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"Smart use of Digital Tools"

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Abstract

Some years ago, it was not so common to find digital tools in a meeting with friends, at home, not even at work. Today this quantity of tools are continuously increasing and we need to understand how to use them, and how can companies obtain profit with them. People and technology have evolved through time, and companies need to adapt. In this work, I will analyze the most common digital tools used nowadays and determine if they can be used in the frame work of "smart working".

For digital tools we understand any electronic tool, device, or resource that generate, store or process data. Given the quantity of tools present, there will be analyzed into a framework, where they can be labeled into Social, Mobile, Analytics and/or Cloud tools (SMAC technologies). Regarding people and the working environment, people are demanding the use of these tools, because they are using them in every aspect of their lives. They are becoming digital people. So, work activities had to be rethought. Companies need to be able to provide flexibility and autonomy to each employee, and give them the optimal tools to innovate, and this can be achieved with the use of some digital tools. The idea is that, by giving this to them, also the results of the company could be better.

The objective of this research can be clarified and is to analyze the main digital tools on the market into a framework, analyze how companies use these tools, the main benefits they search in these tools and determine if they can or cannot be used for smart working in a company. To do so, data about the main tools used by companies will be presented, and the tools are going to be analyzed into the SMAC framework, and then, it will be determined if they are suitable for a company to do smart working. Also considerations about innovation will be made.

You will see through reality and this work that a variety of digital tools can be used for this purpose of smart working. The idea is to understand what do you want to achieve, and what kind of integration in the company do you need. This will determine which tool is more suitable for you. Sometimes it will more suitable to choose a specific tool, for example to do a call from anywhere, because you already have another package of tools or you only need to do that, to do a call. But other times, it will be more suitable for a company to acquire an integrated system, like Slack for example (it will be explained later), where you have many tools into one.

It is a huge challenge for companies to define if the tools are suitable for the smart working philosophy (this is the part we are providing at this research) and to need to select the right bundle of tools.

Introduction

Through years, the world has been changing and we can find relevant differences as decades passed. If we think in the world in 1800 it was a totally different world from the 1900s and from now. A variety of eras have passed and now we are in the middle of other one.

To begin, I will focus on the 3 following aspects, in order to see how they evolved:

1. Technology
2. People
3. Organizations

Three eras will be defined, by the point of view of these 3 aspects mentioned below.

A new technology era

Technology has evolved a lot though time. In the 1900s it was incredible to have a TV in "black and white colors" and today is totally normal for a kid to have a cellphone. Nowadays we are going through a new technology revolution, an different eras/revolutions have passed.

When we talk about work, till 1780s it was done mainly by manual labor. Through the next 200 years, 3 really important revolutions passed:

- First revolution: appearance of *mechanization* (steam engines).
- Second revolution: related to division of labor and new productions lines, no more driven by steam, now with *electricity.*
- Third revolution: first steps of *digitalization*, related to programmable logic controllers that enabled digital programming of automation systems.
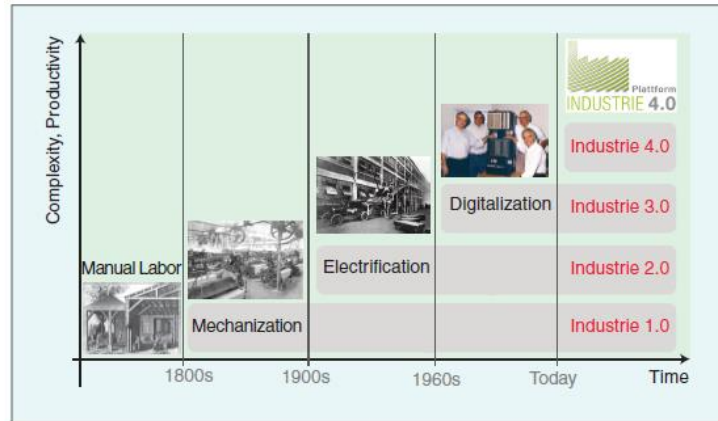
Figure 1: 4 Industrial Revolutions (Rainer Drath and Alexander Horch,2014)

The technology from the third revolution is still present and also evolving, but now a new era is beginning, the era of the Fourth revolution. The major technical background of the 4th revolution is the introduction of <u>Internet technologies.</u>

In this new revolution we can consider 3 aspects:

- Communication infrastructure will become more affordable and, hence, be introduced everywhere.
- The devices will increasingly be connected to a network .
- And also these devices will be able to store documents and knowledge.

This new "digital revolution", characterized by the use of internet, is accompanied by the use of mobile devices and applications as we can see in Figure 2. This document will focus on this part of the era and in the tools of these revolution, defining later a framework of work.

As we can see in the figure we have as mobile device and applications:

- Mobile broadband
- Cloud services
- Analytics
- Social business

We will see later these 4 pillars more in detail in the "SMAC framework".
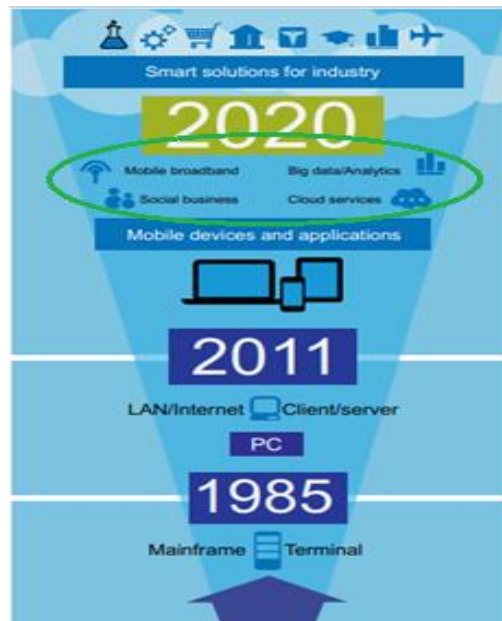
Figure 2 Figure 2 International Data Corporation (IDC), 2015

The world has been evolving, with different technologies in each decade. These new technologies have been disrupting the world and these radical changes, have influenced people lives and the work environment has also changed. This technologies have brought alternatives to people, making them more flexible and autonomous. In the next part it will be analyzed the new era under the perspective of people.

A new people era

As we have said previously, technology has an impact on peoples life. Due to these technologies advances and globalization people have access to a variety of tools. Some years ago, it was common to read the physical newspapers every day. Also people had lots of physical books, for example, physical manuals to search the machine spare parts at work. Today, even if some of these physical elements are still present, people have access to mobile phones, computers, and there is a lot of data available, more specifically digital data. So it is common to use Twitter to read the news, to search the code of a spare part through a digital PDF. People have different tools that weren't available before. In other words, the world has changed.

People needed to adapt to these new technologies and from "the millennial generation" (The Millennials, also known as the Millennial Generation (Generation Y), are people born between 1980 and 2000 (Alberghini, et al., 2010)) people have growth with more advanced technology than before. These new generations have different habits than the older generations. This is because

they grew with new technologies, and this affected their way of living. According McKinsey Global Survey "Americans spend approximately 11 hours a day communicating or consuming messages in various ways, including in-person, watching TV, reading, and using e-mail" (Chui et all, 2012)

So, these new technologies, more specifically the ICT technologies (Information and communication technologies), have dramatically changed our way of living and habits, and we can say that we are through a "digital revolution" where adolescents are at the forefront .The way adolescents of today learn, play, and interact has changed more in the past 15 years than in the previous 570 . "In 2010, U.S. adolescents spent an average of 8.5 hours per day interacting with digital devices, up from 6.5 hours in just 2006. Thirty percent of the time they are simultaneously using more than one device, bringing daily total media exposure time to 11 hours". (Jay N. Giedd, M.D.-2012).

Having said that we are in a digital era, if we zoom into this era, focusing on the evolving of ICT, we can identify trough time four distinctive stages of information and communication technology, and how these stages impacted on society. (Applegate et al. 2002, Cash et al. 1994, McKenney et al. 1995). We can see this relationship of the stages and societal impact in Figure 3.
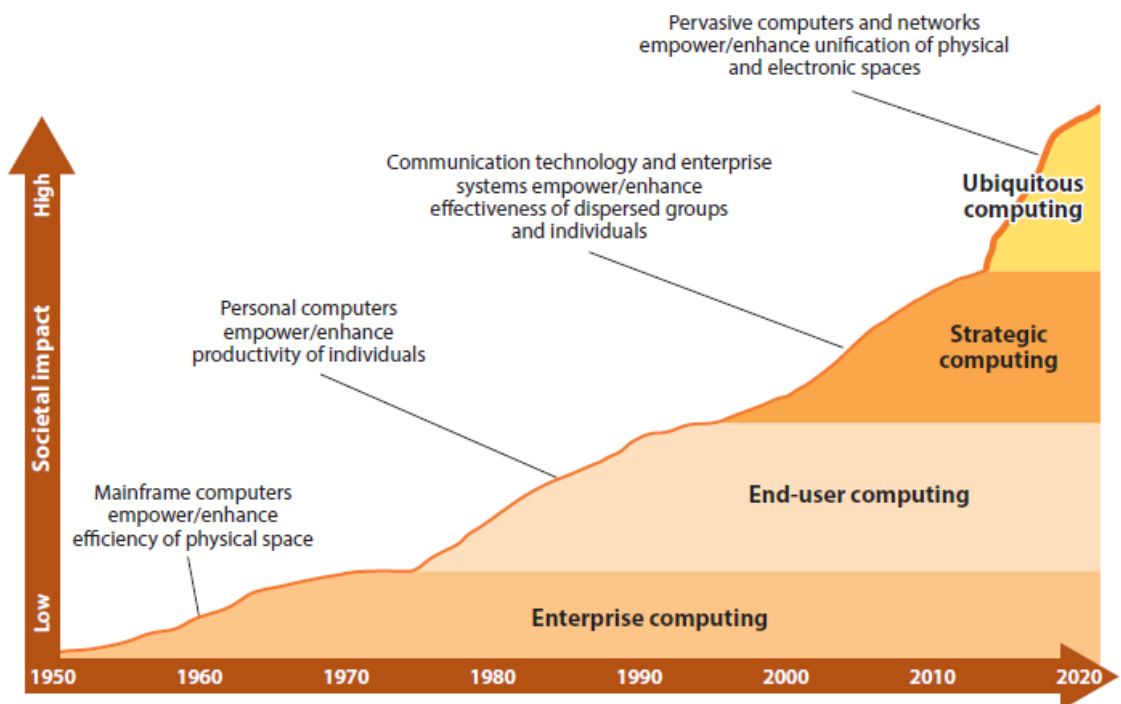
Figure 3 Stages of information and communication technology within the digital era(Wayne, Montealegre, 2016)

The 4 stages are:

1.   Enterprise computing: centralized computers only analyzing data. Low society impact.

2.   End-user computing: each employee with the computer. Medium society impact.

3.   Strategic computing: combining internet with the ICT tools. High society impact.

4.   Computational computing: creates an optimized space that links people, computers, networks, and objects overcoming the limitations of both the physical world and the electronic space. Very high impact.

Through these stages people have been in contact with digital technologies, and these new technologies give them lot of opportunities and they impacted on how they live. As we saw in the computational computing stage, digital tech has overcame the necessity of being present in the physical world (for some activities), giving people more autonomy and flexibility.

One big question arise. When people are at work, do they have these technologies available? Can they use the same tools they use at home at work? Are they digital employees? These questions lead us to the third and last era we are going to describe.

A new organizational era: Smart working philosophy.

As people and technology have changed, organizations began to question if they should change. Their business models and organizational structures started to be challenged. Before, it was common to follow strict time schedules where you need to report the time you arrive or leave, and also follow strict procedures on how things were done. Nowadays in many organizations, you do not have strict procedures with strict rules, and they allow the employee to choose how things are done. Organizations are starting to give autonomy and flexibility to their employees.

Companies discovered that, due to these strict procedures and limitations, the innovation potential of employees was not exploited 100%. Organizations need to adapt their selves to these "tech and people eras" described before. People at home are digital people but when they arrive to work, in some companies, they don't feel like digital employees.

So, firms started to rethink their organization models, referring to the new trends, the new eras and this is where the Smart working (SW) model arrived. "Smart working corresponds to non-conventional organizational models that are

characterized by higher _flexibility and autonomy_ in the choice of working spaces, time and tools, and that provides all employees of an organization with the best working conditions to accomplish their tasks."

This SW model can be defined by 3 elements (Gastaldi 2014):

1.   The usage of Digital Tools
2.   The innovation of HR practices and in the organizational process
3.   The reconfiguration of the workplace and the layout.

Organizations, started to focus in these 3 pillars in order to get higher benefits for them and for their employees. The idea is that if people feel comfortable at work, they will perform better, and the company will earn higher returns. We can see these 3 pillars on the levers of the Smart working framework in Figure number 4, where HR practices and organizational process is divided in organizational polices and behaviors and leaderships styles.
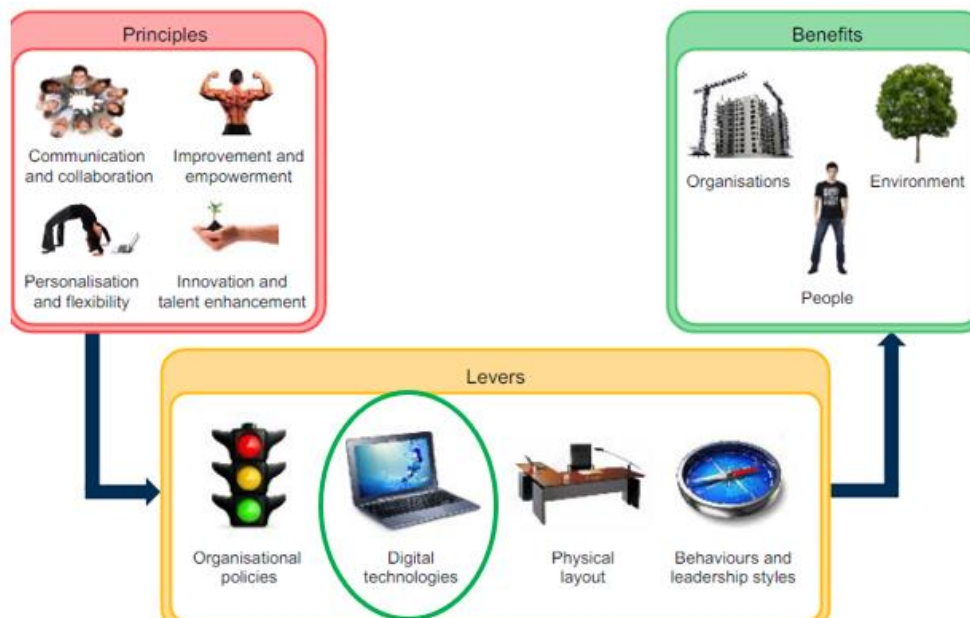
Figure 4 Smart Working Model (Gastaldi, Corso, 2013)

In few words, this framework says that, organizations will rely on new _principles_. The accomplish of these principles will be done by focusing in _4 levers_, and as a result, _benefits_ to the organization and people will be achieved. Everyone will be better off with these new framework. Detail on the principles, levers and benefits can be seen in Figure number 4.

To understand how many companies are adopting this SW philosophy we are going to refer to the Smart Working Observatory of School of Management of Politecnico di Milano, that did a survey to the HR managers of Italian companies (100 of medium and large Italian companies), giving interesting

results about how this companies were applying these 3 elements mentioned before (Gastaldi 2014). This survey gave as result 4 different approaches to SM, 4 clusters:

1. Cluster 1: Inconsistent smart workers: 28% of the companies, that do not invest in any of these 3 elements mentioned before. These companies do not have a high level of human capital and are composed mainly by capital investments. In addition, the human capital are majority old-age people with low productivity

2. Cluster 2: Analogical smart workers: 13% of the companies, they focus on the 2 element of HR practices and the organizational model followed and the 3 element of physical workplace. They do not focus in the ICT tools, that's why they are called analogical workers

3. Cluster 3: Digital smart workers: 33% of organizations, that invest in ICT but have little focus on the reconfiguration of workplaces and of the office layouts. The majority of the employees of this companies are young and have medium to high productivities.

