IBE505 Industriell digitalisering

Eksamen

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1.

a.

We will create dashboards with visualizations which track packages trael and shows predicted travel and turnover times at key locations. The system shall be data-driven and aims to assist the company to better estimate delivery times, plan routes, and allows the customers to see their package in real time with relevant statistics. Furthermore, by optimizing delivery routes and times the company can reduce its emissions.

b.

The solution shall use (partner business') API's, machine learning, and big data analysis. API's will, for instance, be used to show airplane routes and locations, and to interact with our data analytics cloud infrastructure.

c.

The role as Chief Information Officer (CIO) is responsible for the overall IT strategy and implementation of UPS' technology infrastructure. Tasks which the CIO should undertake and be responsible for include:

- Initiate and lead the digital transformation efforts
- IT management and designing strategies for implementation of IT
- Oversee the implementation of new tools and technologies

d.

We will outsource the production of the software solution to a suitable partner company and work closely with them. We will hire a small team of data scientists and mathematicians to liaison on our behalf and the CIO will spearhead the team. If we already have people working in related positions we might reallocate resources internally and offer them incentives and opportunity to re-educate in related fields, such as machine learning.

e.

SDGs impacted

- Goal 13: Climate action
- Goal 17: Partnerships to achieve the goals

By optimizing deliver times and routes the company aims to limit its carbon footprint and reduce emissions.

2.

a.

To improve student learning outcomes in a remote learning setting, I propose to build better systems for communications and knowledge sharing. We will provide a platform where students can work in chat-rooms, in voice and/or video rooms, and provide digital lecture halls where hundreds of students may watch in the same time. The platform will have easy file sharing similar to OneDrive or Dropbox. The system shall make it easy for lecturers to plan and design learning paths, as well as create

components which can be easily shared in other courses or learning paths. We will *NOT* implement any VR/AR technology as this is not widely available and the cost of providing one to the student is unreasonably high and adds uneccessary complexity to the project. Basically we will create a hybrid LMS solution taking inspiration from platforms such as Zoom, Discord, and Teams. We will phase out useless legacy systems such as Canvas and provide an all-in-one streamlined experience fit for the modern student.

b.

I would propose that lecturers write better questions, or perhaps make several sets of questions and distribute them such that we minimize the effects of cheating, rather than wholesale monitoring the students. In a remote situation there is no acceptable non-intrusive solution which removes the students ability to interact with an expert or to share with others. I say the internet shall remain free, and our privacy should be respected.

But if we really can't be bothered writing good exams and instead want to rely on monitoring I suggest we force all students to set up an array of cameras capturing a 360 degree view of their surroundings and workspace, which also plugs into their computer to capture audio and screen as well. The software running this shall be encrypted and have priviledges such that the user of the computer cannot interrupt or otherwise tamper with it, and shall run locally to avoid interruption of service due to internet outage. The device shall also be equipped with battery power sufficient to last throughout the entire exam in case of power outage. The software will capture video and sound for the entire duration of the exam. Hands visible at all times or be disqualified, and external devices such as telephones and tablets must also be connected to the device and be subject to audio and video recording. The software creates a hash of the resulting video which is sent to the school for tamper resistance and verification. Then we will train algorithms to scan the resulting video for evidence of *suspicious behaviour*.

c.

To achieve the insane monitoring device we will use machine learning, AI, cloud computing, big data and analytics, and IoT devices.

To achieve the LMS we will use web technologies like for instance APIs, databases, websockets, and video streaming.

d.

The challenges which impact online learning are primarily in lecturers inability to operate software solutions or to structure the learning in a way that is easily accessible to modern students.

Another challenge is privacy concerns, and these are paramount. Student information is sensitive and must not be shared without their knowledge and consent. Privacy can sometimes be a difficult thing for lecturers to navigate. Students will want to record lectures, but sensitive information might be presented. The rules framework must be agreed upon and made very clear to everyone participating in advance of using the systems.

e.

SDGs impacted

- Goal 4: Quality education

By ensuring that students have access to up-to-date and accurate information we can help them make better informed decisions about how they pursue their academic goals. By giving them different

paths through a subject they can aim high or low depending on the goals. By making it easy for them to communicate and share resources we facilitate cooperation, better learning environments and foster good relations. By being open and transparent, by opening channels of communication between students and lecturers we give credibility to our courses which will increase student retention and boost the reputation of our institution.

By using the insane exam monitoring device we ensure that no cheating can occur, at the cost of seriously breaching privacy and trust with our students. But at least we will have accurate reports on the result of the exam.

3.

a.

We will develope a light-out system for patient care (where applicable). Automated machines for making initial diagnosis, making scans, and generating reports which are automatically propagated to the right authorities in your patient journal. The aim will be to entirely replace doctors and nurses in the exploratory phase of a patients stay in the hospital (outside of emergency situations), freeing up time and resources for the hospital and moving workers into position where they only need to verify findings. By utilizing machine learning we will also mitigate human error in diagnosis.

b.

We will utilize robotics, machine learning, artificial intelligence, cloud computing, big data analytics, and potentially AR/VR for visualization.

c.

