

Managing artificial intelligence for information challenges

June 2018

If Peter Drucker was a software developer, how would he use artificial intelligence to help managers?

Recently, I realized that I have a terrible trait: I often intentionally forget the name of people I meet . First I thought I had a bad memory, but that was not the real reason. I realized I didn't focus so much on the name of someone during a conversation because I concentrated all my attention on what they were talking about and on the context our our encounter. For example, if I had to talk about a group project I leaded, I would describe it as a personless body of decisions and actions and information; that is what I thought was more relevant. However, I came to the conclusion that even if I remember in all detail what someone had done and how we connected, the name was an essential part of making someone feel relevant and awarded when they were praised. This was one aspect in which I was failing when I was in a managing position because I didn't know how to handle well one kind of information challenge, in this case, remembering the name of people so I could truly connect with them.

This example is very particular to my experience, but Peter Drucker describes from a broader perspective the challenges of managing information in his book "Management Challenges for the 21st century". In the 4th chapter of this book, Drucker details the problem he was observing on the use of software to manage information. He says that with the development of the Information Technology (IT) and Management Information Systems (MIS)

fields, most people started to see how software could be used to make scientific calculations, but few people saw how software would "revolutionize the work of top management". And, according to Drucker, those people who saw the potential of software on management (like himself) were largely wrong on how much time it would take for it to be used by top managers. When he wrote the book in 1992, software was *"still not used to make decisions such as whether or not to build a new hospital, school or prison, or what its function should or could be"*. This has partially changed since the book was written, but the use of artificial intelligence in top management is still not widespread.

Drucker says there is a reason why top managers are reluctant to adopt software to aid them. Some people said it was because managers were *old school*, but Drucker defended that *"top executives have not used the new technology because it has not provided the information they need for their own tasks"*. Drucker wrote that the software that was being used by corporations at that time *"so far has been producer of data rather than a producer of information, let alone a producer of new and different questions and new and different strategies"*. In the case of my personal example of failing to connect with people, a data based solution would be to use the contacts app in my smartphone, while an information driven solution would be an artificial intelligence where I could input data about my contacts but that could also, for example, suggest me that I haven't talked to a person in a while, or suggest me articles that I could send them based on their interests or events that will happen and that we could go together. In the second case, the software is not only a repository of data, but questions my relation with these people and what I have been doing to improve it. Peter Drucker called this difference, the transition of focus from the "T" to the "I" in "IT" .

Drucker foresees that the transition from "T" to "I" in "IT" would be, in capital words, a REAL NEW INFORMATION REVOLUTION. By the time the book was written, Drucker writes that the market for information and the supply was still disorganized, but predicts its potential in the next two decades. Today, some of the largest companies in the world are fundamentally technology companies that operate based on the information extracted from large amounts of data, confirming the hypothesis about the "T" to "I" transition. For instance, in my hypothetical software that allows me to connect better with other people, many of the features I described have already been implemented by social media platforms. But still I don't think social media is the ideal tool for my personal management challenge. And on a

broader perspective, the problem Drucker presented remains: top managers still have a limited toolbox to solve information challenges.

Drucker writes that both enterprises and individuals will have to learn what information they need and how to get it. He writes in capital words "THEY WILL HAVE TO LEARN HOW TO ORGANIZE INFORMATION AS THEIR KEY RESOURCE". This does not mean that the information must be organized using software and it is not that way in many successful companies. But in companies where a large amount of data is generated and where there are many levels of managements and documents are digital, software is the most appropriate tool to deal with information challenges. With this in mind, I imagined how Peter Drucker would design software for two real cases of top managers at large companies.

Cases of information challenges in top management

- **Case 1:** How to get information from lower management levels?

During a symposium, I listened to the CEO of a cement company describe the moment in which the company almost went bankrupt. In the past, cement was reinforced with fibers of asbestos, which however causes life-threatening and debilitating respiratory diseases. The asbestos cement was produced for many years and it caused unforeseen costs due to lawsuits. According to the CEO, information kept in intermediate levels of management worsened the situation, leading to a financial crisis in the company.

- **Case 2:** How to transmit implicit skills?

During a lecture, I listened to a manager from a Japanese company in the petroleum industry that was operating a petrochemical complex in Saudi Arabia. According to the manager, one of the challenges was the training of the technical personnel. This happened because the diagnostics and operation of the large complex was based on implicit knowledge from the oldest employees and that it took several years to train a new technician, furthermore, it was hard to measure how well prepared a new employee was after training.

Peter Drucker argues that to manage information, the starting point is to ask two sets of questions:

Question for executives to start planning for information management

- "What information do I owe to the people with whom I work and on whom I depend? In what form? And in what time frame?"
- Which information do I need? From whom? In what form? In what time frame?

Regarding this reflection, the position of the managers from case 1 and case 2 was remarkably different. I asked the CEO of the company of case 1: if a similar problem happened today and only one intermediate manager held the relevant information, how long does he think it would take for the information to reach him and which kind of information infrastructure does the company have to avoid the repetition of the same mismanagement of information. In case 1, the CEO was still not sure how he would solve this problem if it happened again and they were only able to identify the problem, but were not heading towards a solution. On the other hand, the lecture of the manager of case 2 was different. He also didn't have a solution for the challenge he presented but his lecture was focused on his wish to institute inside his company a department oriented for information management and he tried to describe how this department would be. I asked how far they were from implementing this group responsible for managing information and he said it was a personal idea that the company still had to adopt.

