact on some people's job security. Lord Suger just published his view on the topic of working from home. LORD SUGAR: It's time for everyone to get off their lazy backsides - and their Pelotons - and get back to the office! https://www.dailymail.co.uk/debate/article-10799043/LORD-SUGAR-time-lazy-backsides-office.html.

Just as some people are suffering from Long Covid, businesses are suffering from Long Laziness — the hidden side-effect of the pandemic.

I'm horrified by stories of bosses struggling to get their staff back to their desks, only to be met with point-blank refusal.

And with the economic news as grim as it is — inflation soaring, growth stalling and interest rates going through the roof — we need everyone to pull together and put their shoulders to the wheel, working as a team, ***not in individual bubbles.***

Hospitals

Evaluate patients needs accurately

One can use classification algorithms to diagnose a patient correctly, this might improve the manual classification accuracy of humans. One needs to collect a lot of data, more data than one hospital or even country possesses, so a cross border research program needs to be initiated. Secondly all the patient data needs to be anonymized for personal data protection to be maintained. Lately MIT Technology Review have published articles of how synthetic data can be used for this type of purposes where big data is not lacking.

Another issue with using classification algorithms is that some patients might struggle to believe in such a method, and prefer the old human experience method. Also depending on the algorithm of choice the reason why, i.e. how did the algogrimt derive its diagnostic answer might be a black box, and difficult to explain, and in healthcare it might be a prerequisite to be able to explain in layman terms how the diagnostic was derived. Some classification algorithms such as decision trees a human is able to trace through the tree why the classification was done as such. But even so, it still might be difficult for a doctor not trained in machine learning to explain to a patient with no clue of machine learning. However his whole issue will slowly fade away as the society as a whole will be accustomed to trust in machine learning from anything to driving our car to make decisions for us on the most optimized choice of action. We trust in X-ray today, but not everybody has a full understanding of the technology behind it, we take it for granted.

Manage hospital resources effectively

With telemedicine you can pool resources across many hospitals to allocate them more effectively. You can also use telemedicine to diagnose the patients before they come to the hospital in the first place, maybe they can be treated as effectively at home, hence not taking up any resources at the hospital.

With IoT devices at home or at the hospital the patient can be monitored without the need of a doctor visit. There is a human aspect to all of this, some patients just want someone to talk to, regardless of physical medical needs. However if that is the case, maybe they just need a ‘normal’ person in whitecoat pretending to be a doctor.

Also operation robotics controlled from the other side of the globe can perform specialist operations which would not be possible in certain situations given travel distance and time.

SDG
Remote operation would reduce travel and hence emissions.Having people recover sooner due to correct diagnosis the first time will have them back to work or serving the community in other ways faster have a positive impact on the society as a whole.

Industrial digital transformation

Defensive and offensive strategies compared

The defensive strategy is concerned with protecting the business from competitors and disruptions. An offensive strategy tries to disrupt the competitive environment.

If you only play the defensive strategy, there exists a probability that at some point in time someone who plays the offensive strategy will put you out of business. Look to Nokia and Kodak.

Example of a defensive strategy for an OEM would be applying IoT, big data and machine learning to improve predictive maintenance and reduce major breakdowns. Everybody in the industry is doing this, and have done it for a decade. It is the bare minimum an OEM needs to do today to stay in the game at all.

Example of an offensive strategy for an OEM, could be to move from being a hardware company to be software company, creating digital platforms to serve many different and competing OEM such as Vessel Insight by Kongsberg Maritime.

An offensive strategy is more costly and has a higher risk of failure. However it also has a potensial higher potential reward by disrupting the industry and taking a leading position in the industry and benefiting from almost monopolistic situation for some time.

A defensive strategy might work very well for a long time, even to such a degree that the company thinks of itself as unmatched and protected from all competition. This is not true, and could serve as a trap with dire consequences.

For a company as whole it is important to strike the right balance between and keep a portfolio of high risk / high reward strategies/projects and strategies/projects protecting their current cash cow to fund all these higher risk projects that might not materialize.

Covid-19

- Covid-19 has speeded up the process of using teleconferencing and augmented reality to perform and participate in digital meetings that mimic the physical environment.
- Covid-19 has helped us develop a process to come up with a vaccine in the shortest amount of time possible to date.
- Covid-19 has helped us develop across at least EU a common standard of a digital heath certificate which shows

Technical debt

Source:
https://www.productplan.com/glossary/technical-debt/
Technical debt (also known as tech debt or code debt) describes what results when development teams take actions to expedite the delivery of a piece of functionality or a project which later needs to be refactored. In other words, it's the result of prioritizing speedy delivery over perfect code.

Shaun McCormick's definition of technical debt focuses more on the consequences in the long term, "I view technical debt as any code that decreases agility as the project matures. Note how I didn't say bad code (as that is often subjective) or broken code." He suggests that true technical debt is always intentional and not accidental.

Leading indicators of failure in an industrial transformation

Failure occurs when individual projects do not achieve expected business value or never reach completion and must be restarted. Critical indicators of the health of transformation such as the lack of IDT strategy, lack of top-down support, inward focus rather than industry sector trends and customer's perspective, mismatch of planning versus doing, too much focus on technology rather than cultural shift – causes are due to misaligned vision, economic and technological factors.

Source: Source: Industrial Digital Transformation: Accelerate Digital Transformation with Business Optimization, AI, and Industry 4.0
Book by Ann Dunkin, Mahesh Chowdhary, and Shyam Nath

And Ibrahim A. Hameed.

What is lights-out manufacturing

Lights-out manufacturing refers to a situation where the entire production line is fully automated. Automation, robotics, IoT, machine learning are all driving the light-out manufacturing revolution.