4. Cluster 4: Complete smart workers: 26% of organizations, that highly invest in the 3 elements of the SW philosophy. They are characterized as labor intensive companies, of medium dimension and have medium productivity levels.

From this survey, we can see in the next table the main reasons of why these 4 kind of companies invest in SW.

Organisation		A Inconsistent SW	B Analogical SW	C Digital SW	D Complete SW
Reasons for investing in SW	Organisational efficiency*	Cost reduction	Rationalisation	Productivity	Flexibility
	Organisational effectiveness*	Response rate	Quality improvement	Collaboration	Innovation
	Employees engagement*	Empowerment	Creativity	Sense of community	Work-life balance
Configurations of the three elements characterising the SW models	Layout	• No significant intervention made • Building constraints to be faced (old facilities not easily reconfigurable)	• Development of a new building focused on fully exploiting SW • Concentration, collaboration and relax rooms	• No significant intervention made • Necessity of changing the building in order to fully benefit from SW models)	• Intelligent, modular building, which adapt to organis. needs • Building automation • Acoustic isolation
	ICT	• No significant intervention made • UCC as enabling investment	• No significant intervention made • UCC as enabling investment	• Mobile workspace for all employees • UCC • Cloud solutions • Social network within the firm	• Full digitalization of archives/docs • UCC • Mobile workspace and app for employees
	HR	• No significant intervention made • Assessment of the effectiveness of current model in balancing employees' needs with firms goals	• Extension to all senior managers • Training • SW leadership program • Clear definition of the SW priorities on which focusing	• Preliminary pilots in ICT & market-ing divisions • Quantification of the SW benefits • Extension to all other employees • Training	• Extension to all employees • Full autonomy in choosing working times, places and tools • Self-certification of working hours

For each organisation we have underlined the main reasons explaining the investments in SW

Table 1Main reasons for investing in SW and configurations of the three SW building blocks(Gastaldi, 2013)

It can be said that inconsistent smart workers have their focus on cost reduction. They see SW as a tool to achieve this. Analogical ones, tend to combine the resources in order to achieve creativity. Digital smart workers focus on collaboration, creating a sense of community among each other. Finally complete smart workers focus on work-life balance in order to search balance in their lives. Companies in this cluster see the flexibility and the innovation of their assets as a key resource to retain their employees.

This work will be focused, as said before, on the lever of Digital Technologies, on the use of Digital technologies as a mean to SW, given the other variables given. It is going to be analyzed how these digital technologies are used to give autonomy and flexibility to the employee, without entering in details of the other 2 levers. Referring to the clusters defined, clusters 3 and 4 are the ones approached. Companies that are using digital tools.

Considerations about innovation

As technology has been evolving through time, innovations have been made. Before introducing the innovation aspects, some concepts will be explained.

In this report it is going to be discussed 3 types of innovation:

1. Innovation as a "hill": in order to envision each innovation opportunity as a hill.
2. Innovation as change in meaning or technology. We are going to use the Verganti's Matrix (explained before)
3. Innovation viewed in the field of design research.

The first type, refers to a study done by Norman (Norman, Mahwah, NJ: Lawrence Erlbaum Associates, 1986) that realized that this continual process of checking with the intended users would indeed lead to incremental enhancements of the product. This is related to the HCD (Human center design) where you design and innovate regarding the people needs. Norman realized that this innovation had a form of a hill, as an analogy, where you need to climb that hill in order to reach to the best product (See next figure). You need to keep on designing till you reach the best quality product. "Climbers" have no way of knowing whether even higher hills might be scaled in some other part of the design space. They need to choose if it's better to continue in the same hill, or jump into another one.

This is where the concept of radical and incremental innovation appears (to be defined more precisely later). Radical innovation looks to reach the highest hill, while incremental innovation seeks for the highest point of the current hill. To clarify with an example, if we are in point A of the figure, if you reach B, it is an incremental innovation. But if you jump to D, you had a radical innovation, that could be a radical innovation in meaning, technology, or both.
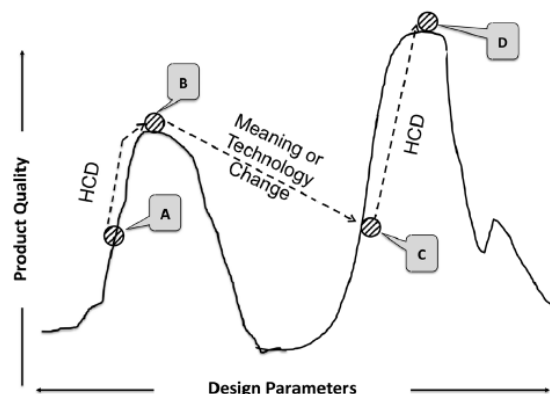
Figure 5 Innovation as a hill.

Human center design if a form of incremental innovation, of climbing the same hill.

The 2nd type of innovation, made by Verganti's, was really similar to Norman. They both agreed that HCD was really important to incremental

innovation but it's not enough to explain the radical innovation. But Verganti's went one step forward, he rooted this investigation in the definition of design as "making sense of things". Design is making sense of things (Klaus Krippendorff, ,1989) and also can be seen as the deliberate and reasoned shaping and making of our environment in ways that satisfy our needs and give meaning to our lives. (John Heskett, Toothpicks & Logos, 2002).

Having introduced these concepts, it is going to be defined the types of design and innovation that could be used.

There are two different forms of conceiving design. One perspective sees research as exploration and experimentation that leads to the advancement of knowledge, the development of theories, and the application of theories. This approach is more experimental. The other view is more theoretical. The other perspective sees research as any activity of collection and analysis of data for a better understanding of a topic.

Regarding innovation, as we said before, it can be radical or incremental (Roberto Verganti- 2013). Verganti argued that radical innovation could be make through a radical innovation in technology, or also in meaning (or combine both).We have:

- Incremental innovation: improvements within a given frame of solutions (i.e., "doing better what we already do").
- Radical innovation: a change of frame (i.e., "doing what we did not do before").

Maybe incremental innovation is not as just as exiting as radical innovation, but it is really important, because it helps to improve performance, reduce costs. So we do not need to think and search always for radical innovations, they are both really important.

In order to an innovation to be radical it needs to accomplish 3 criteria's:

1. The invention must be novel: It needs to be dissimilar from prior inventions.
2. The invention must be unique: It needs to be dissimilar from current inventions.
3. The invention must be adopted: It needs to influence the content of future inventions.

In the next fig, there is an example of video games to clarify more these concepts.
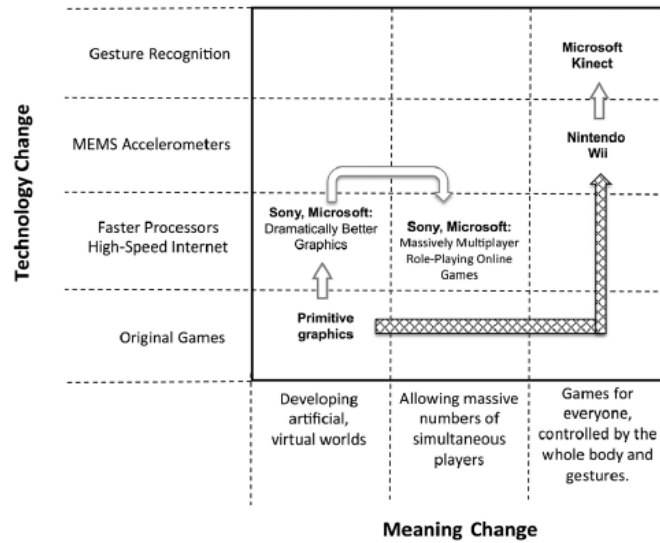
Figure 6 Examples of Technology and Meaning change

At the beginning, there were primitive graphics of video games, and when the quality of the graphics was increased, it can be defined as an incremental innovation, it involves technology. Later, it was added the features of multiplayers, this is also an incremental innovation, but in the meaning, not in technology. To see an radical innovation, the perfect example is the Nintendo Wii. They disrupted the market. They totally changed the meaning of how to play. So the innovation was radical in terms, of technology and meaning. It was a radical innovation in both senses.

If these concepts are applied into the eras mentioned before, it can be seen that through time there were radical innovations. We have passed from manual labor, to mechanical labor, to electrification and finally to digitalization. Each one of these steps are novel and unique, and, of course, there were adopted by people. So we have radical innovations.

The tool used in the example of Video Games was made by Verganti, and it's called the Verganti matrix (also in Fig 7). This matrix defines 4 areas of innovation, that depends on which innovation has been made, technology and/or meaning, and also if these innovations were radical or incremental.
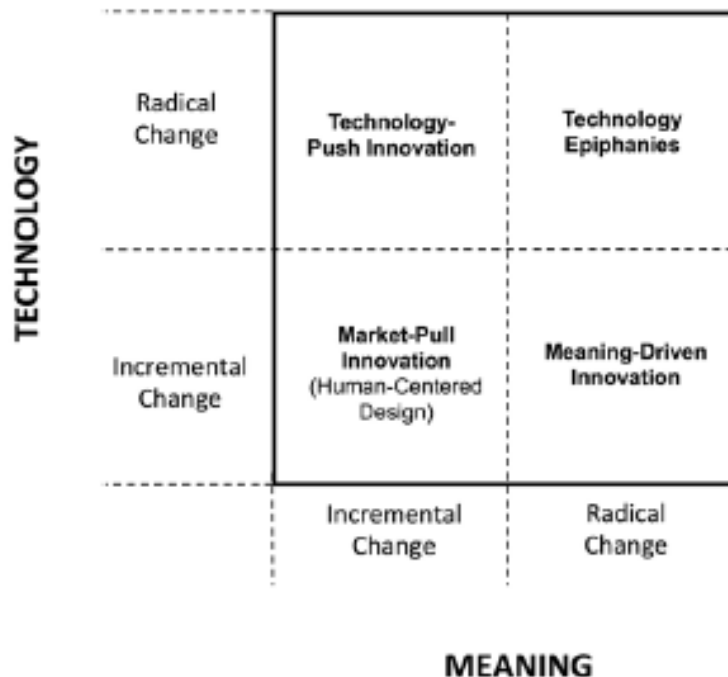
Figure 7 Verganti's Matrix

These 4 areas of innovation are:

1. Technology-push innovation: comes from radical changes in technology without any change in the meaning of products, or incremental changes in the meaning. Ex: the invention of color television sets.
2. Meaning-driven innovation: related to radical new meanings. No tech is involved. An example is the invention of the mini-skirt. This was not a new cloth. It involved a changed in the meaning, representing the freedom women were searching in that time.
3. Technology epiphanies bring a radical change in meaning, enabled by the emergence of new technologies or the use of existing technologies in totally new contexts. Ex: the Wii video game
4. Market-pull innovation, based on HCD. It defined two steps to do this. First, it starts from an analysis of user needs and do research about it. The second step its based on prototyping and testing. You iterate till you got a complete product.

It is important to mention that these areas depend on each other. Tech-push innovation requires also to understand the meanings. What defines in which area the innovation is, is the starting point. The driver that motivates the innovation.

The 3rd way of seeing innovation, is in terms of design. The key point is to understand the role of design research in innovation. This can be defined into 2 dimensions:

1. The search for understanding and considerations for use. The search for the understanding in terms of meaning.
2. The search for practicality.

We can see these 2 dimensions in Fig. 8
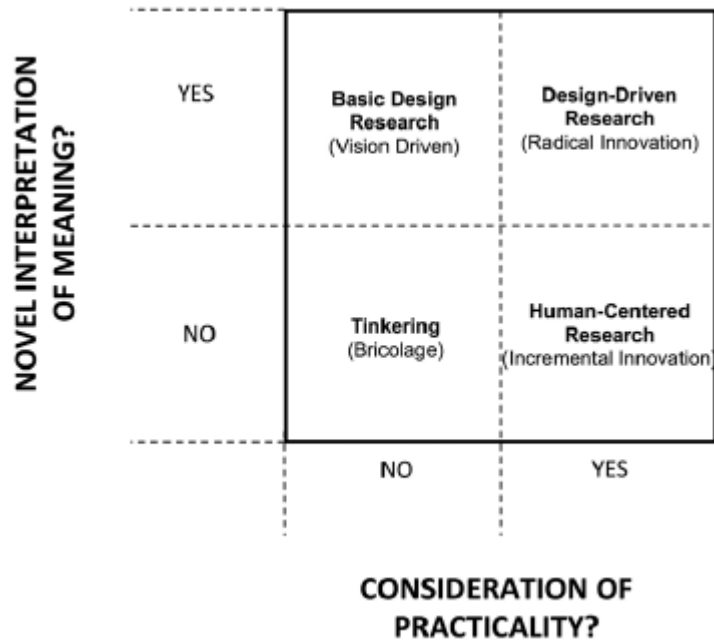
Figure 8 Design Research Quadrangle, Donald Stokes (1997)

We can divide the design research into 4 quadrants:

1. Basic design research: is aimed at exploring new meanings, without specific consideration for its use in products.
2. Design-drive research: is aimed at envisioning new meanings that are intended to be applied in products. You are looking for creating new knowledge about meanings, seeking a deep understanding of why people buy products and how one could transform these products into items that people buy for its emotional, playful, and symbolic components as much as for its functional use.
3. Human-centered research: this research explores people's current meanings assigned to products and aims at detecting existing meanings and needs to design products that fit those meanings and needs.

4. Tinkering: When someone plays around with a product or a technology with no goal in mind. Tinkering can lead to brilliant insights and new products, but when such results happen, they are completely accidental.

Merging the 3 eras

Having presented the 3 areas, a relationship between them can be made. Technology has changed (and it is changing) and we are in a new era with new opportunities. We are in an era of *digital tools*, with lot of them available. Due to this, people have changed how they live, their habits. We can say they have become *digital people.* As a result of this, organizations had to change their principles start thinking new business models and the *Smart work* model appeared. We can see this 3 concepts in Figure number 5.
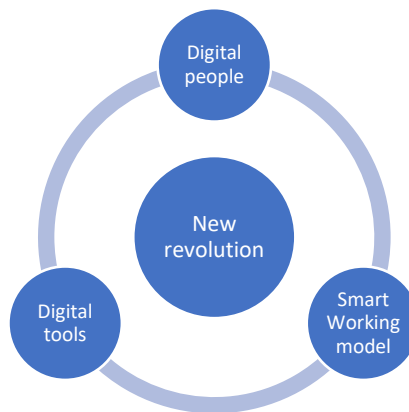
Figure 9 Relating the 3 eras

In the following sections, we will study how some of these digital tools can be used by organizations to pursue the objective of smart working: give autonomy and flexibility, with better results for everyone. A framework, to analyze the current digital tools and decide if they give autonomy and flexibility and these digital employees, will be presented. When these to two things happen, we are under the smart working model.
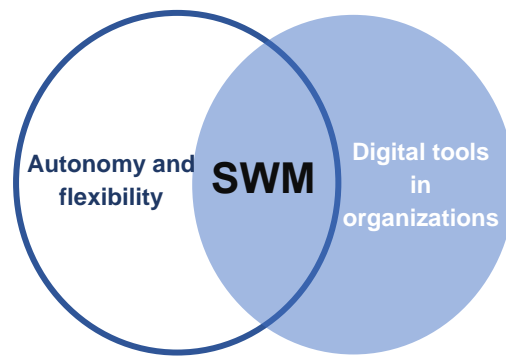
Figure 10 Merge of the areas

As said before, in this work it will only be studied the element 1 of SM, the digital tools element. The other elements will be only considered only if they are related to digital tools. To make it clearer with an example, relating each element (Gastaldi, 2014) to digital tools.:

1.   Element 1: any ICT tools.
2.   Element 2: HR training programs, communications plans done with digital tools.
3.   Element 3: digital work spaces.