Advantages:

- Easy access to sufficient computational power to drive our AI and analytics.
- Security. Data held on premise is easier to tamper with and suffer more employee theft than data stored in data centers.
- Reliability. Data in the cloud can be easily accessed from most locations and is frequently backed up. Data in the cloud ensures redundancy by existing on multiple servers as opposed to one.

Disadvantages:

- Downtime can be an issue if you lose internet access as the data is removed from location, or even more catastrophic, if the cloud provider experiences an outage for any extended period. Lives may depend on the availability of this data as the hospital cannot be expected to function without proper documentation.
- Security. Data is vulnerable as it travels over the internet. Without proper protection protocols in place this could be potentially dangerous as our hospital handles sensitive patient records. It would be catastrophic if they were leaked to the public or into the hands of malicious actors.

The four models:

- On-site
- Infrastructure as a service
- Platform as a service
- Software as a service

d.

e.

SDGs impacted

- Goal 3: Good health and well-being
- Goal 9: Industry, innovation, and infrastructure

We will impact goal 3 as our solution will reduce waiting time and patient turnaround time at the hospital. One doctor can verify the work of many *examination machines* whereas before one doctor would have to see the individual in set chunks of time. This should lead to an overall increase in public health and well-being.

We will impact goal 9 as we aim to disrupt and innovate in the healthcare sector, by building new infrastructure which lessens the load on society.

4.

a.

Defensive strategies: are defined as a strategy of transformation which aims to protect the business from competitiors and disrupters. Such defensive strategies should lessen the risk of being attacked and soften the impact should an attack happen, and to preserve any competitive advantage held. Different approaches may be employed such as actively blocking competitors by for instance cutting prices to make them unviable. Another approach could be counter-attacking by launching your own variant of their product, or creating advertising campaigns to shift customer opinion away from their product.

Offensive strategies: are defined as a strategy of transformation which aims to disrupt the rest of the industry. They should be focused and often require the right timing to be effectively employed. The aim of the strategy should be to carve out a niche in an already established sector by occupying new territory, or by improving an aspect of the product and dominating that niche.

Examples: An example company utilizing offensive strategy which has paid of is Tesla. By introucing their *luxury* electric cars they disrupted the automotive industry and have forced the long established big automotive companies to adopt a defensive stance against them, and to offer electric alternatives at a loss just to stay competitive.

An example company utilizing defensive strategy would then be the other automotive companies which counter-attacked Tesla by producing their own line of electric cars.

b.

Covid-19 forced much of the labor force to lockdown in their own homes, yet businesses still need to operate in order to survive. To combat this, many companies adopted remote work policies and offer their employees benefit packages which facilitated this change. Some companies such as saw opportunity, created and offered better solutions for remote communications and collaboration. By removing our abilitiy to be in close proximity, covid invariably led us to seek ways to cooperate remotely.

The increased use of IT systems also meant a wider demographic of people were taking their first steps into the digital world, and as such highlighted many potential flaws in current systems. For instance, older users would have trouble navigating systems which were intuitive for the *average* IT user. The growing userbase also helped expedite the discovery of security flaws and overall has led to more money being pushed into the digital sector.

We need only look at todays situation to see that the covid has shifted public opinion on office vs remote work and education, and that for the future workers will expect much greater flexibility in where and how they execute their daily tasks.

c.

Technical debt is a term relating to the development of software, also known as design debt or code debt. It implies that there is a cost to implementing an *easy* solution now rather than taking more time to implement a more solid solution. The premis being that the easy solution should incur significant time refactoring in order to achieve the same goal, and in fact might take longer as un-tangling the code each time takes longer. This has lead to, among other things, such concepts as *dry* and *clean* code.

Due to budget and time constraints it's almost never feasible to entirely avoid technical debt, but utilizing methodologies such as Agile we can mitigate the technical debt. There might also be available solutions which allows companies to retire their technical debt by adopting them. An easy example could be a company which software solution is slow and the produces something which must be fixed manually afterwards to comply with modern standards. By modernizing this solution we can retire the technical debt incurred.

d.

The leading indicators of failure in industrial digital transformation:

- **Lack of an industrial digital transformation strategy**: Implementing technology for the of technology often times lead to failure. The company should always start with the business goal and ask itself *why*.
- **Lack of top-down support from board**: Management must be drivers of the change, not resisting it.
- **Inward focus versus industry sector trends**: Digital transformation should empower the company culture. The change should be allowed time to succeed, and focus should be placed on improving results in the industry to avoid a misalignment between vision and expectation.
- **A mismatch of planning versus doing**: Improper use of Minimum Viable Products (MVPs)

e.

Lights-out manufacturing is where the entire production line is automated and workers are only required for maintenance and repairing the system.

Industrial digital transformation is driving this process by optimizing for instance: time, cost, and environmental and safety factors. Tasks which normally take a human worker a lot of time to accomplish can be executed by a computer in a fraction of the time, or by a robot in less time. Work which could be potentially dangerous to a human worker can be safely performed by a robot. Furthermore we eliminate some of the biggest factors for error which is human error.