Yesterday, now and tomorrow.

40 years of uninterrupted technological breakthroughs. Current disruptions. What's next?

Synopsys

During the last 40 years, technology breakthroughs have brought radical changes in the way our societies operate. Changes are still ongoing, announcing new radical disruptions. At first sight, it seems that we are in the middle of a whirlwind over which we have no control. But with some context, it becomes possible to understand the nature of the transformations under way, and to orient their outcome depending on what we consider desirable.

This book will focus on the events that have impacted the publishing industry at large. There are two reasons for it: the first is that, as the printing press was the first industrial process ever invented, where machines were able to produce identical products in massive amounts, the publishing industry has experienced major disruptions, the major one being the emergence of the World Wide Web, which has become a universal publishing platform, and the biggest library that ever existed, as well as the biggest shopping mall and the public meeting area that ever existed. The fact that we are currently in the middle of unfinished business, where the social media platforms refuse the role of content curators, disrupts the way information is shared in the society and calls for a new publishing model adapted to the digital era. The second reason is that I have worked in this field for more than 50 years, I have actively involved in making these changes happen, and I am calling for other changes to happen, which do not necessarily fall into the mainstream of what is being presented as hot. My point is that universal attention is being directed towards AI, as it was the only technology available, but this is mainly staged as a distraction to avoid thinking about solutions to build what we need to make our societies work.

Contents

Intro

This book tells the story of what happened in the society since 40 years in relation with technology, and is still happening.

The recent past has brought many radical changes which have caused disruptions in many ways in which our societies operate. The present is still uncertain, as more changes are happening before our eyes. The future can be what we want it to be. This book aims at providing the keys to understand what is happening and what we can do about it.

PART I -- Past: Milestones

The road to digitization

The society didn't one day decide to abandon paper and turn to digital. It started by a simple modernization process within the publishing industry and ended up impacting most of human activities and the economy.

Electric devices can be switched on or off. There is usually no intermediary state. Electronic devices are made of myriads of small devices that can be switched on or off.

Since their emergence, around the Second World War, computers were huge machines that could only be installed into governments, big corporations or research centers. Computers, as their name indicates, were first designed as machines to crunch numbers. Every letter can be encoded with a number, and therefore each character can be displayed as a set of pixels that are switched on or off depending on its shape.

Even if it was possible to display text on computers, the resolution of the computer screens did not reach the precision and quality of text printed on paper, and the two worlds remained completely separate.

Computer operators used "dumb terminals", i.e. a keyboard and a monitor, to connect to the computer in their company.

1980s. Personal Computers

In the mid 1970s, young and aventurous people decided to venture into something that was unthinkable: build autonomous computers that were much smaller. Their power didn't rival with the big powerful machines, but they were capable of performing tasks that could be useful for the public at large. New programming languages were created to allow anybody to become a programmer. The "micro-computers", also called "personal computers" hit the market as commodities at the end of the 1970s. They were affordable enough to be attractive by enthusiasts and innovators who came on board in great numbers. Soon after, new operating systems were invented that mimic an intuitive graphic interface and were appealing to creative graphic designers and artists. Circa 1985, the invention of laser printers opened the possibility to print documents that were of a quality that started to compete against printed materials.

The corporations started to understand that many office applications could be optimized using these new devices. The new generation of personal computers could be used by non-programmers. Three kinds of software were of particular interest to the corporate world. The availability of databases opened the way to organize and easily retrieve information . Word processors were much more comfortable to use than typewriters and were adopted by secretaries as a big improvement. The word processors were so easy to use that even the executives figured out they could directly type themselves and improved the quality of the work of their secretaries who get upgraded as "assistants". Spreadsheets were used by the accounting and marketing departments to capture numbers as they could easily simulate the cascade of changes that resulted from modifying the numbers. The ease of use of spreadsheets triggered a usage for which it was not designed for: just accumulating any kind of data in tables, that could be sorted or filtered using any criteria.

Personal computers were independent machines that were equipped to work on their own, without the need to be connected to a network. Most personal computers could exchange data through a modem using the regular phone lines. Companies built private, internal networks to connect their computers together.

Communications between computer users were done using discussion forums and emails. Because of the lack of graphic possibilities, emails were just simple text, and fax machines were the preferred way to exchange official documents, contracts. A fac-simile is a photocopy of a document that is scanned and send through the phone lines. These new technological breakthrough facilitated work, as they shortened the time it took to exchange information.

Storage of data went to several steps. At the very beginning, personal computers recorded data on magnetic tapes. These were slow and unreliable, and were quickly replaced by floppy disks. Computers got equipped with hard disks, that stored much more information. Laser-based technologies appeared: Cd-Roms and DVD-Roms were able to store much more information than floppy disks. These read-only devices became the way to publish and distribute big documents, such as complete encyclopaedias, and videos.

The 1980s were a period where technological innovations were intensive, and had an immediate effect as they were opening huge markets for these products that every company and many individuals wanted to have. These innovations were disruptive in the sense that they created new ways of working, and were regarded as progress, as they provided ways to do the same work in a better way. Perhaps the most disruptive effect was in the printing industry. The printing shops lost significant market shares, as many of their customers could produce on their laser printers documents that were considered "good enough". The vinyl record industry witnessed significant losses as people started to switch to CD players. But the effect on society as a whole was not as important as it will become later.

The rise of the Big Tech Giants

Microsoft

Bill Gates started to build a micro-computer in a garage, and he understood that it was not enough to build a small computer. He also wanted it to be easy to use. He created a programming language, BASIC, that was easy to use, and could be learned in a matter of hours. Microsoft was founded in 1975. In 1980, IBM asked Bill Gates to provide an operating system for the Personal Computer they were preparing. Bill Gates decided to license an operating system, that he renamed MS-DOS (Microsoft Disk Operating System), that performed the essential functions that a computer is supposed to do: writing and reading on disk, understanding keyboard input, and displaying data on a monitor.

The IBM PC was a big hit and was purchased by many companies throughout the 1980s. There were many other brands of computers that were available, also equipped with MS-DOS. In 2004, IBM sold its computers to the Chinese company Lenovo.