Having defined our area of analysis, we will start our analysis defining a framework for these digital tools, to then, proceed to the analysis of some specific digital tools.

Digital technology and digital tools

In this section digital tools will start to be analyzed (the most used ones) and see if they can be used in the SM model.

By working with digital technologies we are leaving aside the analogic technologies. This digital technology is characterized on information that is stored, transmitted and forward into digital format to people.

The digital technology that are going to be analyzed are from the ICT area, previously mentioned. ICT technologies refers to any electronic device or technology capable of collecting, storing and transmitting information (Steinmueller, 2000).

We can think of many digital tools that could be applied to work, but in order to keep the scope narrower and applied to organizations, and also their relation to smart working, we are going to define a framework to analyze this digital tools.

SMAC framework for digital tools

 As introduced before there is a new technology era, where mobiles and apps are playing a fundamental role (see Fig. 1), where the challenge for companies is to integrate these new technologies.

Companies, in order to develop a technology-driven technology advantage and transform their digital business, are working with SMAC (social, mobile, analytics and cloud) technologies, and we analyze our technologies under the SMAC framework. (Dr Mark van Rijmenam, 2014)

SMAC is the new enterprise ICT/digital model delivering an organization that is more connective, collaborative, real time and productive. It can be defined as a collection of various individual technologies and platforms which have shown growth in past few years.

These individual technologies from SMAC are the ones currently driving business innovation, and are used to develop the SM model. This SMAC tech enables a business to transition from e-business to digital business.
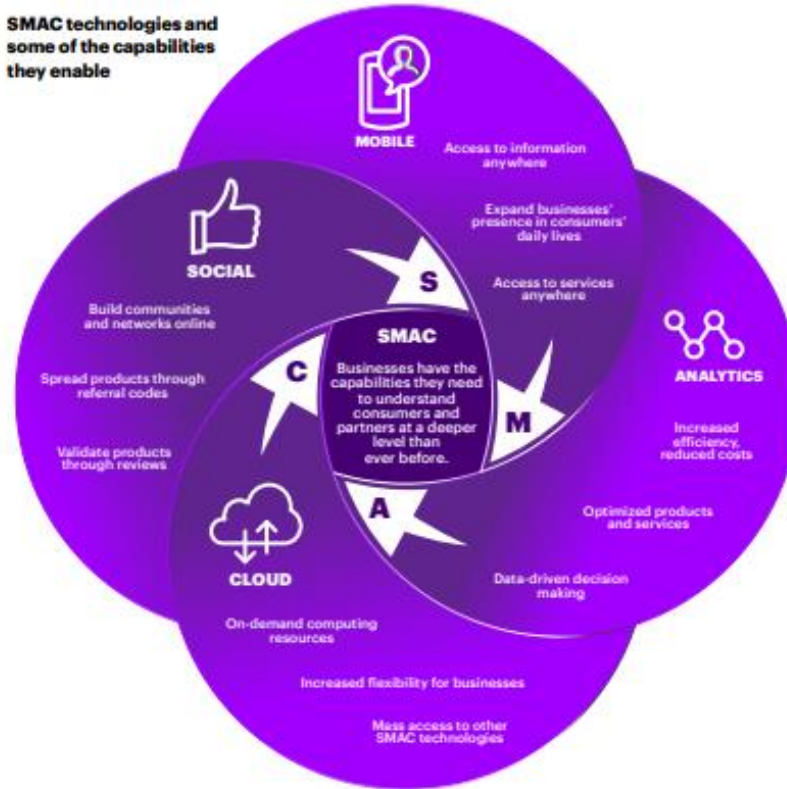
Figure 11 SMAC technologies, Accenture vision, 2019.

Social technologies

This concept of social technologies is related with social networks. These social networks have given individuals the ability to create, publish and share content. Clear examples of these are Facebook, Instagram, Twitter. Companies, for example. use social media to reach customers, a common strategy used by marketing, where they use adds in these social media. Social media has many potential benefits that could be translated into business. Some of these benefits are: it is easy to search, to share information, to know about people ,etc.

Figure 12 Examples of Social technologies

A formal definition of Social technologies would be: "the computer code and the services that enable online social interaction – are, essentially, the product of 40 years of technology evolution and the fulfilment of a long-held vision of what computers and digital technology could do" (Chui et all, 2012)

These social technologies could be seen as a threat, regarding that people like to enter the social media to keep in touch with friends, to see their photos, basically to connect and have fun. In other words, some people believe that social technologies are here to make people waste time. The real challenge for organizations is to extract value from this. They do not need forbid people to do what they like (with mobile phones they have access to this 24/7, it makes no sense). Some organizations for example blocked Facebook, YouTube, and some pages on the company computers. Organizations must see these technologies as an opportunity. They need use them in order to have better results. Organizations need to trust their employees and give them flexibility.

So what organization should do? The social must be seen as collaboration tools defined as "the communication of two or more people, who are interacting in order to reach the common goal. We can quote the term e-collaboration is increasingly being used in industry to denote collaboration activities supported by some form of information and communication technologies" (Weiset et al, 2006).

These Social technologies can also be defined through the following three characteristics (Bugin et al, 2011):

- they "are enabled by information technology";
- they "provide distributed rights to create, add, and/or modify content and communications";
- they "enable distributed access to consume content and communications".

We can define 3 spaces where these tools are used: e-business tools, e-government tools and e-community tools.

*Public administration
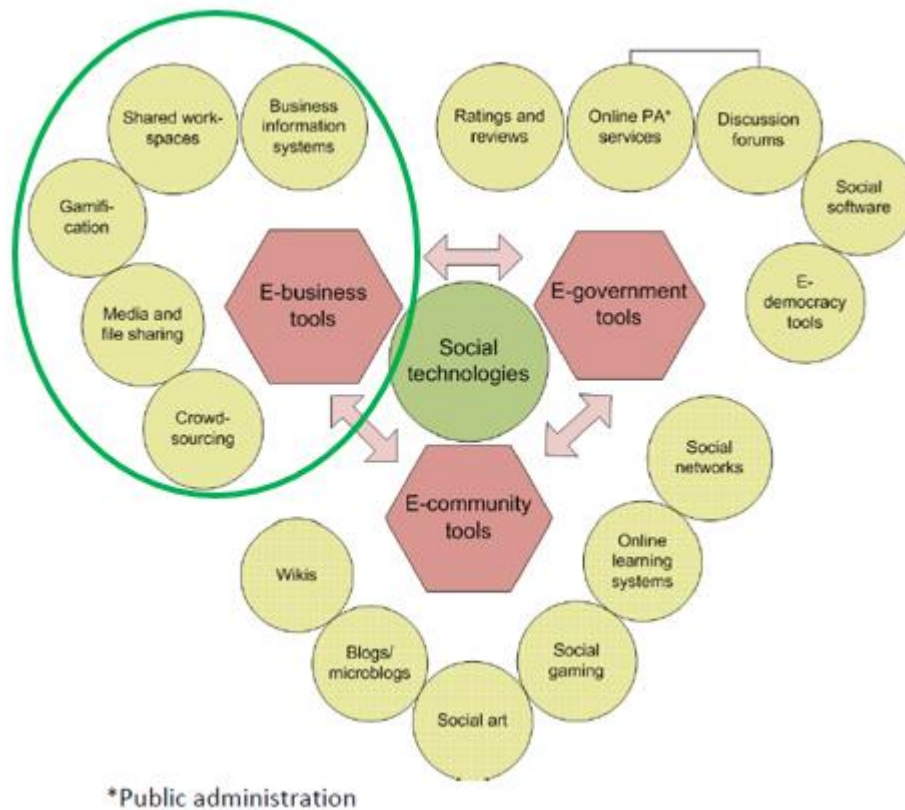
Figure 13 Social collaboration tools and technologies, Skaržauskiene et al (2013)

The report will be focus on the Business Area and how this social technologies are used in the organization, as we can see in the figure. It's worth mentioning that every tool, used in certain area, has a potentiality to be used in other areas. For example I can use a social networks in every one of these 3 groups.

Having defined the first technology of the SMAC framework, we move on to Mobile technologies.

Mobile network technologies

By mobile technologies, the idea is that you can use the technology from anywhere. Data will be always available, even if you are out of home or work, and also at any time of the day. This is a key concept for smart working.

Some years ago, there was a huge gap between process and people. Let`s explain this with an example. Let's suppose that you work in an industrial company, more specifically a mineral water bottler. If a machine was broken and you were not there, you will not know it was broken and what decision they have made to move on till you arrive the next day. Now a days, this has been simplified. With mobile devices, if something happens, you can be contacted from anywhere.

If the machine is broken you can be notified and be part of a decision. Also if you need some data, like how many bottles they have made, you can see it through your computer with internet. In other words we have wearable devices.

The main explanation for this kind of technologies is related to the concept of *broadband mobile technology*. This refers to wireless internet access, without the necessity of any cable. This has been evolving over time, giving different ranges of signals, and more important, higher velocities. Higher ranges and velocities, means that more activities can be done. To have information, devices need to process a huge amount of data in a short time, so velocity becomes crucial.

Over time, broad bands evolved. To illustrate this evolution, we can bring an example of the different broadbands that have been over time, and their respective download velocity for different kind of files.

	GPRS (114 Kbit / s)	EDGE (386 Kbit / s)	HSPA (7.2 Mbit / s)	HSPA+ (56 Mbit / s)
.html (100 kB)	15s	5s	600ms	30ms
.png (3 MB)	7m 35s	2m 31s	8s	1s
.iso (700 MB)	30h 20m 28s	8h 40m 13s	28m 54s	2m 33s

Table 2 Broadbands velocities

- GPRS and EDGE corresponding to 2G networks(second generation)
- HSPA and HSPA+ corresponding to 3G networks(third generation networks)

For a same size of a file, with 2G we needed to wait 30 hours and with 3G it can be done in 2 minutes and 30 seconds. Now we are on the 4G network, and it has the double download velocity of HSPA+. This year, they have launched 5G networks, which are under study.

The real challenge for organizations is to select what activities can be managed through mobile locations. There are still many activities that requires the person to be at work. Things that need to be done there. There are other activities that can easily be done at home, giving the person flexibility and allowing the company saving, because they do not have to pay for the employee transport.

Analytics technologies

When we talk about analytics, we need to bring on the concept of *big data*. With new technologies emerging, these ones are generating more and more data.

This data is crucial to analyze and make decisions. We are storing huge amounts of information(the clouds mentioned later are a key player for storing this information) and also there is a huge expansion of the internet into billions of organizations and companies.

So we define Big data with 3 characteristics, the 3Vs:

- Volume: as said before, we have huge amounts of data.
- Velocity: in which data is created. It's getting higher.
- Variety: all the information is not about the same topic. We have a huge variety of information.

It has arrived the time where the amount digital data has surpassed the analogic data. But information by itself does not mean anything. We need to analyze it, so we need to go *from big data to smart data*. There is a challenge to manage these huge amounts of information, and how to extract value of them.
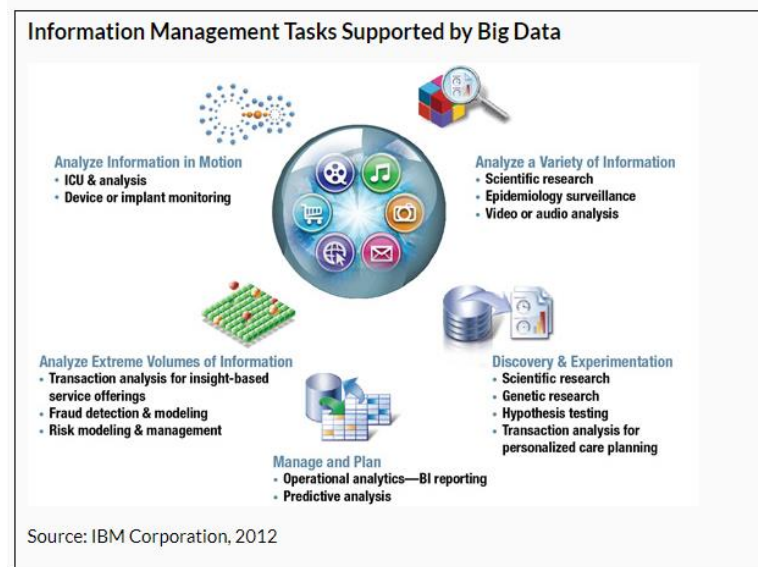
Figure 14 Information Management Tasks supported by Big Data, IBM (2012)

Smart data is basically valuable information. Information by itself is not valuable. We need to process it, give people what is necessary, and this is smart data. We find value analyzing data. In the figure we can see a range of activities that we can do with the big data stored. When people have in their hands the information from big data filtered, they have smart data that could help them to be more productive, autonomous and flexible.

Cloud technologies is the main disruptor of these 4 technologies of SMAC. It is the enabler to develop many others digital tools . It relies on advance software apps and networks of servers of computers.
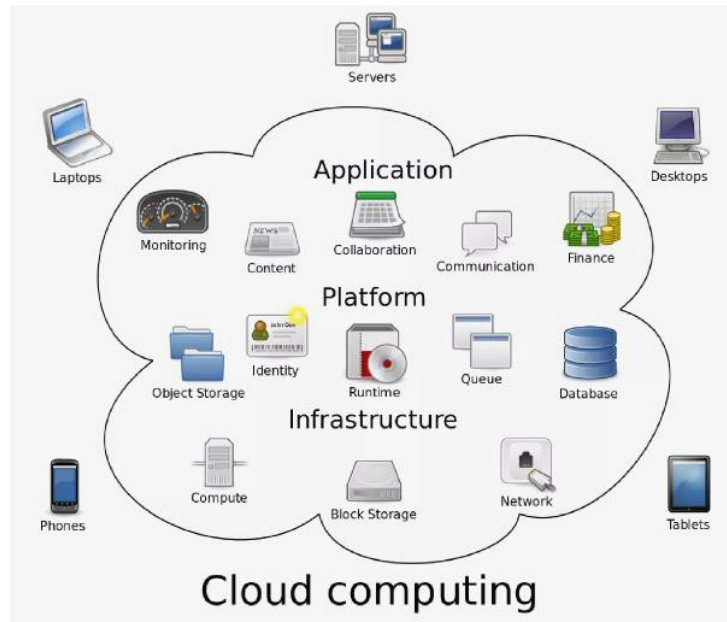
Figure 15 Architecture of cloud computing

The idea of a cloud computing system is to keep all the data on the "cloud". It means that the user will no have a physical device to store the information, apps, etc. The information will be on internet servers. People need to be connected to internet in order to access to these services. Maybe the most common example, familiar to everyone, is Dropbox and google drive. You haven't bought any physical device to store data, but you have data available, it is on the "cloud".

As we can see in the figure, there are 3 applications/services that cloud computing may cover. Any of these cloud technologies could cover one these services or the 3 at the same time. These are:

• Software as a Service (Saas): in other words, applications, programs. The idea is to provide a functional program to the end user, and this program will not be specific to a local computer. In other words it is the use of the web to deliver applications.

• Platform as a Service(Paas): resources are offered via platform, in this case, providers usually face corporate clients. The difference between Saas and Paas, is that in platform as service, the responsibility is shared between the

provider and client. As in Saas the client manage the apps and the data, but here the provider is responsible for managing the system(servers, storage)

• Infrastructure as a Service (Iaas): basically provides computing infrastructure, such as virtualization, storage, and networking.

Some of the main advantages of cloud technologies are:

- No need of infrastructure (with a faster development time)
- Low cost
- Reliability (certified provider)
- Flexibility and autonomy
- Scalable (some of them are paid proportionally to their use, you pay in function of the storage size or service that you need).

SMAC technologies together

We have defined each pillar of the SMAC technology separately, but in many digital tools we can have all of them. These four technologies are pillars to develop tools that bring flexibility to the worker. Also in some cases we do not have all of them, and we have only some of them present. For example: a cloud only for storage, without analyzing data, has only the M and the C of SMAC and a platform has the 4 technologies present.