So, after I heard of these two cases, I reflected about how software could help to solve the problems that pose fundamental risk to the existence of these two multi-national companies. For me, a master student in Computer Science, it seemed to be fundamental to empower these managers to make better decisions. But if Peter Drucker says that information management didn't reach top management because the software the IT people make is not what CEOs need, what do they need? Peter Drucker suggests 3 ways to organize information that are relevant for top executives:

Basic methodologies to organize information

- **Key event**

Drucker writes that executives should identify the "hinges" on which the rest of the performance depends. The key events could be projects, or it may have to do with people and their development. In case 1, a key event would be unforeseen legal costs and on case 2, a key event would be the loss of technical knowledge by the company, threatening operation of the petrochemical complex.

- **Probability theory**

Drucker writes that for a manager, it is necessary to know when an event is within a normal variation range or when an event is exceptional. He says that if an event is within a variation range, it is not needed to change direction, however, exception calls for action. In case 1, an exceptional event would be if the CEO observed an increase in the legal costs of the cement industry before it reached their own company. In case 2, the manager could observe the number of hours that sections of the petrochemical complex were inactive due to maintenance and if it is related to lack of qualified technicians.

- **Threshold phenomenon**

The threshold phenomenon is the theory that we only perceive certain events when they pass an intensity or frequency threshold. Drucker says this flaw in human perception can actually be used by managers to identify trends. For example, in case 1, if the cost of potential problems caused by the low mobility of information through management levels can generate losses above a certain threshold, it might be necessary to reorganize the company or to build tools for managing information. In the case 2, if the number of trained technicians is below a certain level, it would require an emergency recruitment and intensive training.

If we observe carefully, the methodologies Drucker suggests for managing information are filters to sieve data. We can also observe that the methodologies do not mention software, but on the case of these companies, I reflected specifically on the use of artificial intelligence to aid in the information challenges of cases 1 and 2. It is not possible to know how Peter Drucker would advise these managers, but in order to approach this problem, I used a thought experiment. I imagined I was in the position of a Peter Drucker who was a software developer and who had to advise these two managers.

Proposed approaches based on Drucker's methodologies and use of AI

- **Case 1**

Proposed approach: Use AI to organize a layered system of information transmission with random components

Reasoning: In this case, the information the CEO owed to the workers is the trend in expensive lawsuits that was troubling the cement industry. The CEO owes the information that this was a risk to the existence of the company. The information he wants is the information that is kept at intermediate management because those managers think this information is not relevant enough to be transmitted or don't have the tools to do it. One way to improve the mobility of information is to create a channel where information is actively requested in constant intervals of time. The managers from different levels generate information, grade their own information and the information of lower levels according to their relevance, passing it to the a higher management level. The information classification can be aided by an artificial intelligence trained on how good each person is in reporting, decreasing or increasing the weight of personal reports. To diminish the risk of important information being discarded, some information that is not considered important can also be randomly taken to higher levels, who can occasionally find out that this information was in fact relevant. This random factor helps to decrease the chance that relevant information is lost. The goal is to provide the CEO with a report containing a reasonable amount of information graded based on the perception of all levels of management. Because the report reflects the opinion of all company, it is a non-voting form of democratic consult and it will be faster and easier for the manager to take a decision that will take everyone on board in case it is necessary to change direction.

- **Case 2:**

Proposed approach: Use sensors and AI to collect implicit information and convert it to explicit information for the training of new employees and robot technicians

Reasoning: The information the manager owes to the workers is the awareness that the limitation of workers threatens the company and that they should put an effort to gather information that could turn implicit knowledge to explicit knowledge. The information the manager needs from the workers is explicit information on how they diagnose the conditions of the petrochemical complex based on their five senses and accumulated knowledge, what is needed to know to keep the complex working and under improvement, and, from this body of information,

what is the relevance of each piece for training new employees. In this case, the manager does not look for a constant update but for a large compilation that can be improved with additions. What the manager of the petrochemical complex could do is install arrays of sensors, such as sound, gas and vibration sensors that can be used to track constantly the complex. Then, an app can be used to collect mini-reports from the workers. Based on the sensors and on the mini-reports, an AI can relate good or bad things about the operation to measurements by the sensors. For example, if a gas sensor detects an increase in sulfur in the air, it could indicate a leakage or that the temperature of a machine was set wrong and the rubber seals are burning, which can be verified with the mini-reports by the technicians. Or if the vibration sensors detect an anomalous activity, it could be that the parts of a machine are not well soldered. With this, the implicit knowledge can be turned into explicit and the manager knows that in the training of new employees he would have to include, for example, how to detect and fix leakages or how to efficiently solder the equipment. In the future, when robots have dexterity similar to humans, the same body of information can be used to train the robots.

While these might not be practical solutions for now, the thought exercise that originated them are a way for the managers to reflect on their information challenges. Peter Drucker warns that *"In the long run, information about the outside may be the most important information executives need to do their work"*. This is becoming clearer and clearer, but it will be a steep learning curve for CEOs to increase their technical literacy and for programmers to learn what CEOs need to get their job done. Furthermore, there are ethical questions on the use of AI to take decisions and these questions will become increasingly complex. Despite that, the work of Peter Drucker will remain an up to date reference on how to approach the use of information management in the curriculum of the 21st century manager.

Word count: ~2,600