Apple as a style

Steve Jobs wanted to make computers desirable objects that could be used by creative people who had no interest in getting into computer science. He started by designing a micro-computer, the Apple II in 1977, and then decided to design a computer with a graphic interface that could be operated with a mouse, having been inspired by ideas developed at Xerox. The first computer, named Lisa, was released in 1983, and demonstrated the new possibilities. It was overpriced and ended up a commercial flop. In 1984, Apple launched a new version of a similar machine, significantly improved, and significantly cheaper. This time, Apple didn't hesitate in launching an enormous sale campaign, and the MacIntosh took off, much better than any other product that Apple did in the past.

Windows

The appeal of the graphic interface pushed IBM and Microsoft to work on a graphic interface that was made to compete against Apple: the first version of Windows was released in 1985.

The need for standards

As Microsoft rose into dominance in the corporate applications using personal computers, standards were developed to ensure that data could be sent and interchanged across multiple environments. It was also a way to preserve the ability for multiple companies to compete on the market. Standards were developed for the network architecture of the Internet, for database queries, for file storage, for programming languages and for operating systems (mostly Unix). In the publishing world, a standard named Postscript was used to provide a common output format for laser printers. A standard character code, named ASCII, was used almost universally within the new computing environment. However, it only standardized the English alphabet, and any accented character or any character in an alphabet other than latin was not standardized at the time. The United States was still the driving force behind innovation, therefore this was not seen as a high priority.

The publishing industry was one of the first to experience significant changes. This is not new, as the printing press was the first example of industrialized, mass market, production. Typesetting was traditionally done by assembling movable types using lead characters. At the end of the 19th century typesetting machines such as the Linotype were invented. The operator used a keyboard to gather the matrices that corresponded to each character, and hot metal was poured into the matrices to form the lines of characters. In the mid 20th century, phototypesetting appeared. Pages were made on films and that eliminated the use of metal in the printing process. At the same time, phototypesetting was made using computers which allowed the operators to type the text and used specific codes to introduce changes in the characters, such as font size, and variants such as italic or bold. Each manufacturer of typesetting equipment developed software which had specific codes. The personnel responsible for typesettings was trained on a specific equipment.

The word processors used on personal computers were basically doing the same thing. Each product had a specific set of internal codes to handle typographical variations.

The need for standardization was becoming more urgent. The solution that seemed obvious was to list all cases that could present themselves, and consolidate them into a universal catalog. But this approach was easier said than done. There were always specific cases that appeared that were not described, and the list kept growing. It became so long that it reached a level of complexity that was impracticable for most users.

IBM used a different approach. They developed a standard for phototypesetting which used a set of tags, but then decided to take a bolder approach. Instead of using typographical tags, they decided to generalize this method by using tags to semantically describe what things were, for example, a citation, a chapter's title, but also a city, a person's name, etc., and describe the mapping between this structural item with a specific typographical value externally, in an stylesheet. Furthermore, documents could be validated against the model that was prescribed, and therefore any non-compliant item could be detected before the document was published. Charles Goldfarb was the main proponent of this standard that was published in 1986 by the International Organization for Standardization (ISO) as the "Standard Generalized Markup Language" (SGML). The main advantage of this approach is that it became possible to publish a single encoded text into multiple outputs, such as paper or in electronic form for a Cd-Rom. Anecdotically, this standard was the first to introduce angle brackets for tags, and was to become the source for other standards which played a pivotal role in future innovations that introduced radical change, including most and foremost HTML, which opened the way to the World Wide Web.

1990s. The Web

In 1990, Tim Berners-Lee was working as a physicist at the European Organization for Nuclear Research (CERN) near Geneva in Switzerland. He spent time working on improving ways for researchers to exchange documents. Those documents were not particularly complicated, from a typographical point of view, and Tim Berners-Lee decided for a limited set of tags to represent the most frequently used typographical variants. He borrowed elements from the SGML document type definition that was used at the CERN, and added one tag to allow links between locations in different documents. The first version of the "Hypertext Markup Language", or HTML, was published in 1991. The documents connected through these hyperlinks formed a web. Tim Berners-Lee created a tool to navigate across documents that was able to activate the links. He called it a browser. This project was not formally adopted by CERN at the beginning, but was going soon to put the world in fire.

The requirement for document validation was key to the SGML industry. The benefit was to ensure that all valid documents would be presented in a consistent way by the tools used to display text. But the drawback was that the tools were rejecting many documents because of validation errors, and it took a significant amount of time to ensure that the documents were valid. The HTML browsers took a much more permissive approach and allowed documents that were not 100% correct to be displayed anyway. Until 1995, the browser that was mostly used was Mosaic, later called Netscape. Microsoft realized that they have been neglecting this growing market, and decided to create their own browser, Internet Explorer.

Until that point, web pages were just text and images displayed. Netscape started to add the ability to have the web pages become interactive, and created a language called Javascript. Microsoft created their own interpreter that was quite different from Netscape. The two main browsers were not behaving in exactly the same way, and some documents had to be created to be compatible with either one of them. Eventually, Javascript was standardized in 1998 but Microsoft didn't stick to the standard at that time. Microsoft didn't feel they needed to comply to a standard, as in 2001 they were occupying 95% of the market. Netscape morphed into Mozilla, and open-sourced its browser, that they renamed Firefox. [^https://thehistoryoftheweb.com/browser-wars/]

In 1995, as the Web browsers became interactive, eCommerce sites started to develop. That year was the start of an online bookstore named Amazon, an auction web site first named AuctionWeb which became eBay two years later, and an advertisement company, DoubleClick, which would be acquired by Google in 2008. The development of e-commerce was massive. In 2024, the total sales amount of eCommerce is evaluated to be more than a third of the total sales, as it is around 1.5 trillion dollars, while the brick and mortar total sales is $5.28 trillion dollars. [^https://fitsmallbusiness.com/ecommerce-vs-brick-and-mortar-statistics/]

The pursuit of Knowledge

As more information became available on the World Wide Web, there was a need for tools to help us find information.

[^https://digitalguider.com/blog/history-of-search-engines/]

The first search engines were catalogs containing high level categories that were refined into subitems. They were first done manually, and that was fine as long as the number of sources searched for were limited.

However, the rapid increase of web sites made this solution unmaintainable. Instead, tools called crawlers were created, that would look all over the Web to collect the information that was available at a certain point in time, and returned results based on exact matching of words.

The Yahoo directory was a hybrid product that was presented as a catalog but was returning data acquired by crawling.

One of the most popular search engines at the end of the 1990s was AltaVista, created in 1995, which reached 80 million hits per day two years after its start.