In the next figure we can observe how these technologies are related.
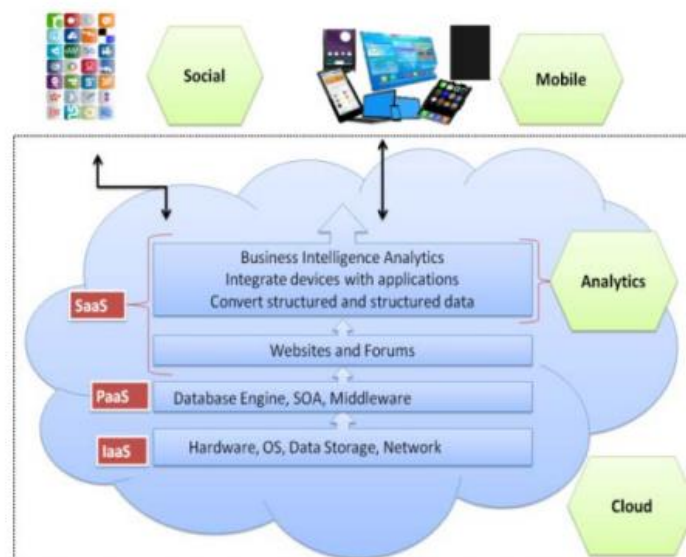
Figure 16 Four SMAC technologies, Merugu.Gopichand (2016)

Digital tools

In this section the digital tools used nowadays will be described. As we will observe some of these tools will be more *specific*, meaning that they will have a specific objective/use, having one or two of the technologies of the SMAC framework and some of these tools that will be more *integrated*, meaning that will integrate all the technologies of the SMAC framework, offering an "integrated platform".

The idea is to present the technologies mostly used by organizations, to analyze them , see their advantages, and how companies or industries use them, in order to see if they can be used in the smart working framework.

Clouds: OneDrive, Google Drive, iCloud, Dropbox

Clouds are the most common storage tool used nowadays. People are using clouds to store and analyze data rather than physical hard drives. Between them we can mention some pretty famous examples as Google Drive, OneDrive, Dropbox, iCloud, etc., as we can see in the next figure.
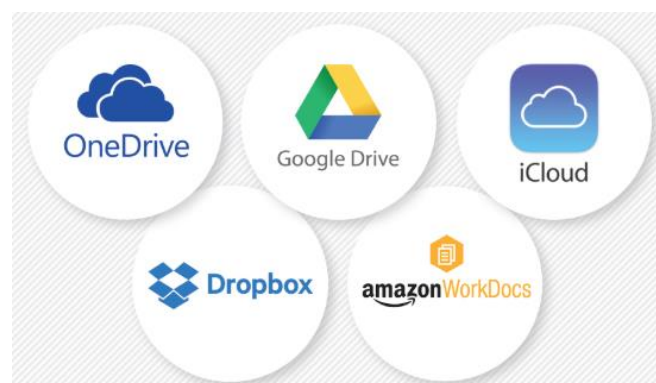
Figure 17 Examples of Clouds technologies

As we know companies have a lot of documents to store. Also it is necessary to send files to investors, a suppliers, for example. So this kind of cloud storage, having the characteristics that we saw on the cloud technologies section of the SMAC framework(C of the SMAC) are more practical, as any other user, can access to this information only by creating an account.

According to literature(Daniel Hein,2019) industries are benefited from cloud services. We are going to mention the main 5 industries that are benefited from this services. This industries refer to general clouds, without referring to a specific cloud provider.

1. Automotive Industry: The automotive industry relies heavily on constant availability of data. For example : even if you don't have that perfect car in store, customers will be happier if you can search

inventories and direct them to a location that does. With the cloud, automotive companies can store inventory and additional data in one easily-accessible location. When you have instant access to the information you need, you will close deals faster. Another example is from *Volkswagen*, the world's second-largest car, manufacturer company Volkswagen uses the open source cloud computing platform to build a private cloud to host websites for its brand like Porsche, Audi, VW. Volkswagen is one of the many automotive companies that are leveraging transformational cloud technologies for a digital future.

2. Entertainment Industry: Scalable resources are provided by cloud computing. This characteristic of cloud computing offers a power to only pay for the computing resources you use, and you can easily supervise projection without making any fix investments. For example, Netflix leverages scalable usage of cloud computing to its advantage. Netflix faces large surges in server load at peak times due to its on-demand streaming services. The migration to the cloud helped the company to expand its customer base without investing in costly setups. This is how cloud computing is being leveraged by the entertainment industry which is the very big reason for its success.

3. Retail Industry: retailers usually buy the products in bulk from the wholesalers and then add their margin and further sell it to consumers. The cloud computing provides benefits like scalability, reduced cost, lesser time and flexibility, access to large amount of stored data from anywhere and anytime, segmented market, improved and maintained relationship with customers, tracking the current trends of customers behavior and purchasing patterns towards various brands, reducing cost and targeting the right customer etc. Some benefits of cloud computing in retail are:
    a. Improved Channel Operations
    b. Higher Supply Chain Visibility
    c. Better Merchandising Decisions
    d. Personalized Customer Service
    e. Better Insights into Business Performance

4. Production Industry: In the production industry companies need to manage diverse location and supply chains that require large database applications. The cloud permits the companies to unite anywhere and supply essential information to influence each location.

5. Education: The education industry deals with tight funding situations and this problem can be directly alleviated by cloud computing. This helps the students(in this case employees) to access all the information they need from one place and even the teachers can easily distribute

assignments. It also provides security to the students as very sensitive information is collected by the school.

According to *IBM*, a multinational enterprise focused on technology, the *most common uses of cloud computing* by companies can be resumed as:

- *Infrastructure as a service (IaaS) and platform as a service (PaaS)*: When it comes to IaaS, using an existing infrastructure on a pay-per-use scheme seems to be an obvious choice for companies saving on the cost of investing to acquire, manage and maintain an IT infrastructure. There are also instances where organizations turn to PaaS for the same reasons while also seeking to increase the speed of development on a ready-to-use platform to deploy applications.
- *Test and development*: This entails securing a budget, setting up your environment through physical assets, significant manpower and time. Then comes the installation and configuration of your platform. All this can often extend the time it takes for a project to be completed and stretch your milestones.
- *Big data analytics*: One of the aspects offered by leveraging cloud computing is the ability to tap into vast quantities of both structured and unstructured data to harness the benefit of extracting business value.
- *File storage:* At any time and place you have high availability, speed, scalability and security for your environment. In this scenario, organizations are only paying for the amount of cloud storage they are actually consuming, and do so without the worries of overseeing the daily maintenance of the storage infrastructure.
- *Backup:* Backing up data has always been a complex and time-consuming operation. This included maintaining a set of tapes or drives, manually collecting them and dispatching them to a backup facility with all the inherent problems that might happen in between the originating and the backup site. With a Cloud service, we solve these problems.

According to Getronics, a digital company that works with cloud management, in order to choice a Cloud provider companies need to analyze some factors:

- Compatibility: for example if you have all Mac computers and iPhones in your company, iCloud would be more suitable for you. On the other hand, OneDrive would be better if you have all Microsoft computers and Android cellphones

- Price: depending the profits of the company, you can access to different kind of services. The higher the Price the better the services, as capacity storage, download/upload velocity, for example.
- Security: they need to analyze guarantees this cloud storage service offer. The provider needs to guarantee security, not only when you store, also when you share. For the examples mentioned above, security is not a problem.
- Upload and Download velocity: even though you have a high speed connection, this cloud could be your "bottle neck". So you need to search that this technology is compatible with your requirements.
- Storage: how many space do you need, in order to pay for the right amount.
- Content sharing: in order to see to who I will be sharing the content.

So about the technical aspect and performance a company should evaluate all this items in order to select their right provider.

Regarding the innovation side, according to *Forbes* ,Cloud is enabling and creating innovation as: .

- Internet of things (IoT): you have access to untapped markets through new Internet wearable devices
- Business Processes Enhancement: revision of business processes to fully integrate with cloud computing technologies
- Creative Collaboration and Approach: people collaborate for unique and exponential value from business cloud solutions
- Customer Value Creation: expand into new customer opportunities
- Speed and Agility: quickness to capture elusive market opportunities

Communicating tool: Skype business

Communicating between partners in a company is very important, and in some situations you need something more than a simple call with your mobile phone, the cellphone is not enough.

This is where these communicating tools (with some characteristics of collaborating too) appeared. We have the examples of Skype business and Cisco Meeting. We will be showing figures of skype, but the main points are practically the same for these tools.

Figure 18 Skype Business

The idea of these tools is to bring to employees more than a simple call like a cellphone. With this communication tools you can:

- Video-Communicate: you can see the other person where ever it is
- Share: as we can see in figure is useful to show presentations or data, that it is difficult to explain only by words. You can Present your screen during meetings or give control to others.
- Reduce costs: by this we mean two costs.
    - o Transportation costs: we do not need to move to reach the other people, having a similar conversation as we were there.
    - o Communication costs: its cheaper than a paying a call to other country.
- Multi Communication: we can add many people to this conversation. Broadcast online to a large audience.

Focusing on companies and industries, a consulting company called Envision Consulting, made a top 5, of why and how companies use Skype Business:

1. Cross-Platform: Skype for Business is a collaboration software that allows team members to communicate with one another regardless of the device they use. This implies that the platform (Windows, Android, iOS or Mac) used by team members doesn't hinder them from communicating with one another.
2. It cuts costs on business travels: Business organizations are always on the move. They want to know what customers are saying, want to meet

with investors, visit their partners, etc. Skype for Business helps you cut back on these business travels, which could set you back some dollars. You have the option of having a video conference with partners, investors, suppliers, etc.

3. It enhances productivity and communication: you can schedule meetings and video conferences into your normal workday. You can do this on any device and any platform because Skype for Business provides you with an account that is synchronized on all your devices.

4. High-Level Security Authentication: Skype for Business encrypts communication between users. It also prevents colleagues from sharing the resources within the platform with individuals. This ensures only the devices and subscribers that have been approved by an organization can be connected

5. It helps you track expenditures: Business is only complete when you can account for income and outflow. So, in summary, Skype for Business lets you connect with co-workers or business partners in your company or around the world.

Having in mind all the characteristics seen above, these tools have a lot of potential and can be used for multiple purposes, not only to communicate between employees. For example, lets suppose you are a HR recruiter. You do not need to tell a potential candidate to come from their country, you can arrange an "skype call". Also with trainings, or customer service. If you need detailed information you can arrange a call and save some huge costs, and, in addition, give your worker the flexibility of doing that from anywhere.

Digital calendar-Google calendar

Calendars by them selves are crucial for workers, and have real important benefits. You can keep things accountable, realistic, on track. By putting tasks on a calendar you can set boundaries and help you to prioritize. These benefits are for any kind of calendar, digital or analog. What changes with a digital one? A lot.
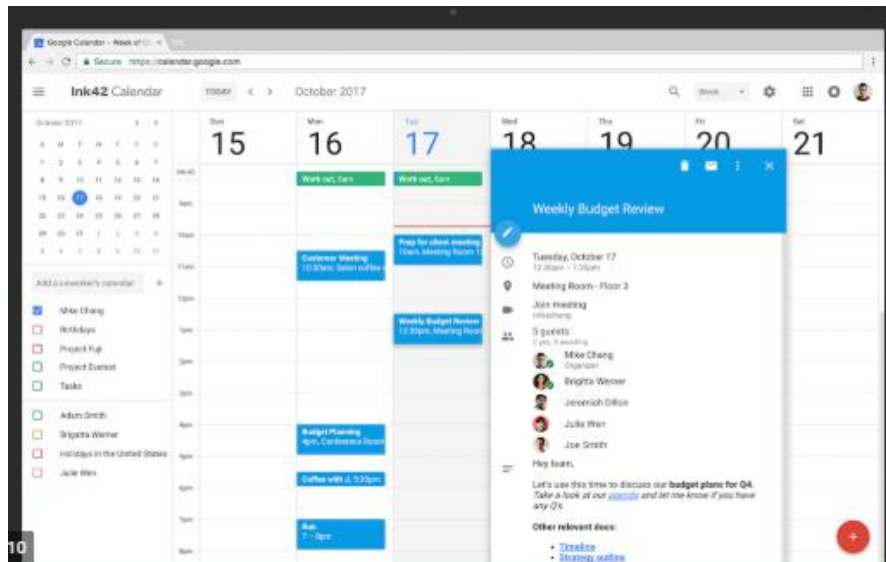
Figure 19 Google Calendar

Digital calendars are a huge contribution to people flexibility, providing them an easy way to work.

We are going to mention how companies use calendars and make the most out of this timeless productivity tool.

With a digital calendar ,you can decide to make your calendar *public*: the idea of making public the calendar in a organization, is to let other people know when you are free and when you are busy to set up a task/meeting. You can invite people to look at your calendar. You can let your boss, your colleagues, your business partners, your family, your friends, see where you and what you're doing each day. They can see your plans and your activities, who you're meeting and where you're planning to meet them. This is really productive, it saves time.

The main 5 advantages of calendars (Kayla Sloan,2018) are:

1. You can access to anyone schedule from any device. The calendar is portable, you can have your calendar everywhere, without the need of having the physical calendar.
2. You can schedule meetings and appointments, and you can:
   a. Customize and connect: you can write on invitations or either attach documents, in order to connect with people.
   b. Make automatic invitations for events.
   c. You can share locations, linked with maps in these meetings.
3. You can set up reminders
4. You can block up your time
5. You can create repetitive events on the calendar. It has simplicity: to change the content(tasks, time, place, etc).

Having seen the most important uses of calendars in companies we can say that calendars improve productivity. Companies can increase productivity doing the following things:

1. Pick the right moment
2. Improve meeting timing: choose the right hour
3. Calendar as preparation tool: you know what you need to study before, information and documents can be attached
4. Limit the time of the meeting: very often, there are meetings way too long. You can put a time that need to be respected.
5. Can be used to put deadlines in tasks

E-Mail: Outlook, Gmail

In this work, as simple as an email it is, it is need to mention them in a few words, because they have huge benefits, and also they are integrating some functions mentioned above and also will be integrated on platforms that will be seen later.

The original idea of an email was to send digital messages to users, and keep these messages recorded. Then some functions were added as attaching files, and now things are more interesting. In the next figure we can see an example of outlook email in business.
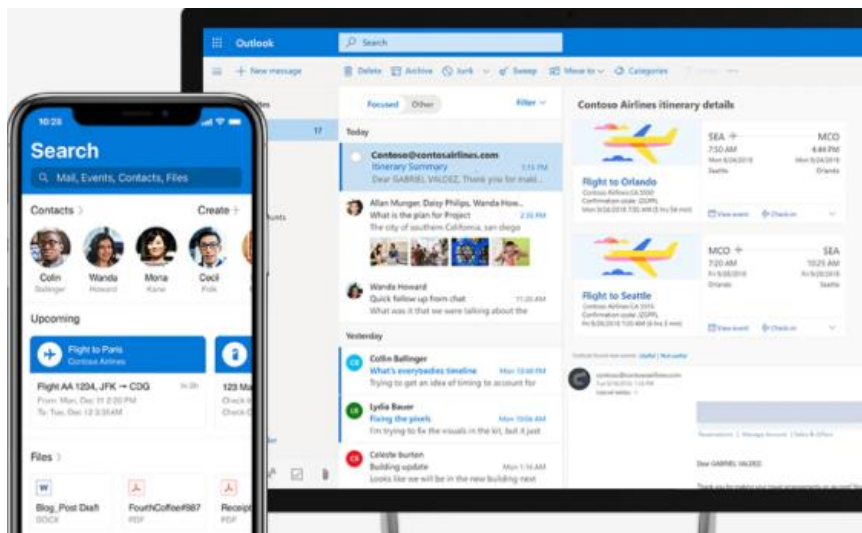
Figure 20 Outlook email

This is an email commonly used at work. The main functions are:

- Integration across email, calendar and contacts: you can find cellphone numbers, find contacts and schedule some meetings.