Larry Page and Sergey Brin, students at Stanford University, founded Google. Instead of just crawling the Internet, they analyzed the graph made by the links between web sites, and starting ranking web pages, in a way that is similar to a citation index for academic publications. This approach provided them with results that were ranked by relevance and authority, therefore providing more value to their users.

At the end of the 1990s, the overall way information was flowing was not that different from what it was before. There was a new way to publish data, using web sites. But at the time, web sites were still looking as experimental, not in any way comparable with professional publications produced on paper, which were more sophisticated. Some web pages contained ads, as in newspapers and magazines. The Web had not completed its overrun of the traditional modes of communications. But that situation would not last. Big changes were still pointing on the horizon.

Two models were developed in parallel to navigate topics within a graph. The Resource Description Framework becomes the foundation of the Semantic Web. It describes statements that express predicates between a subject and an object, which are similar to simple sentences. It is possible to express rules that these statements must follow, in order to enable automated processing. The Topic Maps architecture describes a graph of topics that represent abstract units of meaning. They can have multiple names, and are related to other topics through associations whose semantics is left to the users to define. Topics point to sources, called occurrences, in a way similar to the entries in an index that are referring to pages through their numbers. Topic Maps gave rise to what became later known as the Google Knowledge Graph.

In 1995, librarians met tech geeks in Dublin, Ohio. Librarians were looking for a way to organize library catalogs using a Web-based framework, and they chose RDF. The result of this work is known as the "Dublin Core" and is now vastly used in libraries throughout the world.

2000s. Social Networks and Smartphones

The turn of the century marked the end of the seemingly endless expansion of the "dot com" era, when the goal was to ensure an online presence. Investors were willing to pour significant amounts in companies on the promise that being online was a key to financial success. But the reality was quite different. Rumors spread that Japan was entering a recession, the NASDAQ fell. Microsoft was being sued for monopolistic practices. The numbers didn't look good for many dot-com companies and the investors rapidly lost trust in their ability to get a return on their investment. At the end of the bubble, in 2002, stocks had lost $5 trillion in market capitalization since the peak. [^https://en.wikipedia.org/wiki/Dot-com_bubble]

The attack on September 11, 2001 contributed to accelerate the downturn of the dot-com bubble. But it also had other effects on the evolution of technology. Shoshana Zuboff [^*The Age of Surveillance Capitalism*] tells the story of the quid pro quo that Google negotiated with the US government. Google will give the government information it had gathered on its users, to help the government track potential terrorist activities. In exchange, the government will refrain to regulate the way Google collected information, even if the methods used went against the privacy of citizens. The agreement was easy to settle, as many Americans were mostly concerned about the risks of potential other terrorist attacks.

The tech companies were quick to react to the complacency of the US government that promised to them impunity regarding the exploitation of personal data. Google understood that the intimate knowledge they had collected on their users had a huge market value. Google was, at last, able to monetize their trove. Instead of charging users for searching the Internet, it was much more profitable to sell their profiles to the advertising industry.

A small group of RDF enthusiasts created around 2000 a small ontology to describe a graph of friends. It was called "Friends of a Friend". Each person was described by their email address, the location where they lived, and their subjects of interests. And, most importantly, they were connected to the persons they considered as friends.

In 2004, a group of male friends in Harvard decided to exchange pictures of women and rate each other's photos. They hacked the internal networks at Harvard to get the pictures. This project, called "FaceMash", created an uproar and was eventually removed. But Mark Zuckerberg, who was the "brain" behind this project, persisted and created a more serious web site to connect the students at Harvard. Soon after, half of the students joined. The project was expanded to other universities, and Facebook was launched in Palo Alto, California, in 2004.

Facebook is not just a way to connect friends together, it is also a way for businesses and individuals to advertise their products or their performances. At the time of writing, February 2026, Facebook has 3.07 billion users [^https://www.demandsage.com/facebook-statistics/]. This number is more than a third of the world population.

In 2007, Steve Jobs launched the iPhone, a handheld computer with a touch screen that had the ability to connect to the telephone network. Google launched Android in 2008. These devices, called smartphones, revolutionized the use of computers. They were not even perceived as computers anymore.

TO DO

TO DO. Add something about the upper-ontologies, linked data, universal schemas, database modeling, XML.

- Upper level ontologies: hope that everybody will agree on everything. Wikipedia.
- Per industry, Database schemas, XML schemas,

2010 The apps and the cloud

The smartphone applications, or apps, will become more ubiquitous than the software designed specifically for computers. The Web which aimed to be a unifying platform got fragmented into new silos defined by the apps. It was still the same infrastructure, but its access modalities were through apps. It became possible to book a reservation for a trip, or a show, or a restaurant or a hotel, on the phone. It become possible to manage one finances on the phone, to read a book or a newspaper on the phone, to watch videos, TV programs, listen to music or radio programs, to take photos or record conversations on the phone, to write notes, to post on social media platforms, with a device that fit in one's pocket. Contrarily to a personal computer, that needed access to a Wifi network, a smartphone could be used anywhere where a cellular signal was available.

Apple continued the same policy. The only devices that were able to use their operating sytem, iOS, were the ones they manufactured themselves. Google adopted the same strategy as Microsoft did for computers. They created an phone operating system, Android, that was available for any brands to use. Google ensured that it was on top of the software that helped them collect information about the users. In addition to their ubiquitous search engine, they deployed their email platform, Gmail, as a free and affordable service, that not only allowed people to exchange emails, but also let them manage their calendars and contact lists. Google not only had access to what people were writing to each other, but also what they were doing every day.

The big tech companies bought the most succesful companies that were extremely succesful, therefore consolidating their power and influence. Google bought YouTube. Facebook bought Instagram, a photo platform exchange, and Whatsapp, a messaging app that provided free phone and video communications worldwide.

As the Internet grew, it became possible to distribute data and software from remote servers to individual machines. Rather than providing each machine with its own copy of the data and the software, companies created remote servers that distributed the same data and software to a virtually unlimited number of machines. It became possible for any user to get the same data on multiple devices. Amazon, Google, and Microsoft were the leading companies that provided cloud computing. Cloud computing is also what allowed streaming to occupy a significant part of the media markets, disrupting the traditional distribution channels for books and magazines, musical records and videotapes. The importance of physical storage media such as printed publications, Cd records and DVDs, diminished significantly.

New opportunities arise thanks to the availability of huge quantities of data. The era of Big Data had started. The considerable rise in computing power made it possible to handle much more data than ever before. This data was managed -- and therefore owned in a certain way -- by the technology giants. Any amount of data considered small was discarded as uninteresting. The convenience of having the data handled externally by big tech companies was overwhelmingly appealing. Consumers of data and information accepted willingly to defer control of their data to external companies, because they were providing services that they found irresistible.

Governments moved their data to remote data centers. The power grid, and even military operations, migrated to the cloud. This move was beneficial as it brought new possibilities that were not available before. But it also was creating vulnerabilities that didn't exist before. If this data were to be hacked, the damage could be severe.

Technology was considered a positive activity as it was powered by good will. But the naïveté was hiding a more sinister reality. Bad actors started to get on board. Massive leaks were organized by persons who denounced what they considered abuses. In Russia, highly skilled propagandists understood how they could use social networks to influence users. Troll farms were created in China with bots that inondated the Internet with fake posts. At the same time, in the rest of the world, people were enjoying the perks of using apps on smartphones, and became addicted to their use. The loss of privacy was not considered seriously, with the exception of grumpy Cassandras. And the overall lack of regulation allowed the tech giants to expand their empire without limits.

Tech was a tool that was used to organize protests, as it happened during the Arab spring in 2011. Several innovative initiatives emerged in countries such as Taiwan or Estonia, showing that use of technology could foster democratic innovations. At the same time, authoritarian regimes started to reign in their people thanks to technology. The most advanced usage of technology with the goal of controlling people was made in China, with the invention of the notion of "social credit".

The confusion of the elites

TO DO.

Add something about the evolution of publishing. Aaron Swartz. Reversal of MIT/JStor. Confusion between leaks, attacks against national security, and free access to knowledge.

2020s. The pandemic and AI

The 2020s have been marked so far by significant big events: the Covid-19 pandemic lingered for nearly two years and caused not only millions of casualties but major disruptions in the economy.

The violent assault on democracy occurred on January 6, 2021, and reverberated a few years later by the re-election of Trump, who implemented the destruction of the democratic institutions in the United States and of the world order.

On the technology side, the pandemic became a golden age for video conferencing. More significantly, breakthroughs in the field of artificial alleged intelligence announced serious disruptions in the society and the economy at large. This is happening now.

PART II -- Present: Changes That Have Occurred

Optimism

The feeling of optimism about the benefits of technology never fades. Artificial intelligence is considered as a major breakthrough for obvious reasons. Generative AI is able to produce well-written text, as well as illustrations, that help acquiring information in ways that are more palatable than just lists of millions of links collecting by scraping the Internet. Many tasks that are repetitive, tedious, can now be performed quasi automatically by machines, so that humans can spend their precious time on activities that are more valuable.

Computers power keep growing and the promise of quantum computing, if it comes through, promises significant leaps in data processing that could make what we are seeing now look like a quite primitive notion of what is possible.

Smartphones are ubiquitous, and a significant proportion of humanity is now able to benefit from the access they provide. Not everybody yet, but the access is growing.

The apps that are bringing people together, such as translations, are becoming more effective.

The Web keeps growing and more apps are available.

There are reasons to be optimistic about the future of technology. But the disruptions has not been all positive. Some of the side effects are often swept under the rug. However the effects are real, and they mark a generation that has never known anything else.

This section is presented in two parts: disruptions and concerns. The disruptions are a description of what happens, the concerns are the problems that we have to face and create a sense of pessimism, which is real. It is important to look at it, rather than dismissing it with a shrug. This will help formulating the third part of this book, which proposes a perspective to envision a different future.

Disruptions

Smartphone addiction

Everybody stares at their phone. All the time. Day and Night. At work and at home. Inside and outside. At lunch, at dinner, and in bed.

Smartphones apps have been notorious to create mental health issues, more serious than just attention disorder. The availability of cameras has pushed predators to seduce children and engage into pornography. Several states have passed legislation to limit the use of smartphones and access to social network for children.

One size fits all

The concentration of tech products into the hands of a small number of companies has resulted in a homogeneization of the use of computers and apps in a certain way, that appears to be all what there is. For example, the fact that personal data is systematically acquired by the companies providing the software is considered a given. It is instead the result of an aggressive push of the tech industry which has prevented any pushback from citizens concerned about their privacy.

Big data is all there is. And where is the rest?

The enterprise software offer is centered around the ability to manipulate a huge number of data. Big data has taken over. However, most of the data managed by a given company, even a reasonably big company, is much smaller. People know what they produce, and should be able to present their own information with other tools that do not require to adhere to technologies that have been designed to search among an ocean of unknown data points. People are concerned that they are not able themselves to manage the data they own.

The side effect of connecting the dots

In the aftermath of 9/11, the US government was concerned that this disaster happened because the various agencies in charge of security did not work together. Therefore they have been looking for ways to connect their information, to improve their ability to detect terrorist activity before it happens.

This movement took another turn when the Trump administration gave the keys to the data to Elon Musk who was able to connect all American citizens (and non-citizens alike) from Social Security and from the IRS. One of the goals of connecting the dots that way was not any more to go after terrorists, but to find potentially compromising information on the alleged enemies of the President. What ensued was attempts to sue several individuals, including James Comey and Laetitia James for alleged mortgage fraud. That attempt didn't work, but the danger of connecting data that should not have been connected, for nefarious purposes, was suddenly exposed.

A new class of tech slaves

Tedious, repetitive tasks have been removed. For example, there is no type to retype an entire document just because some changes have been made. Similarly, it has become faster, easier and cheaper to edit photos. Boilerplate text can be assembled in a fraction of a second. Transmitting a document has never been easier. There is no need to print, copy, fax, or use a human career to transmit files. The need for comprehensive bookshelves filled with reference books has disappeared. Most information is now at our fingertips. The digital era, in other words, has brought many benefits and make work easier and more enjoyable than ever before.