You can see synchronization with other activities as we see the trip that the employee need to do in the figure.

- Offline access to email: no necessary to have internet. You can work and when you have internet, it will synchronize all.
- Organize email your way and categorize email items: the email can be personalize by each person. Some people find more suitable one way of work and other another way.

So as we can see, in outlook we have an integration of digital calendars and the email, giving more flexibility and commodity to the worker.

Email is an important method of business communication. It is fast, cheap, accessible and easily replicated. Using email can greatly benefit businesses as it provides efficient and effective ways to transmit all kinds of electronic data. Email is a highly effective form of business communication. The four primary uses of email in business include:

1. internal company communication
2. external communication, ex with business partners, suppliers, stakeholders, etc.
3. customer support
4. marketing to customers

In summary, independently, for what of this 4 purposes we use email in businesses, it present some advantages and disadvantages that need to be mentioned:

Advantages:

1. Cheap: sending an email costs the same regardless of distance and the number of people you send it to.
2. Fast: an email should reach its recipient in minutes..
3. Convenient: your message will be stored until the recipient is ready to read it, and you can easily send the same message to a large number of people.
4. Permanent: you can keep a record of messages and replies, including details of when a message was receive
5. Attachment of files: you can quickly and easily send electronic files such as text documents, photos and data sheets to several contacts simultaneously by attaching the file to an email.
6. Sharing: you can share an email to multiple contacts. You can build groups of people to forward an email.
7. Automated emails: you can program automated responses and emails, for example when you are in holidays.

Disadvantages: there are some negative points that can be a problem to a company, with emails, and because of these points, new ways of managing companies are becoming popular. (as we will see with teams and slack later)

1. Spam: unsolicited email can overwhelm your email system.
2. Viruses: easily spread through email attachments.
3. Sending emails by mistake: at a click of a button, an email can go to the wrong person accidentally, potentially leaking confidential data and sensitive business information.
4. Data storage: electronic storing space can become a problem, particularly where emails with large attachments are widely distributed.
5. Information overload: it is difficult to process information, to find it. When you have tons of emails, becomes a challenge to organize yourself.

Facebook- @Workplace

Workplace is a social media tool and has integrated on some of the functions seen before.

As said before, social media has a huge impact in our lives, and people are used to rely on them to communicate, search information and do many activities with them. We are going to see a social media tool and how Facebook adapted his social network, to present a digital tool for work.

The use of social media to engage with audiences is becoming a standard practice for many businesses, organizations, libraries, celebrities and even political candidates. Many of the elements that make social networking platforms strong communication tools are now being used internally, allowing employees of these organizations and businesses to collaborate and connect with the same ease as with external audiences, and also to innovate. This connection is being made through *enterprise social networking (ESN) or enterprise social media (ESM)*. The applications used for this method of communication are known as social networking platforms or team communication platforms (TCPs). There are 3 attributes for a platform to be considered ESN:

1. Have the opportunity to send and receive messages individually or into groups.
2. Share files with other users
3. View all the conversations that are done publicly, considering text messages and file shared

The following tools that we are seeing next (with exception of the MOOCs) will present these characteristics mentioned.

37

If we think on Facebook by itself, we can see that it has many of the SMAC technologies present, but it is mainly used to as a hobby, to connect with friends, to upload photos, and talk about anything you want. People enjoy this way of communicating, they know how to use it, so this can be seen as an opportunity for companies. If they use Facebook, they do not need to bear learning costs on their employees. This is were workplace, a tool by Facebook was born.

Workplace is a paid tool, that looks exactly like Facebook, but it is for company purposes, and also people can relax there, posting what they are doing, and enjoy a little bit.

The main idea of workplace is to use the tools from Facebook, to a work purpose. For example HR can communicate updates on this social media as a post, instead on sending an email to everybody, employees post their trainings or achievements there, communicate with each other, etc.

To define how companies use Workplace, we need to define the principal features that can be used at work.

Workplace features
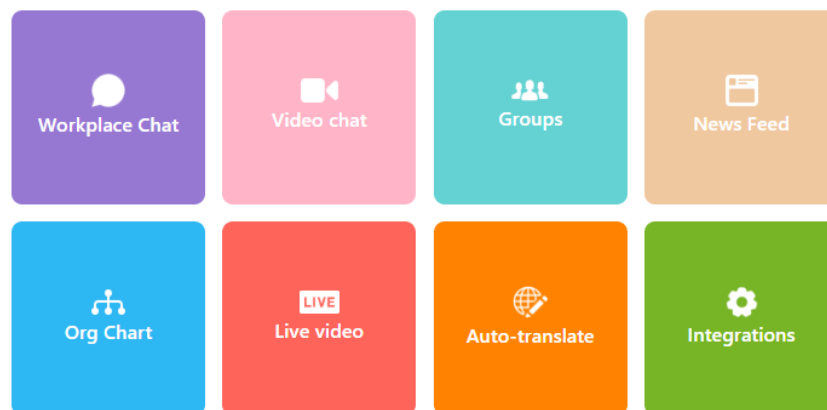
Figure 21 Main Features by Workplace, Facebook

1. Chat: you can chat with out colleagues, also using video calls, and accessing popular accessories like GIFs, bringing more satisfaction to the worker
2. Groups: as in Facebook, you can build groups, for example, a group for the Quality Team, and be updated anywhere.
3. News feed/live video: you can post updates or important news, also doing a live video

4. Organization charts: you can access to organizational information regarding your company.
5. Auto translate: while you are talking you can benefit of translating into another language to connect with a collage from another place
6. Integrations: you can integrate this social media with another apps, like google drive.

So the idea of workplace is to combine this generation Facebook technology and easy-to-use features to transform communications, culture and workflows inside organizations of all shapes, sizes and industries.

Facebook has integrated some of the tools that we mentioned before. You can upload data, you can do calls like Skype, having more tools in one.

Regarding the industry, we can mention 2 examples of companies that have adopted Workplace, related to an innovation objective. The main reason why they chose to integrate Workplace is to achieve collaboration between employees and interest parties. Lets see how:

Walmart - Innovate better, save money: they wanted to unlock the value in their most valuable asset, their people. They wanted to innovate. That's why they acquired Workplace. This campaign focused on generating new ideas on sustainability, employee productivity, and other specific topics. They launched the 'Value Makers' dedicated group in Workplace by Facebook, and monitored closely for the duration of the 90 days campaign. Employees across the firm contributed ideas, as well as liking and commenting on others. This open collaboration helped transform good ideas into great ones. This tool was a great success.

Softvision – Seeing things differently: Softvision has led the digital transformation of many global enterprise brands. Softvision recently used Workplace by Facebook to host a company-wide innovation enterprise called the 'Innovation Pod Challenge'. Given that 94% of the company are active Workplace by Facebook users, this was the obvious approach for maximum engagement. The purpose of this campaign was to encourage 'Softvisioners' to share new ideas around technology to benefit their clients.

With this 2 examples we can conclude that companies can use this tool to:

- Get people inspired
- Create dedicated communities
- Measure, analyze and engage.

Another social media tool, LinkedIn, has a different scope. This app is to connect professionals, from different business units and places.

In this report it's analyzed from the point of view of the company, more specific from the HR point of view, where this tool can be more useful. Before it was difficult to analyze and contact a new employee, it was not an easy work. You needed to post a job, receive CV and emails and analyze each of them, you needed to contact them by phone and email, set interviews. It could take a lot time and information needed.

Description	Operator Name	Dependency	Possible Values
First Name	fname:	n/a	<keyword>
Last Name	lname:	n/a	<keyword>
Current Title	ctitle:	n/a	<keyword>
Past Title	ptitle:	n/a	<keyword>
Title	title	n/a	<keyword>
Current Company	ccompany:	n/a	<keyword>
Past Company	pcompany	n/a	<keyword>
Company	company	n/a	<keyword>
School	school	school:	<keyword>
Country	country:	country:	<valid country>
Zip Code	zip:	country	<valid zip code>
Radius	radius:	country: and zip	<10, 25, 35, 50, 75, 100>
Industry	industry:	n/a	<valid industry>
Interested In	interest:	n/a	<p:potential employees c:consultants/contractors e:entrepreneurs, h:hiring managers, i:industry experts, d:deal-making contacts>
Joined LinkedIn	joined:	n/a	<login:since last login, d:in the last day, w:in the last week, 2w:in the last 2 weeks, m:in the last month, 3m:in the last 3 months>
LinkedIn supports search operators directly from the query box.			

Table 3 LinkedIn features, search criteria

With LinkedIn premium HR recruiters can search for employees anywhere at an anyplace, giving HR more flexibility and less time to do it. With this digital tools you can get a set of people with the qualifications you are searching off, as we can see in the figure.

To research, you can put the radius where they are living, the title(career) you are looking for. You can search years of working experience without analyzing that much.

LinkedIn has numerous benefits for the Business to Business companies and also has different benefits for Business to Consumer companies. We can mention between the purpose of using LinkedIn the following ones:

- Build your Professional Network via the power of Social Media

- Increase Exposure with a LinkedIn Company Page for Product(s), Service(s) and to Attract Quality Employees
- Increase Credibility and Attract New Business

These are the main purposes. Digging in more, we can mention more business benefits that companies achieve by using LinkedIn, and these are the reasons why they choose this social media:

- Creating shareable content that benefits your audience
- Introducing new products or services you've developed.
- Differentiating yourself from your competitors.
- Finding job candidates who can make a significant contribution to your business success.
- Checking on what your competition is doing.
- Improving your ranking in search engines.

This social media has a more specific use, if we compare it with Workplace by Facebook. You can also post updates, works done, but not as an internal communication, to the outside world, to the whole LinkedIn network.

MOOCs tools-Mobile learning

When companies hire people, they need to devote some time to teach them the culture of the company, the tools of the company, some norms of safety and quality, etc. Also they need to continue training existing employees.

So ,to summary, they need to:

- Teach and evaluate them.
- Pay specialized people to train them.
- Train them with an adequate frequency.

An alternative mode of learning appeared and it's called *mobile learning.* This consist in technologies that brings the characteristic of portability, individuality and availability and this allows its users to easily access information according their convenience anytime, anywhere.

The main too that we are analyzing of mobile learning, that it`s highly used these days, are the MOOCs.(massive open online courses)

Figure 22 MOOC tool

The initials stand for:

- Massive: there are a lot of people and courses in these platforms, giving them retro alimentation and quality.
- Open: anyone can register (most of them are paid).
- Online: the entire course is delivered over internet.
- Course: similar to a personal course, but developed digitally.

There are many services providers of MOOCs, we are going to mention some of them, and we can see them on the next figure
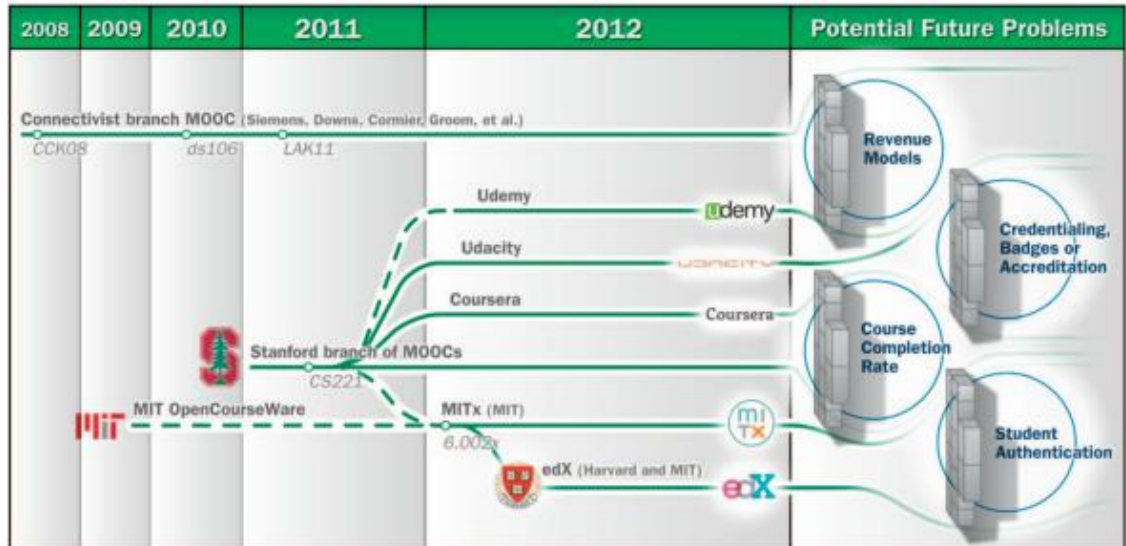
Figure 23 Most famous MOOCs service providers

- Coursera: a social entrepreneurship company that partners with the top universities in the world.
- Udemy: is a portal that facilitates online courses, mainly in the area of entrepreneurship, IT, software use, design, arts and sports.

- Udacity: is a company that has been cofounded by a Stanford professor, who started to offer information science courses online

People and companies can find lot of webs and companies offering Moocs, where the final goal is the same. Learn in an easy way, with autonomy and flexibility.

It is important to mention that with moocs, also you can control, follow your employees. After each section you need to do an evaluation. Let's suppose you have new employees with no management skills. So you ask them to finish a management course, with the evaluation of the moocs, and then your only concern is to ask them few questions to corroborate they have done the task. You save time for the employer and employee and both feel more comfortable.

In some cases you do not necessarily need to pay someone to find a course. For example if you need to develop some kind of repetitive procedure in your company, instead of teaching it for every employee, you can record something and make an evaluation to them to complete. This is suitable when it's a simple training, not specific and really repetitive. With this you gain autonomy and time.

Regarding companies, here there are just a few of the most important advantages of this new trend, as revealed in the literature:

- MOOCs represent a training method for employees on specific and practical topics on a 24/7 basis.
- MOOCs educate and boost new employees' skills, also complement the existing staff experience with underlying theory and knowledge.
- MOOCs contribute to continuous professional development and professional networking.
- MOOCs open the access to new knowledge and new research findings on a global level.
- Meanwhile, as main barriers (or risks) there are considered:
  o low awareness and experience.
  o lack of capacity to offer or produce MOOCs.
  o some MOOCs are perceived as not covering the requirements of the company.

According to literature (Razvan Bogdan,2017) , companies can use/offer Moocs in these 4 ways:

MOOCs offered by private companies

In the following table we can see private companies that have adopted Moocs, in order to train their employees for internal purposes.

Company	Platform	Number of MOOCs	MOOCs by subject	Certificate
Microsoft	edX	92	Computer Science (45), Business & Management (4), Education & Teaching (6), Programming (34), Personal Development (3)	67
Google	Coursera Udacity	57	Computer Science (4), Mathematics (1), Business & Management (3), Art & Design (2), Programming (47)	4
Acumen	*Future Learn*	30	Business & Management (22), Humanities (2), Science (1), Art & Design (1), Personal Development (4)	19
IEEE	edX	17	Computer Science (3), Health & Medicine (1), Business & Management (1), Humanities (1), Engineering (8), Science (1), Education & Teaching (1), Programming (1)	3
EIT Digital	Coursera	17	Computer Science (13) Entrepreneurship (4)	17
Inter-American Develop-ment Bank	edX	16	Business & Management (6), Engineering (3), Science (2), Social Sciences (4)	6
Pixar	Khan Academy	13	Computer Animation	13
The World Bank	edX Coursera Udemy	12	Business & Management (5), Science (3), Social Sciences (4)	11
British Council	FutureLearn	11	Humanities (6), Education & Teaching (4), Personal Development (1)	10
Fullbridge	edX	5	Business & Management (2), Personal Development (3)	1
Esri	Esri	4	Business & Management (1), Engineering (3)	1
Linux Foundation	edX	4	Computer Science (4)	4
Amazon	Udacity	3	Art & Design (1), Programming (2)	-
IBM	Coursera, Open-Classrooms	3	Computer Science (2), Programming (1)	3

Table 4 Public MOOCs provided by companies

And we can see some examples of the Moocs provided, the topics that cover in the following table.