But computerized work has created new constraints. Many people have been forced to add to their core skills computer literacy. I am not talking about everybody forced to become a programmer. But people had to adjust becoming fluent in using software that is the mandatory layer that they need to go through in order to perform any task. If a software product is well designed it may be straightforward to use. But more often than not, companies providing tools, especially in the enterprise world, are actually providing many things at once, that cover multiple aspects of working. Every "user" has more or less to figure out by themselves how far they will go in becoming fluent in using supercharged apps. The enterprise products on the market incorporate various tasks into workflows that have been thought of carefully to cover most cases. Therefore, the skills that workers need to acquire is not just an agility to operate a software to perform the functions that are required by their occupation, but they have to internalize the inherent methods and concepts that have been used to design these products at the first place. Their core competencies evolve from the domain in which they were trained, to an agility in mastering the tools that they have at their disposal. A significant part of their workload is to ensure compliance with the software requirements. Management also has evolved to track the productivity of workers according to the features of the software and the fact that activity is recorded, and can be tracked and presented as measurable data points.

The gap between what the software offers and the tasks to be accomplished can sometimes result in suboptimal outcomes. For example, outsourced call centers follow a strict procedural playbook when they interact with customers. The procedures they use are identical, regardless of the issues raised. When a customer faces a specific, unheard of, issue, the procedures applies often failed to address the real problem, and the problem is not solved. Call centers' employees, who listened to the person they are talking to, may say they are sorry they could not solve the problem, but they are not equipped with the ability to do something about it. They are stuck in the way the processes driven by software.

When people get trapped into the idiosyncracies of software limited features, and when they understand that there is realistically nothing they can do about it, they tend to lose the sense of commitment and responsibility that they would have expected. Work becomes a depressing activity, disconnected from personal motivation. The satisfaction that people reach when they feel that they are doing their best to produce certain outcomes vanishes, at the point that many people even have forgotten that it is a thing. This powerlessness is aggravated when the muscle memory they have spent time to acquire, by knowing where to click to do certain things is lost because the software has been modified in a subsequent version, and things are not any more where they used to be. The software vendors are convinced that they are responsive to their customers as they provide more powerful features, they add things that people ask for. They forget that, while some of their clients have asked for those changes, others are just using their products as they are. This unstable situation of having to retrain constantly creates stress. It is comparable to have learned a musical instrument and having this instrument replaced by another one, without notice. Overall, there are indicators that job satisfaction has decreased, but the real reasons for it are often overlooked. The loss of control on the micro-processes that occupy most of office workers may be one of the key reasons why people are feeling miserable. Having to constantly adjust to changing creates the feeling that people have no choice. They have nothing to say about the way they work to produce the outcomes that is in their work's mission.

This situation is not the inexorable result of technology evolution. Applications are designed by people, who have been granted the power of figuring out for others what their work should be and how they should do it. The companies that produce applications are not that many, they are big and powerful, and are competing against each other to augment their market share. They define the workflows that are appealing for the managers in the companies that need their product. The people who actually use the product, usually qualified as "end users", have not their say. What they are being asked to do is to be fully obedient to the rules that have been set by others. Therefore, the people who actually use the technology are being emprisoned in a system that may sometimes prevent them to do their work in a productive and satisfactory manner.

The more workers are being asked to behave like robots, the more likely they are to be replaced by robots. Many jobs which are under threat to be replaced by AI agents, or have already been replaced by AI agents, are "stupid" jobs. This doesn't mean that people who are or were doing those jobs are stupid. They have done what they were told to do, and in a way, for that reason, they are replaceable. On the contrary, a person who would be much more critical in what they are told to do would be badly considered, but those so-called insubordinate employees who express their voice and their feelings have eventually more chances to keep their job, if they work in a company were management is showing some lucidity. The silver lining of the AI disruption may be that it signals the end of slave driver behavior. The corollary is that people who were trained to be obedient and compliant must be retrained to express critical views and creative thinking. That may be too far to reach in many environments.

The ripple effect of this situation is the inability for people to consider that they can play an active role in improving the satisfaction they get from work well done and the productivity gains that ensues. The obedience required from them echoes the claims of authoritarians that they are the only viable solution to run countries. Running a country like a business means that people have no voice in changing the conditions that affect their daily life. The only viable for them is to disengage, to preserve a part of their life. This notion that "we have all figured it out - don't worry about it" is what the Big Tech companies are throwing at their end users. The political alternative is to figure out how to design solutions that match various interest groups, through complex processes of negotiations and compromises, with constant pressure to accommodate new requirements. Technology has encouraged dictatorships by showing how the power grab can be applied on subduing people to do what a minority wants them to do. Technology can alternatively be used to accommodate requirements of the voiceless end users by starting to open to their demands, even if that means envisioning the developments as more diverse and messier. We are not there yet.

Office Presence

The pandemic of 2020 has forced people to isolate themselves from each other. Fortunately, tools were available to set communications running through remote video conference calls. The availability of data on the cloud has facilitated remote access, and many businesses were able to continue their activity without people meeting in person.

The mandate to return to work after the end of the pandemic has opened new questions that were not asked before. Some people have moved to remote locations, and therefore continue to work mostly remotely. Many meetings are held in a hybrid mode, as some participants attend by video call, while others are present in the same room. It happens also that people who are present on the same location don't actually get together for meetings. Instead, they connect to the meeting through their computers, and the difference between working remotely and being in the office is somewhat artificial. The poor state of the transportation infrastructure, especially in the United States, where cars are englued in traffic jams, and public transit is facing multiple disruptions and delays, takes a big toll on the productivity and efficiency of workers. Many of them are more productive by just working from their home office. Overall, the fact that people do not interact together as much as they used to do, has negative side effects on innovation and forward-thinking. When brainstorming sessions are replaced by well-scripted video meetings, there is less room for improvisation, collective thinking, surprising moments.

Retail

The pandemic of 2020 has also demonstrated the ability for e-commerce to take over retail shopping, as many stores have been shut down. Not all of them have reopened when the pandemic ended. The profits of the big online stores have reached astronomical levels and have established their predominance on the long haul. Local businesses are still viable, but anything in between is threatened to be swallowed by a handful of giant companies. Amazon has reached a quasi monopolistic status and has been able to negotiate rates that further weakens their competitors.

Publishing

Social networks are providing affordable, often free, publishing platforms. Anybody can open an account and publish information to be available for the whole world to see. The companies providing these facilities do not hide the fact that they are using their customers' data as a marketing tool sold to advertisers to target the public they are trying to reach.

This model works well as long as the contributors to the networks, mainly those who create the data that are published, are providing "good" information. But nothing prevents fake information to be published the same way. Any hate speech, discriminatory or racist, can be published as it is protected by the first amendment. Lies and libels are abundant. As the Web is not limited by national boundaries, nothing prevents foreign-based actors to distribute negative information in another country, in order to influence public opinion.

Tech companies providing social networking platform refuse systematically to behave according to the traditional publishing model. The publishing industry was born from the printed press. A publisher, like a producer for a movie, is signing a contract with authors. It ensures the distribution of their work, the profit that can be derived from selling these original creations, and shares liability in case some information infringes the rights of another person. This liability is limited in specific cases, such as libels. Generally speaking, the publishing model is the engine that makes freedom of speech possible, and is one of the foundation of democratic societies.

The refusal to implement a model similar to the publishing model to the information distributed electronically has created a world where fake information coexists with true information and has played an important rule in eroding the trust in institutions, especially the media. False information and lies now look as credible as true, vetted information, and therefore, many people are convinced that what they get is what they believe in. The erosion of truth is something that is a tool that prepares fascist societies to emerge. The huge deployment of well-orchestrated propaganda in Italy and Germany in the 1920s and 1930s are not necessary. This work is performed even more effectively by the providers of information that allow anything to be distributed through their channels.

Concerns

We saw it coming for a while. Now the US has reached a point of no-return, where most institutions, primarily the federal government, but also the academic world, the healthcare industry, the energy industry are trying to be revamped to comply with an agenda that goes against the very foundation of this country.

(Cyber)-security

Several technologies that were created to foster openness and helped people connect together contained vulnerabilities. When bad actors started to enter into the game, the situation changed, and the vulnerabilities emerged. The dependence of critical infrastructure and national security over technologies that are fragile raise the possibilities that severe cyber-attacks can happen that can have devastating consequences. China seems to have acquired a dominance in hacking techniques. The US technology infrastructure is vulnerable, and its vulnerabilities are starting to be known, primarily by its enemies. The reinforcement of network security should be an absolute priority. It may very well be the case, but in the light of what is happening in other critically important sectors, such as the destruction of the heathcare infrastructure, we can legitimately doubt that the current administration is doing what needs to be done on that respect.

Democracy

The lack of a publishing model, as stated before, means that any attacks are possible against legitimate journalists, and these attacks are actually happening. The administration exploits the fuzziness that they have themselves encourages between truths and falsehoods to sue journalists, such as Don Lemon and Georgia Fort, simply for doing their job reporting on protests.

The pressures on the main broadcasting networks have created an atmosphere of fear to displease, and self-censorship has become part of the playbook of the big media industry, preoccupied more by preserving their financial assets than by telling the truth. The freedom of speech, and the First Amendment that defines it, are definitely something of the past.

Privacy

Abuses against privacy is used against a selected number of people. Social Security and IRS have given away the information they had on undocumented immigrants, and that fact allows tracking where people are to facilitate their arrests and imprisonment.

Foreign students and even tourists have to prove that their social media accounts contain nothing critical against the current administration and have to surrender the login information to their accounts. If anything is found that can be interpreted as critical, their applications get denied.

Most US citizens are still unconcerned by those attacks against privacy, because they are not directly targeted. But as the dissatisfaction against the cruel policies deployed by ICE is mounting, more people are expressing critical points of views, and therefore are subject to potential prosecution.

National independence

There are many reasons to think that Russia interfered with the 2016 elections. It is also possible that foreign intervention played a role in the 2020 election. The aggravation of the social network policies, which have gotten rid of their content moderators, make this danger even more acute than it ever was.

The campaign to deligitimize the elections by refusing to trust the voting machines aggravates this problem.

Pessimism

The concerns have raised to a level of pessimism that is a new phenomenon. The usual reaction in America when people are facing a problem is: don't worry, we are going to fix it. This deep sense of optimism seems to have gone away, and the younger generations shares feelings of disillusionment and lack of any positive thinking about the future.

Technology seen as an addiction aggravates the problem, because people internalize it as it were a personal failure. They become indulgent, and complicit, to the failed promises of technology, because it's convenient, and because changes seem out of reach. It's too big, too widespread, too ingrained into our lives.

Dangers of AI

The companies who are selling or promoting AI claim that machines are smarter than humans, and perform better in many circumstances. Even higher education is doomed, as experts are considered to be unnecessary, because they do not compete against the accumulated knowledge that AI agents have collected as their sources. It is hard to see how this kind of discourse, if taken seriously, can not generate a deep sense of pessimism.

Losing Control

Many decisions that affect us all are taken elsewhere. The traditional democratic checks and balances have been neutralized. They clearly do not work. Even the Supreme Court has caved to dictatorship, as it provides total immunity to the people in power.

On the technology side, as most algorithms remain proprietary, and therefore trade secrets, it is impossible to explain why search engines return certain hits on top of their lists, or why AI agents are saying what they are saying. AI agents go even one step further. As they are able to write in plain English a text which is quite articulate, and therefore convincing, they have a power of conviction that is unescapable. Only specialized experts in a given field are able to detect hallucinations when they see one. The AI agents do not present just available knowledge as a resource, they tell us how we should think. Anybody who dares to differ with what an AI agent is uttering is considered sick.

The feeling of powerlessness, both as a citizen and as a consumer of technology, leads also to a feeling of pessimism.

Authoritarian Technology

The lawlessness of the current administration echoes the ability for tech companies to escape any auditability. We need to believe them in an act of blind faith, without questioning anything they do or say.

Crypto money, secret algorithms have in common the lack of transparency that serve the purpose of an authoritarian regime. Like it or not, that is where we are now.

Many decisions which are made in support of the current administration requests are made to preserve financial assets that are threatened. Legal firms, universities, media companies have caved in order to avoid paying heavy fines, that they perceived as endangering their future. What they sometimes felt to see is that the deficit of trust that ensues may jeopardize their long term future. However, some may be able to reverse course if the winds turn in the opposite direction. It's more a financial decision than an ideological decision.