Course Name
Stuff You Don't Learn in Engineering School
Introduction to the National Electrical Safety Code (NESC)
ISSCC Previews: Circuit and System Insights
Writing Exams for Science and Engineering Courses
Introduction to Data Storage and Management Technologies
Introduction to Real-Time Systems
From Goddard to Apollo: The History of Rockets, Part 1
Introduction to Cloud Computing
Big Data for Smart Cities
Health in Smart Cities
Managing a Multigenerational and Diverse Workforce
So You Want to Become a Biomedical Engineer
Innovation and Competition: Succeeding through Global Standards
Smart Grids: Electricity for the Future
Cyber Security: Protecting Yourself and Your Data
Introduction to Systems Biology
Introduction to Metrics for Smart Cities

Table 5 Course Names

Using existing MOOCs to supplement employees' development

This mean using the Moocs that are already in the market. As examples, Deloitte and Yahoo encourage consultants and engineers to sign-up for Coursera MOOCs, while Datalogix recommends their staff some relevant courses on Udemy; more than that, Google enrolled 80,000 employees in Udacity's .

Creating own corporate MOOCs for employees' and partners' development

Massive Open Online Courses can be developed internally by the (big) companies in order to train their employees into the intricacies of specific job-related knowledge.

A number of well-known companies such as DB Bahn, L'Oréal, Hermes,and Valiant have developed MOOCs for their workforce on the German platform Iversity (http://business.iversity.org/en/).

Using MOOCs for recruiting

A new approach for recruiting and for social learning was brought by Massively Open Online Internships (MOOIs), run on Coursolve (https://www.coursolve.org), a platform where students are encouraged to work in teams on real world problems for clients, organizations and companies. For these, MOOIs could greatly expand and easily assess their potential pool of job applicants

Slack

Is time to enter the digital tools that have almost every technology of the SMAC framework integrated, and are integrating many of the tools that we have seen before in one.

One of the main tools accomplishing all that has been said is Slack (we have also mentioned Workplace before, as a similar tool).

The main objective of this tool is communication, making team messaging really efficient. In order to achieve this efficiency, the tools have integrated many functions/tools into chats.
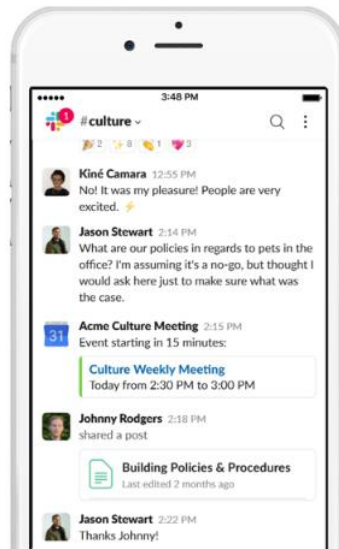
Figure 24 Slack messaging on the mobile phone.

This tool seems like an easy app to use, but is totally new so , it may incur into a learning phase, a learning period. It's not like Facebook that every user knows how it works., The company culture needs to fit with this app.

If the company succeed in implementing this tool they could benefit from :

- Organized conversations: you have different channels with topics regarding each conversation. Each channel can be joined and left by team members. The interesting aspect is that "Threads" can be made. This is if something on that conversation needs to be talk with only few people, you can create a parallel conversation within the channel. In another words, you can make "a conversation from the conversation".
- Searchable history and filters: you can easily find information of all the channels, with huge amount of filters.
- Connected tools and services: within the conversation you have many other applications integrated, like clouds, social media, mail, agendas. Without losing any time.

The important thing about this company is that the software is totally customizable. You choose what groups to follow, what tendencies, and also everybody can see what is in your agenda(if you decide so) and for example if you are on vacations.

Slack centers around teams, all the communication and interaction takes place within a team. At the time of Slack's startup, typical teams ranged from 5 to 75 people, making it suitable for small companies and startups (Tam, 2013).

Regarding to literature, an important study was done on Geosoft, analyzing how the tool was used. Geosoft is a large software company that

produces specialized software of engineering. They have adopted the use of slack. They collected 30000 messages of Slack, shared between members from March 2015 and August 2017. They observed for what purpose these messages were used.

Type	Avg.
General information/coordination	3 %
General discussions	15 %
Problem-focused communication	48 %
Technical information	20 %
Socializing	3 %
Emoji	13 %
SUM	100%

Table 6 Slack analysis by Geosoft

In this messages analysis they found the following challenges:

1. Language: they found that many conversations were used different languages, and conversations between people that speak different languages, were not likely to occur
2. Unbalanced activity: they found that 33% of the users wrote 86% of the messages. So there were a lot of people that were no participating or participate a little.
3. Using to much personal mode of coordination: many people use private messages and did not use the groups
4. Too many channels: they have opened many channels of discussion, being difficult to follow the relevant problems

In conclusion, the implementation in Geosoft was positive, but they need to work in the previous points mentioned. The smartest companies are using Slack today to:

- Emotional cues: with the email, it is difficult to understand the tonality of words. For example, an OK, means it is everything good or something inferring disappointment. Slack solve this. It's a formal and informal chat with emojis
- Team building
- Making work more social
- Productivity: employees can customize their alerts and notifications to be more productive, and you have integrated many tools into Slack.

To sum up, this tool is some way replacing the email, for internal communication within the company, where in these conversations you have many other tools included, like calendars, clouds, subgroups, invitations, etc. You are replacing all into one application, and giving a format of social media. You can use # (hashtags) you can @ (tag) someone. You can instantly make a video call inside of these conversation. The work team need to be tech enthusiastic in order to use this tool.

Microsoft teams-Office 365

This a tool really similar to Slack. In fact is the competition, from Microsoft. They have also launched a tool where teams can organize and chat in only one place, and it's called Microsoft teams, and we can see it in the next figure.
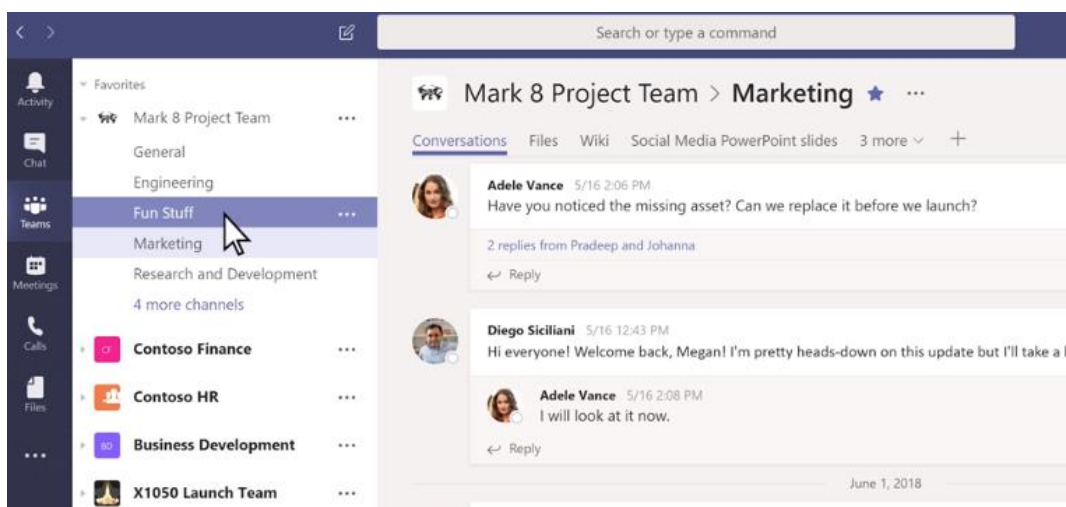
Figure 25 Microsoft Teams Interface

As we can see in the fig. this tool gather many functions integrated. We can mention:

- Teams: where you can build teams aiming at different objectives or just for fun. In this teams you can share files, make appointments, work together on different topics and talk anywhere you want
- Meetings: you have a calendar integrated, to know what you need to do on the week and plan the next one
- Calls: you have a call system integrated, to communicate in the same app with other people
- Activity: to know if someone has mentioned you. If you were mentioned in one conversation it means that probably you are required to do an action. Instead of looking for all the emails, this is a good idea to see where you were mentioned (@) and where it is required your action. But you need to be careful because maybe you were mentioned but someone forgot to tag you.

I am not extending the analysis in this app, because it is practically the same as Slack. In this case we mention Teams because of its popularity, and it's the main competitor of slack. I am focusing in a comparison of them, and how companies decide which one to choose. According to literature, a company looks at the following criteria in order to decide between Slack and Teams.

- Messaging abilities: this is a matter of taste on the design. Both apps offer similar services as gifs, emojis, parallel conversations.
- Pricing models.
- Integrated apps
- Web conferencing: in this case Teams support more people in conferences. Up to 250.
- Platform compatibility with operating systems.

Both Slack and Microsoft Teams are excellent chat applications for organizations and companies. Ultimately, the choice between the two depends on what you're looking for in a collaboration app.

Overall, Slack is a bit more familiar, a bit more "comfortable" given it led the collaboration pack for so many years, it was the first platform of this type to be launched. For that reason, it's the ideal choice for the majority of businesses and teams looking for a reliable collaboration tool.

Microsoft Teams, however, certainly has its place. It's better for larger, more complex companies. If a company already subscribes to Office 365, connecting with Teams is a great solution in terms of features and pricing. It should be a huge attraction for companies with remote workers scattered across the globe.

So, as slack, this tool has integrated almost all the tools that we have seen at the beginning, with the idea to offer, "all in one" platform to work, eliminating other apps. Again, we need to have a tech oriented team, able to manage this kind of apps.

Microsoft offer to companies a whole package called Office 365, that can be used in a computer, tablet, phone, etc. This package include this Microsoft teams app, and other tools from office, as the Microsoft office tools(excel, word, ppt), outlook, one drive and yammer. We are not entering into details on yammer, but it main objective is to communicate inside an organization. It would be the social media of Microsoft, for internal communications.

Salesforce

Another digital tool, that works as a platform, called sales force. This tool has a narrow scope, it is for CRM (customer relationship management). The idea

of this tool is to integrate sales, marketing and service, to organize information, including sales, accounts, and contact information in one central location. In particular, these systems facilitate sharing information across various teams in an organization.

What sales force do is to gather data (big data) and analyze it to align this 3 areas of sales, marketing and services. With this information, you always know updated data about your customer, and you can offer them many solutions before they ask for you. It analyzes what you are posting, sharing, searching in order to offer you things and engage you. For ex: lets think at the adds that appear on Instagram, totally related to your tastes. It works like that.

This app connect everything into a sale process, where you click a customer and you can see what they are into. It tries to deliver productivity and efficiency into to this app, engaging them in a way that suits them. It worth mentioning that this data is also treated with AI (artificial intelligence, mentioned later in the discussion).

This platform is used to engage customers, and also it can be offer to someone in order to develop and innovate new ways of working techniques. It can be seen as Iaas (remember that is infrastructure for service) or as a Paas (platform of service).`It depends of what the user is searching for.

According to literature, companies use Salesforce for the following purposes:

1. Find the right customers. The idea is to connect email, social, marketing to a CRM platform, so both sales and marketing will have

a complete view of leads and prospects so they can create and target engaging communications to turn prospects into customers and reach key decision makers faster.

2. Build more sustainable relationships, by:
   a. exploring their challenges: what matters to your customers in terms of their goals, challenges, and preferences.
   b. Engage with relevancy: in order to offer them a relevant product according to their previous challenges seen before
   c. Scaling 1 to 1 relationships: as the customer feels that you are treating him in an unique way
3. Reduce the cost of sales by:
   a. Improve sales efficiency by taking advantage of the most probable opportunities to engage. This is feasible due to the customer base available, and knowing when it's the right time to engage
   b. Reducing the time to close a deal
4. Increasing the employee productivity: giving them the right technology to treat with the customers.
5. Offer a better customer service: focusing in the customer before and after the sell
6. Improve customer retention: Visibility across all your relationships can help to address at-risk accounts and present satisfied customers with new opportunities at just the right moment

According to a research done by salesforce, they found that trusting a company is important to customers and trusting a company is more than customer satisfaction. Customer trusting a company are more likely to:

- Be loyal: 95%
- Recommend that company: 93%
- Buy more products and services: 92%
- Buy more frequently: 91%
- Spend more money: 88%
- Share their experiences: 86%

From literature we can mention 2 examples of companies using salesforce:

Wells Fargo, a company that offers financial services. Wells Fargo uses Salesforce to keep all its services, including banking, mortgages, investing, and credit cards, in sync. Thanks to that they have:

- Greater focus on high-value work because the bank can save time on customer service
- Increased end-user productivity
- More attention for important projects because automated workflows, optimized platforms, and reliable platforms save time and energy

Thanks to Wells Fargo's commitment to its CRM system, the bank has saved hundreds of nonproductive IT and business hours. It's also reduced technical debt and created systems that drive innovation and business growth.

Activision is known to gamers the world over as the brand behind some of the most popular video games out there. The company prides itself on providing a continually amazing experience to its gamers so they can remain satisfied and enthralled long after they've made their purchase. By using Marketing Cloud, Activision monitors social media conversations that are relevant to their products. Service Cloud then helps Activision follow up on those conversations. And, given that social media customer service is less expensive than conventional methods, Activision found that it was able to decrease its annual customer service operating expenses by 25%.

In summary, the advantages of Salesforce are:

- Attracting new buyers using personalized marketing
- Winning customers from other places by knowing their needs and concerns
- Delivering outstanding shopping experiences
- Respond faster to customer complaints and issues.
- Automate time consuming, by permitting them to personalize the way of work.

Tools discussion

Having introduced each tool, I am going to discuss each tool regarding the topics introduced before. We are going to discuss:

1. Each tool in the SMAC framework
2. Make some considerations about the smart working framework for each tool
3. Considerations about innovation.

For the first 2 points I am going to propose a tool criteria analysis in order to make a relation between the SMAC framework and the Smart working framework.