PART III -- Future: Changes That Are Still Needed

Conceptual Framework

In the pursuit of Knowledge

Documents, Storage, Catalogs versus Links

The Search and Retrieval Industry

Digital Legal Framework

Public ownership versus Private Ownership

Rights of the Digital Citizen

Freedom of Speech, Privacy as Freedom

Digital Publishing Model

Trusted Information vs. Gossip and Propaganda

Auditability and Transparency

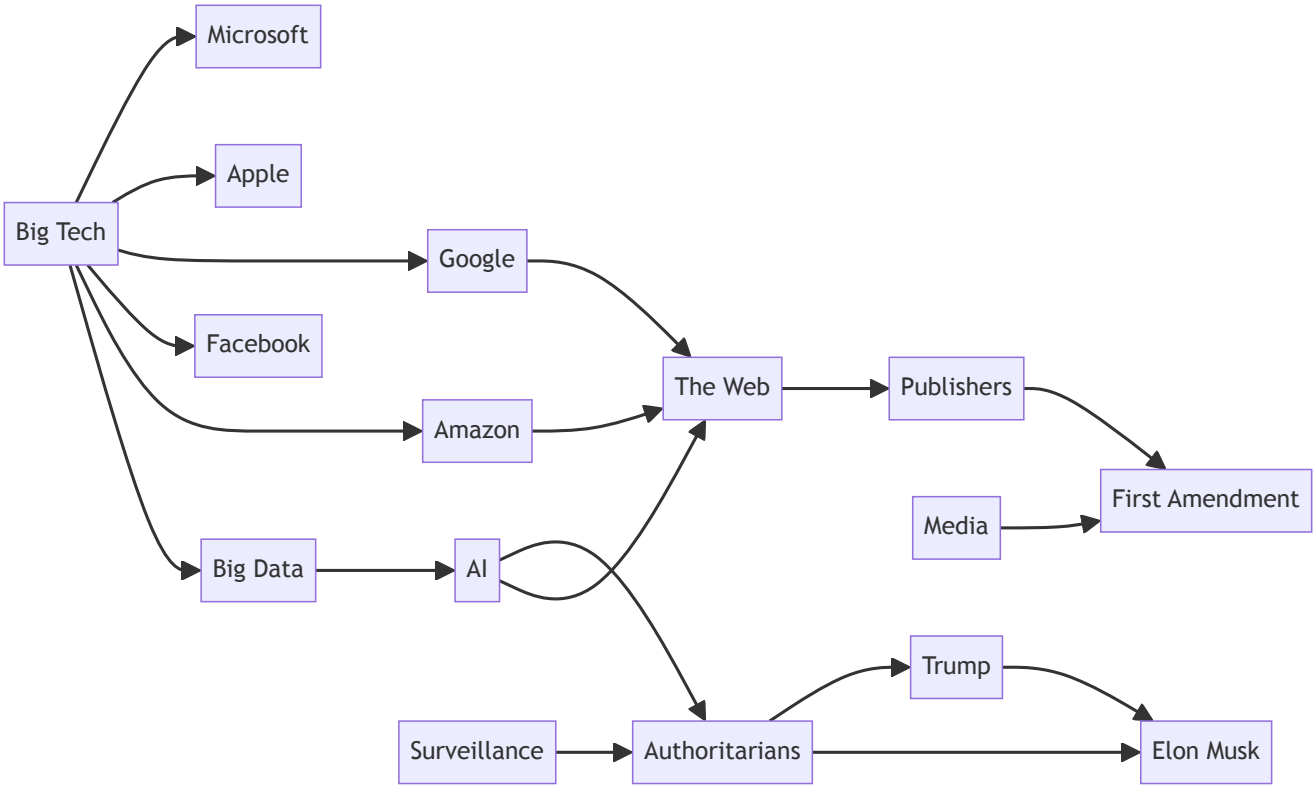
Proprietary Information vs.