For each tool I am going to discuss also topics about innovation, where we are going to apply each model seen before to each tool under 2 perspectives:

1. Tool perspective: meaning how it was created.
2. Company perspective: how company use this tool to innovate

Tools criteria analysis

The following flowchart show the relation is used to analyze each tool regarding the SMAC framework and the Smart Working.
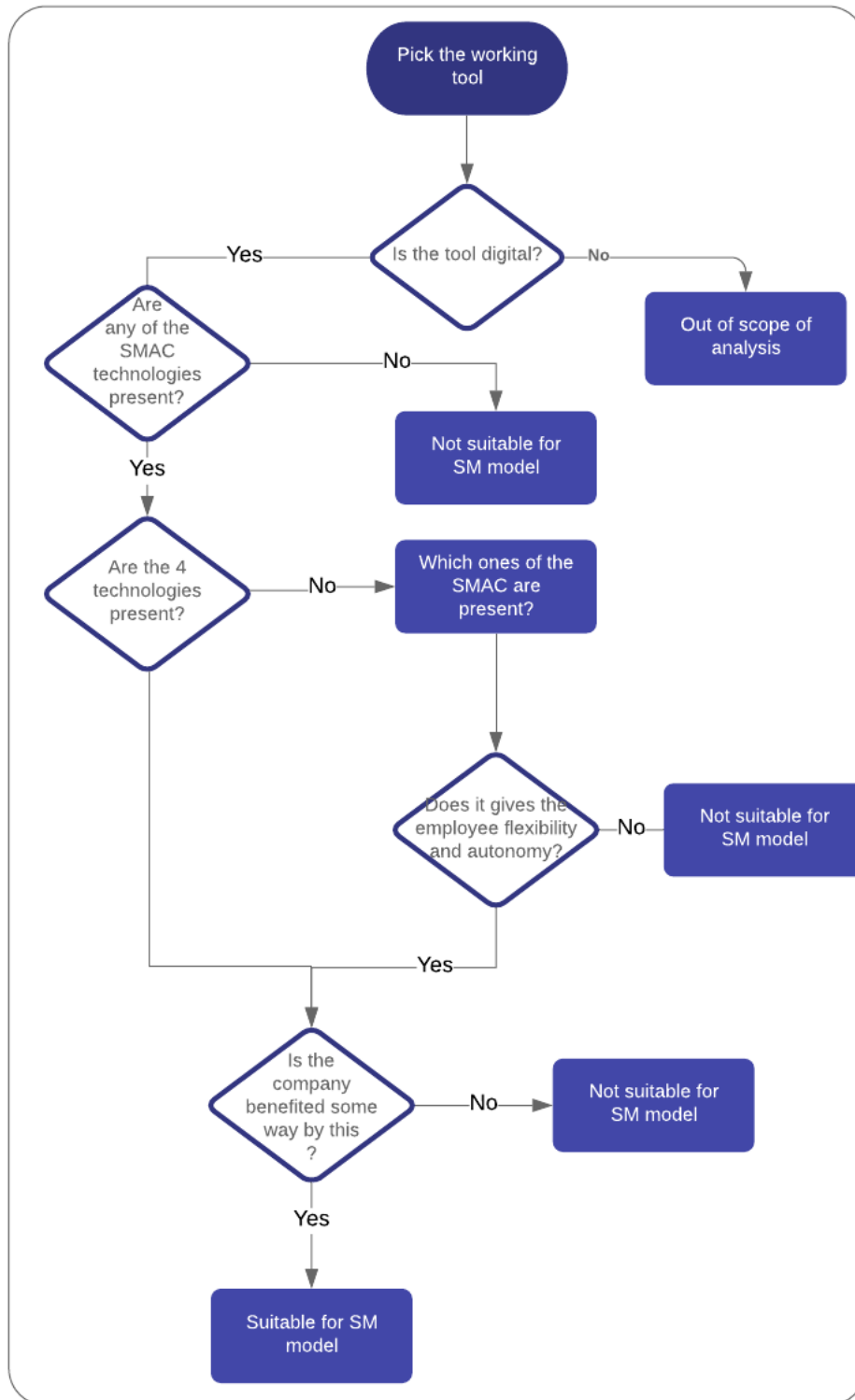
Figure 27 Tool criteria analysis: SMAC technologies and Smart working framework

A detailed explanation of the flowchart would be:

1. We begin asking ourselves if the tool picked is a digital tool. If it is not, is out of scope of this report.
2. As we have seen in the previous pages, we can conclude:
    a. that if all the SMAC technologies are present, the tool will be social, mobile, analytic and with cloud services. If it has the 4 characteristics, we can assume that it will bring autonomy and flexibility to the employee.
    b. If it does not have any of this SMAC techs, it's not mobile, and you are depending on physical devices. Giving these 2 characteristics, we can assume that you need to be at specific space and to use a specific device, and this does not bring flexibility and autonomy.
    c. If only one technology is present, we need a deeper analysis. We need to analyze how this tool affect the welfare of the employee.
3. If it does not bring flexibility and autonomy, it's not suitable for SM model
4. If it does, the next step would be to analyze also the organization. This flexibility and autonomy needs to bring benefits to the company. If it does, we can finally conclude that it suits the SM model.

In order to define better the tool, other considerations will be made:

- Specific purpose: platform, connecting, storage, etc.
- Switching costs: do they need high skills to use it?
- Complementary assets: they need any other tool to complement it?

Also it will be defined how it impacts the SM model:

- How does it gives Autonomy and Flexibility to the worker? Time, space, tool, etc.
- Is it to communicate, collaborate, concentrate or create(creativity)?

It has now arrived the time to determine if they are suitable or not with this new philosophy of smart working, and make some consideration about each tool.

To do so, we are going to refer the decision tree defined on the previous section "Tool analysis criteria". With this tool, we are going to determine if the digital tool is suitable for SM, and we are going to add some additional considerations.

On the next table, we can see the result of the analysis of each tool by the decision tree analysis.

DIGITAL TOOLS	Digital tool?	SMAC technologies present?	All of them?	Without	Flexibility and autonomy to the employee?	Company benefited?
Clouds: OneDrive, Google Drive, iCloud, Dropbox	Yes	Yes	No	S,A	Yes	Yes
Skype business, Cisco Meeting	Yes	Yes	No	A,C	Yes	Yes
Digital calendar-Google calendar	Yes	Yes	No	S,A,C	Yes	Yes
E-Mail: Outlook, Gmail	Yes	Yes	No	A,C	Yes	Yes
Facebook- @Workplace	Yes	Yes	Yes		Yes	Yes
LinkedIn- LinkedIn Premium	Yes	Yes	Yes		Yes	Yes
MOOCs tools-Mobile learning	Yes	Yes	Yes		Yes	Yes
Slack	Yes	Yes	Yes		Yes	Yes
Microsoft teams-Office 365	Yes	Yes	Yes		Yes	Yes
Salesforce	Yes	Yes	Yes		Yes	Yes

Table 7 Tool criteria analysis result

In the Table we can see the results for each question in the previously presented decision tree tool. Now we are going explain the analysis of each tool and make all the considerations.

Regarding the Smart working framework, we are going to refer to the principles, levers and benefits previously defined in order to make some consideration about:

- Principles: does the tool accomplish them? Mainly about flexibility and autonomy.
- Levers: in this one we give as done that is the lever of digital technologies. No special considerations are going to be mentioned.
- Benefits: what benefits does it give to it parties?

It is important to remember, that we are assuming that companies will be from clusters number 3 and 4 (mentioned in the introduction) meaning that they invest in ICT but have little focus on the reconfiguration of workplaces and of the office layouts or they highly invest in the 3 elements of the SW philosophy.

Clouds: OneDrive, Google Drive, iCloud, Dropbox

Focusing in clouds that only store data, without a complementary analyzing tool, this kind of digital tool, does not have all the SMAC technologies, but is good as a Mobile and Cloud tool.

Having lot of information available from any device and anywhere, is really important because provides flexibility and autonomy to the employee. It provides a way to collaborate with each other from anywhere.

Regarding the benefits we can mention:

- Company: they do no need physical devices to store data everywhere and they can acquire capacity as they need it, in an easy way. They save time as employees can access in a quick way the information
- Employee: autonomy, flexibility, empowerment.
- Environment: lest waste, space, energy required by physical devices

If the company it is interested, specifically, in storing information, without analyzing it or chatting tools, they should acquire a cloud service as OneDrive. Example of purposes in this case would be to store information, do backups. Later we can see that there are some other tools that have integrated cloud services with additional tools.

This kind of technologies does not present high switching costs, there are friendly for an user, it can be learn quickly how to use them. It is a good tool to collaborate between employees.

Skype business

Here we have a communicating tool, that have the Social and Mobile pillars of the SMAC framework. It is mainly used to communicate, so these are the only 2 pillars present from the SMAC framework.

Regarding the smart working framework, as we can use it to communicate from anywhere with anyone, it gives flexibility and autonomy to the employee.

Regarding the benefits, we can mention:

- Company: save money, as their employees can communicate from anywhere without the necessity to make them go to the company. They gain productivity as they can solve problems in a simpler way without the necessity of being present
- Employee: gain time, happiness, without the necessity of being present every time. This contributes to flexibility and autonomy
- Environment: less necessity of transport, so it's good for the environment.

In this case we have a specific tool, for the purpose of communicating, without the necessity of high switch costs. It's really easy to use and friendly.

Again, as the previous tool, we can have some integrated tools that have this function available. So it is recommended to acquire it if you don't have one of the integrated tools that already accomplish or have tools for calling.

Digital calendar-Google calendar

Digital calendars have present the Mobility aspects of SMAC framework. The idea is to not depend on the paper on the company, to know your schedule.

This gives the possibility to the employee to know what he has to do, schedule up meeting, and so on, from anywhere. This have some benefits

- Companies: more integration and communication between employees. They can easily know changes, updates, without the necessity of calling everyone, saving costs and time
- Employee: flexibility and autonomy to manage meetings from anywhere and anytime.
- Environment: no necessity of paper calendars.

Digital calendars are really easy to use, and friendly user. So you don't need to bear high switching costs.

Companies should use this as an individual tool if it is not incorporated in e-mails or more integrated tools.

E-Mail: Outlook, Gmail

Regarding the SMAC framework emails provide to working people Mobility and Sociability. People can interact and share info at any time and any place. This is important for smart working. It is important to mention that almost every email, as Gmail and outlook, have calendars integrated so we can add the benefits mentioned before.

As we can use it from any device, emails have the following benefits regarding the smart working framework:

- Companies: more efficient, as employees can answer any mail 24h from their mobile phones
- Employees: they gain autonomy and flexibility
- Environment: all digital. No necessity of physical materials for each message.

These tools, are all really similar, independent from the provider you choose. You do not need high switching costs.

Facebook- @Workplace

Let's analyze the first of the ESM tools, Workplace. This is a tool that has the 4 technologies of the SMAC framework. As we saw, Workplace as born as a Social media concept and provides a virtual place to socialize, communicate, store information and this information can be analyzed.

This tool is recommended to smart working, because it provides all the SMAC technologies, bringing the possibility of flexibility to the employee. Between the benefits we can mention:

- Company: happiness of the employee. He is working in a social media tool, where he can enjoy while they work. This brings productivity and better results. All the work is done in one place.
- Employee: autonomy and, above all, flexibility. It is an informal tool to work.
- Environment: similar benefit as the tools mentioned before.

But we have to be aware, that if you pay this tool, maybe is a not a good idea to use the previous tools mentioned, because Workplace have many functions already incorporated. The power and use of these tools are to use the whole package. For example, it will not be useful to use the app only to publish

some Facebook posts. You also have available messaging and videocall services and so on. It is an integrated platform.

This tool requires a learning curve for the employees that are not used to manage Facebook, in other words switching costs. If the average age of your employees is not high, it will not be difficult to implement it, as is really similar to Facebook, and young people are used to it.

LinkedIn- LinkedIn Premium

LinkedIn, has all the SMAC components present too, but, as we said before, it is more related to the "job searching" world, and sharing the activities that you do at your work. So, the scope is narrow.

It gives lot of flexibility to a recruiter and employee, as they can contact directly a candidate, without depending on the cellphone and respecting a time to schedule a meeting. Let's see the benefits for each part in the smart working framework.

- Company: in this case would be the recruiter. Gains time as the can search with algorithms, filters. They can easy reach suitable customers, having all their information available.
- Employee: also it saves, time, and efforts. They have all the information available in the network. As an internal employee or a future one, this is important and they also can share information regarding they work activities to show to their colleagues.
- Environment: this methodology is saving lot of CV papers, as it is mainly digital.

In this case this tool, has all the components, but should be mixed with other tools that have a more general scope. To do daily activities it is not enough.

Recruiters may have to bear some switching costs as it is not a common platform. It really famous and easy to use, but it requires some time to understand it.

MOOCs tools-Mobile learning

MOOCs platforms also have all the SMAC technologies present, but in this case all these technologies are aiming to a more specific objective, learning and teaching. Educating or training in matter of some things.

It is suitable for SM because you can give flexibility and autonomy to most of the parties. Let's analyze:

- Company: is benefited by not having to be the with the employee, being really useful when you need to train many employees. You

save lot of time and money. You can record a training and repeat it among the employees. The one that should be training can be doing anything else.

- Employee: giving them the opportunity of learning from anywhere and anytime. Employees does not need to go to a specific location in order to learn, neither the one giving the training has to be there. In addition, they can do it wherever they want.

- Environment: the main benefits are related to transportation. Less gasses emissions due to the online lectures. In addition less physical material training.

Moocs are done in a really friendly and easy way to use, bringing no problem in learning curves or costs.

These tools are specific, to learning aspects, but at the same time you can cover any aspect. You can train whatever you want.

Slack- Microsoft teams-Office 365

The next 2 digital tools, in my opinion, are the best ones for SM, because they incorporate all the pillars of SMAC technologies, and you can use it for any area of working. This tools are Slack and Teams. I am treating them together because they are exactly for the same purpose. They work as a platform, bringing many interesting features and they have a general purpose. The employee can email, write, arrange reunions, analyze information, save data. So, in other words, they provide all the digital tools that we mentioned before into one. It is a social media where you can work, chat, make groups, do calls, etc.

It can bring flexibility and autonomy, and the following benefits in the smart working framework:

- Company: it's benefited because they can have all the information in one place, and easy to analyze. This bring high degree of integration and coordination between the parties involved.

- Employee: the employee will have the possibility to work in a Social media environment, with GIFs, etc. An employee happy, and flexible, will work better

- Environment: benefits related to previous tools.

In my opinion. this are platforms, that if a company decides to acquire them, should not be combined with other tools like emails, clouds, etc. Because is an all in one tool, and in order to benefit from these tools we should use the whole package. It makes no sense to use them, only for chatting with other

colleges for example. It is a power tool and employees should take advantage from everything it offers.

This maybe more difficult to use that the others tools. It maybe more difficult in terms of learning, but once you learn how to use it, you can save tons of time.

You should select the tool for SM analyzing the capabilities and compatibilities of your employees and companies. If your employees already use Excel, Word, One drive, for example, maybe Teams is better choice for the company. It makes no sense to go for another tool and learn everything again from zero. It is said that Slack is simpler, but Teams perform better in big companies.

Salesforce

Salesforce is also a digital tool that have all the SMAC pillars present. It bring similar benefits as Slack and Teams but it is for an specific area, and it has a powerful focus on Analytics, a powerful tool to analyze data. The limitation of this tool is that is restricted to a Sales, Marketing and service area. It gives you amazing data analysis, but only related to these areas.

It's a powerful tool for smart working, but only to this cluster of employees:

- Company: have really good results, as they attract and maintain customers.
- Employees: have flexibility on having time available for more customers, as the tools does mainly all the analytical part

So, it is recommended to acquire this digital tool if your company is highly focused on customers. If you need to analyze, pursue and offer to customers what they want, this is an amazing tool. This tool will give lot autonomy and flexibility to your employee, as they can use it from anywhere, and it is really flexible in terms of the data it offers. You can analyze a lot of range of customers.

This tool requires high learning costs, it is not simple. But once you learn it the benefits are worth it.

Considerations about innovation

The models seen in the introduction about innovation are going to be applied.

Using the Verganti's matrix we can make an analysis about each tool mentioned before. I am going to explain innovation under two points of view. The first one is regarding the technology per se, when it was created. All these

technologies were created in different times, moments, and they considered a type of innovation in order to create it.
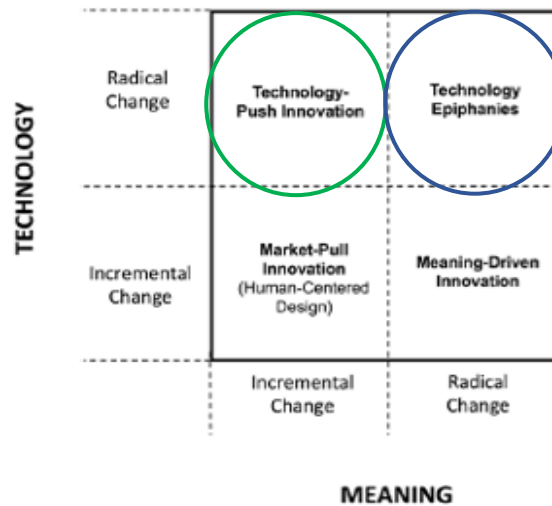

Figure 28 Verganti's Matrix analysis

- Technology push innovation (green circle):these tools we created to satisfy an existing need, with the same purpose and meaning. To do so, a radical innovation in technology was made.
  - o Cloud: When the cloud was created, we passed from hard drives, to digital clouds that we are not able to see it. It was a radical change in technology, in order to store data.
  - o Skype: when skype was created it was also a radical change in technology. Video calls were introduced, in order to communicate.
  - o E-mails and digital calendars: radical change in technology, replacing the physical products to communicate and to organize an agenda.
- Technology epiphany: (blue): in this case, also a radical change in technology was introduced, but also the meaning of the product changed. These tools are driven by a socio-cultural need and competences. They focus on the intangible attribute of the people to be in a social media environment, in order to chat, send emojis, have fun.
  - o LinkedIn: they created a social media, to search jobs, and post things related to jobs, leaving the freedom to post anything and chat with colleagues/friends.

o   Workplace/Slack/Teams: they gathered all the technologies existing into one, and proposed a new way of working. Working in an informal way, also could be done.