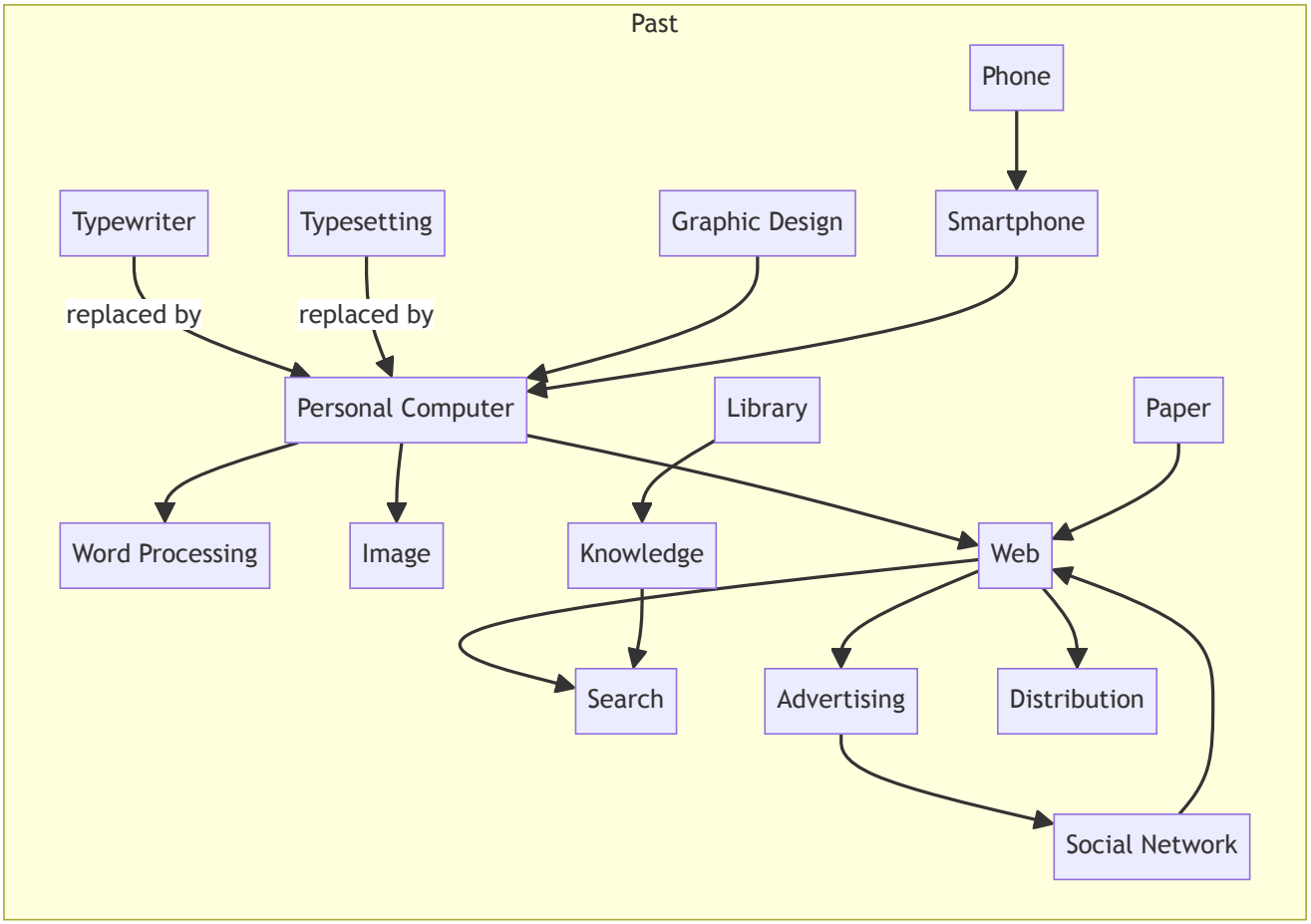
Open Source Voting Machines

New Education System

Annex (provisional)-- Schemas

Introduction of the characters.

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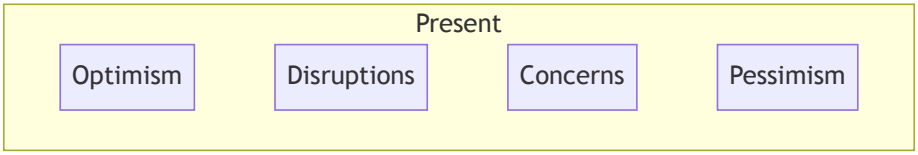
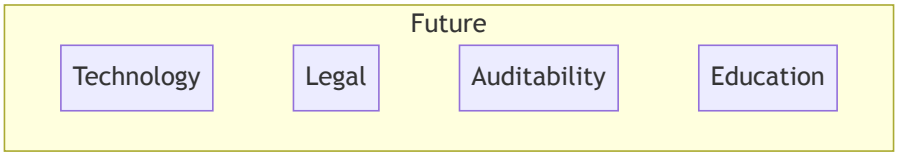

Present
Optimism
Disruptions
Concerns
Pessimism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Education

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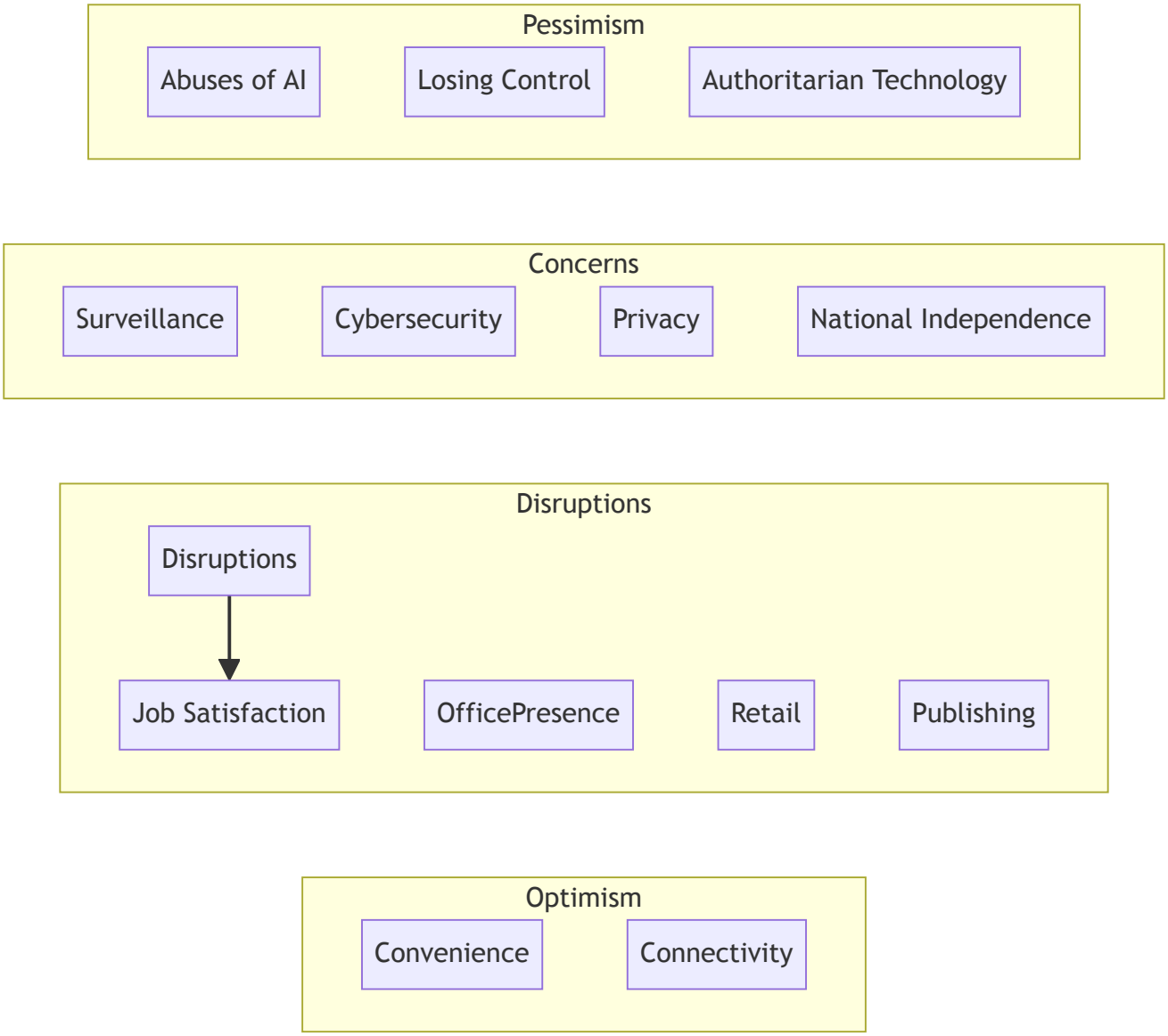
Pessimism
Abuses of AI
Losing Control
Authoritarian Technology
Concerns
Surveillance
Cybersecurity
Privacy
National Independence
Disruptions
Disruptions
Job Satisfaction
OfficePresence
Retail
Publishing
Optimism
Convenience
Connectivity