Now I am going to use the other model of innovation already seen before in order to discuss, how companies use these tools to achieve innovation (other principle of smart working)

At this point, we consider the tool already created. Companies are not creating digital tools, are choosing them in order to enable innovation and smart working. So we have two considerations:

- How the company choose the tools for their employees to work.
- How the employees then use the tools in order to work and innovate.

Regarding how companies search and select the tools, they do the research in a Human-centered research. They are searching tools that fit with their culture and their employees. They want their tools to be practical. We can see this in the next figure on the green circle.
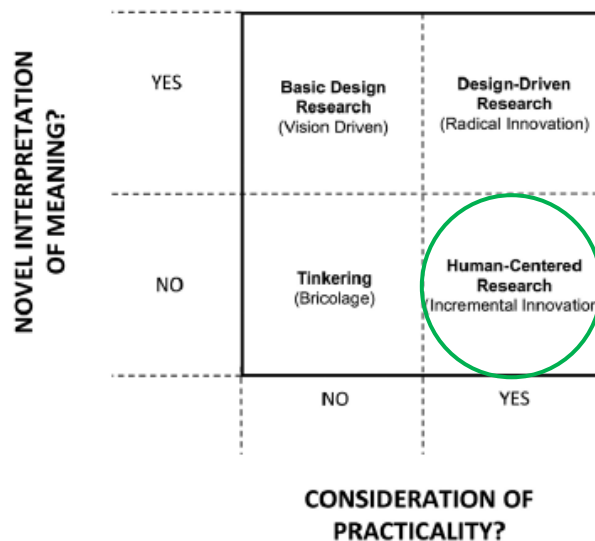
Figure 29 Design Research Quadrangle Analysis

Once employees have the tools, they use them as a medium, a way, to innovate and work. This occurs because with them they have data shareable with everybody, anytime. They have tools to collaborate, communicatee, to create, giving an easy way to innovate. For example, with clouds you have this data anywhere, giving the possibility to the employee to collaborate and work better. With social medias tools, they can create groups and with these groups they can share files, ideas. This leads to innovation. Slack, Workplace and Teams, are

much better tools to innovate than emails. You can exchange your ideas, documents, information in groups in a more informal way. This allows, to think out of the box and be free, bringing as a result innovation.

The objective of this research was to identify the main digital tools that are being used today. We have seem many of them, and then, these tools were analyzed in order to see if they can be used and help to accomplish the smart working philosophy.

Nowadays there are lot of tools, but I have chosen the main ones, in order to introduce the mains functions that are being used today in companies. Each of these tools have many competitors accomplishing the same goals. For ex: we have many digital calendars, emails, clouds, social media apps, communicating apps and platforms. The idea was to pick the most famous ones, analyze them in order to use this criteria analysis for the other competitors with similar apps.

As mentioned before, we started with tools that seemed to have a more detailed function, aiming at some of the SMAC techs, for example Clouds, Digital Calendars, Skype. Also we have seen tools that gather many tools and aim at all the SMAC pillars, working as a platform, as the teams and slack app. We have called them before *specific and integrated apps*. So we can make the following conclusion.
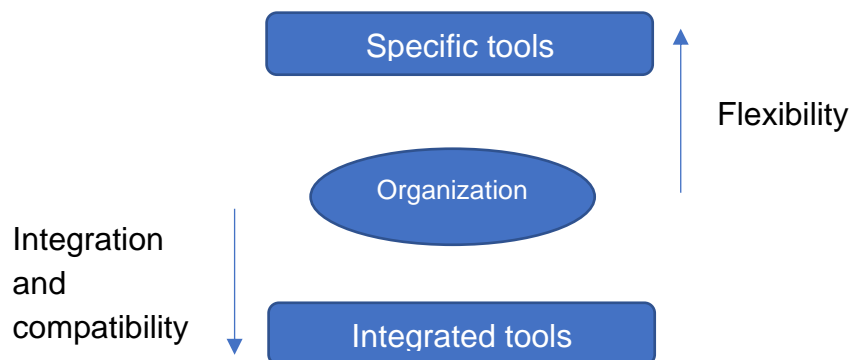
Figure 30 Specific and Integrated tools

We can categorize each tool seen as:

- Specific tools: clouds, skype, cisco, digital calendars, workplace, LinkedIn, moocs tools.
- Integrated: slack, Microsoft teams-office 365, sales force

So organizations need to choose, if they need to acquire specific tools or integrated ones, or a mix between of these two (one integrated with few specific). There are some implications in this choice.

As introduced before, if they choose to go into integrated tools, companies will be integrated, in the sense that everyone will have all the tools sum up in one, and all these tools with be compatible between them. But this will give some

inflexibility when they need to use another cloud, another calling system, because they have all in one. So we can say that you choose specific tools when you are searching more flexibility in managing your company. You are not tied to the platform.

You will choose integrated or specific tools, by the following criteria:

- Integrated tools:
  - when the company has no IT, and no or few tools at all. When they need to start almost from 0, aggregated tools are a good choice.
  - When you need many specific tools and need to cut learning times and gain time.
  - When the number of employees in the company is big.
  - When the supply and customer network also used an integrated platform, in order to be compatible with them.
  - When the company has a technological mindset
- Specific tools:
  - When you are looking for an specific feature or tool. For example if I only need to have a good system call to work from home, and the company does not consist in a huge amount of people, it will make more sense to the company to pay for skype instead of the huge package of Microsoft teams.
  - When the company do not have lot of employees
  - When your supply and customer network is diversified in the tools they use. In this case it makes no sense to integrate. If the majority have incompatible tools, I would lose time duplicating effort for using two apps, or way of working.

Regarding the Smart working framework, we have seen how these tools aim to increase the flexibility and autonomy of the employee. The challenge for the organization is to choose the right tool, in order to bring the maximum welfare to the organization(made by the employee and the company). It is important to understand the Business model of the company and their structure to choose the tool that fits the organization. The company, in order to achieve the smart working, should:

- understand clearly what their employees need and their capabilities in order to develop their work from anywhere.
- Relate these need to the organization objective. The tool that is chosen will bring flexibility to the worker but it need to be reflected in more profits.
- It is important to iterate continuously in order to see how they are performing with these tools.

Smart working is something that every time is more common for each company, and one this person try this, for them, it is becoming an essential factor at the time of choosing a job. So it is important to choose these kind of tools properly (and the others factors like culture of the company that are not subject of this research)

Smart Working in Italy: Corona Virus situation

The crisis going due to Corona Virus, the pandemic situation all over the world it forcing people to work from home. People need to continue working and the smart working methodology is starting to be used for new companies even if companies were not prepared or trained about this.

The tools discussed and mentioned before are the most used ones by companies and also the most famous ones. Due to this situation a lot of similar tools to the analyzed ones, with similar purposes are entering and competing in the market.

According to a LinkedIn research, most companies are fighting this crisis period with integrated tools. The most used ones are Teams and Slack, as they provide a suitable environment to still communicate between work partners, maintain a relationship as they are at home, sending gifs, chatting by video camera. Also the most used communicating tools in these periods are Skype business and Zoom (a meeting tool with a little description below). This environment, enables an optimal working environment, motivating the employee and enabling innovation.

We are going to mention some of other digital tools suggested in the Italian market, with similar purposes. This research of tools has been made in LinkedIn and with the web page of Soliedaretà Digitale in Italy, that provides free Smart working tools, suitable for this crisis period. In some of them, I will provide a Short description, and other of them will be only mentioned, relating them to the tools already mention.

- Open Square Spaces: similar to team and slack. It's an space for companies up to 100 employees in order to collaborate, where it creates collaborative spaces and you can share info, documents, events, forums.
- Zoom: it allows conference rooms, phone systems, video webinars, meetings, business instants messages. This tools is used by AbInBev and Uber, for example.
- Trello: company that enable you to organize and prioritize your projects in a fun, flexible, and rewarding way. This app it's for the same purpose as teams, slack, but it differentiates that it searches

a friendly way to work. It focus in boards, lists and cards in order to organize work. We can mention Google, Kickstarter and Fender as examples of companies using this platform.

- Business Drive Pro: this app if focused in project management, setting the milestones, sharing files and timesheets. It has the particularity that it gives you reports on how much you worked, according to the tasks that you planned on the timesheets.

We can mention other apps, without getting into a detailed explanation that accomplish the same functions as the apps previously mentioned in the report. It's a matter of costs and compatibility to the companies which ones to choose:

- Similar to Slack and Teams: Zoho Remotely, Ufficio Virtuale, Rack One.
- Similar to Skype: Connexia, Cisco, Join conferencing, Vediamoci, Fibering, Wildix, 3CX, Nexim Cloud call.
- Similar to LinkedIn: Performa, CVing. VisioTalent
- Cloud services: Levita advance services.

In my opinion, the world is going through a disruptive moment forced by Covid-19. As many companies are not allowed to work due to government laws, they are forced to work remotely. This will disrupt the working market, where there will appear new way of accomplishing tasks and old working methodologies will be challenged are replaced for more efficient methodologies. The transition to the digital world in the working environment will be accelerated due to this situation.

Additional and future considerations

Who allowed who?

At the introduction we discussed some eras, that can mainly be resumed that people started to look for flexibility and autonomy, and the world due to globalization and technology advance brought new tools to the world.

One question can arise. Did these disruption of digital tools allowed the smart working philosophy to appear ? or, in the other way, did smart working encouraged the digital tools market? Is kind of a chicken an egg paradox, where I am going to discuss my appreciation.
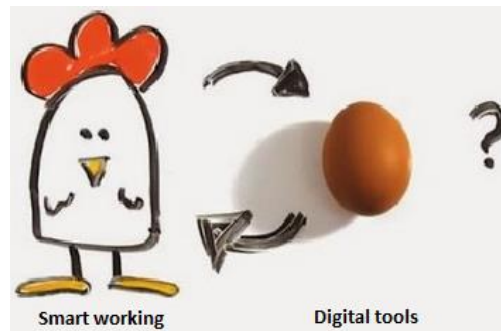
Figure 31 Chicken and Egg Paradox-Digital tools and Smart Working

According to me it is true that both are promoting each other. The smart working philosophy is encouraging companies to look for more digital tools. But in my appreciation, digital tools, played a key role in changing people habits. Some companies started developing apps to gain profits, and they started doing this due to the new needs of the era. People were demanding more autonomy and another tools to work, in big part, due to these new tools. Once internet appeared, and then the cellphone and so on, the routine of a person changed. When this new generation of people arrive home, they enter twitter to read the news, they communicate with a simple call or SMS WhatsApp by the cellphone. Before they thought only on the newspaper and the "fix telephone" at home. Think on the working environment, if you are used to this social media, and mobility of the technology at home, and then you arrive at work, and you only have a telephone in your desk and a computer with "excel", you will feel frustrated.

So, in my opinion, the digital world, enabled the smart working philosophy and then this framework feed back into the tools, demanding new ones, and so on.

What about the future?

In this section the idea is to present how smart working and digital tools will be evolving the next years.

About smart working: Agile smart working

We have seen that smart working is totally related to the people autonomy and flexibility in work, providing them the tools to do so, in return on accountability on results. Lets discuss what its not mentioned in this philosophy and new authors are starting to discuss.

	when	where	how	what	who
flexible working	✔	✔			
smart working	✔	✔	✔		
agile working	✔	✔	✔	✔	✔

Table 8 Agile Smart Working: blog.terminologiaetc.it

We should define 5 dimensions:

- Where: place of work
- When: schedule, and time schedule for work
- How: tools that they use, in this case digital tools
- What: what objectives are we aiming for.
- Who: competences need to do the work.

Before, we have mentioned in our philosophy the where, when and how, focusing out effort in the when (flexibility and autonomy) and the how (digital tools).

But nowadays the context in the world is constantly changing and companies have less time to react to achieve goals. So the next step would be to take the smart working framework and incorporate also the what and the who in a more clear way. We will call this way of working *agile working* that has involves also the smart working philosophy. The idea is to be more efficient and productive at work, defining the exact roles, and objective with the deadlines. Companies need to reach a higher level of efficiency.

We will define Agile working as: " get close people, processes, connectivity, technology, time and places, in order to find the way of work more appropriate and efficient to increment the value of a task or result": (P. Allsopp, founder of The Agile Organization).

So, agile working is smart working plus trying to achieve objectives with agile thinking, linking competences and objectives.

About technologies: Darq Framework

As we have introduced with the agile working, the world is changing and iterating, and then, technologies so. Now a days the technologies that companies are incorporating are related to the SMAC working framework we have explained.

But if we see the news, see some tech forums, we can see many things with virtual reality, also that artificial intelligence is every time more heard, and other technologies. So, the idea is to present a possible framework that will be used in the future, and where companies may should use to update their tool. This is the DARQ framework.
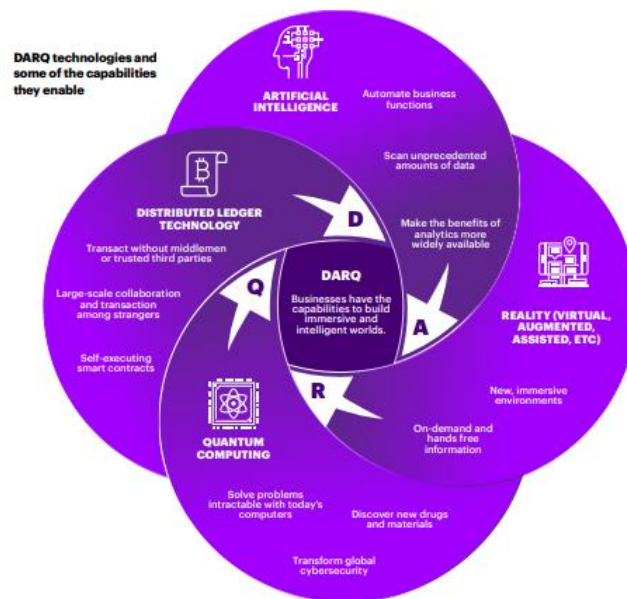
Figure 32 DARQ framework by Accenture Vision 2019

- D: Distributed ledger technology: it means replicated, shared, and synchronized digital data geographically spread across multiple sites, countries, or institutions. There is no central administrator or centralized data storage. Ex: Blockchain: tech allows digital information to be distributed, but not copied
- A: Artificial intelligence: Artificial intelligence (AI) is an area of computer science that emphasizes the creation of intelligent machines that work and react like humans. Ex: smart personal assistants, such as Siri, Cortana and Google Now.
- R: Reality: combination of real and virtual (computer-generated) worlds. Ex: to immerse in new environments to simulate.
- Q: Quantum computing: The idea is that quantum computers can use certain phenomena from quantum mechanics. Ex: to solve complex problems that computers cannot do today.

Companies should begin exploring this new kind of technology, exploring this new trends and capabilities, in order to experiment combinatorial effects with the SMAC technologies they already have. In this framework, in contrast to the SMAC, the DARQ framework companies should understand which one of these 4 tech do they need. They are not that related as in the SMAC framework, they maybe in some cases aiming at different things. They should understand if they need them, and how they gain flexibility with these tech,

So the idea is to rely in the SMAC practices/technologies to start exploring these DARQ technologies

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