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Understanding Spain and Europe in the Global Digital Sector

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UNDERSTANDING SPAIN AND EUROPE IN THE GLOBAL DIGITAL SECTOR

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OBJETIVES

- Understand the digitization models (archetypes) that are taking place in the different countries of the world and the key policies that drive them.
- Show how countries can be classified in the defined digitization archetypes
- Show the situation of the EU countries and discuss the impact of the Single European Market on the digitization processes of its member states.
- Show real examples of European countries that have transitioned between archetypes
- Show the opportunity of the "NextGenerationEU" initiative and its corresponding Resilience and Economic Recovery Plans to consolidate the digitization of the EU and its member states according to their current archetypes or move towards new archetypes.
- Show the possible strategic approaches for Spain and discuss which one is considered best for this country

ABSTRACT

During the following years and, specially, during this first half decade, the UE will have to provide a comprehensive and efficient answer in terms of sets of strategies and politics to build up a healthy and competitive Digital Sector. Some of these principia are currently under development (specifically all related with 2030 Digital Compass) thanks to the largest multimillion public investment ever made, coming from the recovery plan instrument, The NextGeneration Funds. The main objective in our research is to provide a clear and systematic diagnostic and critical analysis around this opportunity, using several methodological qualitative and quantitative tools along the paper. Our research also will try in the medium term, using this systematic approach, to create some methodological framework able to cluster and compare other OCDE countries so it will help them to understand and develop their digital planned policies. All governments boost digitalisation in their countries, however, their policies and their digital economies/sectors are very different.

- Can we classify the digital economies into archetypes? How?

- Can a country change archetypes? Which would be better? What do we have to do? How long does it take?

To cover all these subjects and to provide scientific clarification in our argumentation we will follow this argumentative path: First, we explore and understand using the common bibliographical literature which are the main characteristics related with Digital Disruption and Digital Markets and how their capabilities related with 4th revolution (among others 5G, IA, Robotics, Edge, Open innovation) are disrupting industries. In our next step we will review the current scientific literature and international recommendations for composed indexes which expect to measure digital markets, such as DESI. Understanding for instance last OCDE recommendations for those indexes would permit us to elaborate some specific compound indicators differentiating digitalization and innovation inside ICT sectors using available public information. Our idea is then to use all those indicators for determining the different situation along OCDE countries in order to cluster and highlight them, but also to be able to compare them (specifically the UE countries) with other global champions. First, to quantify our analysis, we have made use of different synthetic indicators, some provided by international institutions such as DESI and some developed by ourselves. This last one we have created using the variables offered by the OCDE and aggregating them using the 'Benefit of the Doubt' method. This indicator covers seven policy dimensions: Access, Use, Innovation, Jobs, Society, Trust, and Market Openness. Using these indices, we can study the relative position of the European Union and its member states in the global context. But the most relevant, in our research we finally cluster countries into several archetypes using those data subsets. we named them as Innovation Hubs, Global Factories & Service Powerhouse, Efficient Prosumers, ICT Patron, ICT Novices and Business Hubs.

Then, we create another layer discussing key digital policies for each archetype. This is a relevant tool in order make transitions for a country in a period. We have stated some of these transitions for instance in Finland (from a Global Factory to a Innovation Hub) or Luxembourg (from a Business Hub to a Efficient Prosumer) and consequently we are able to build some probability paths into the archetype characterization transition in a country, changing those digital policies. Then, we will analyse the strategic approach for EU

pointing out which will be the evolution for the European countries in terms of these probable archetype evolution and global positioning. We see that building a cohesive European Single Market is a central idea in our research because we consider that a coordinate Digital Sector is crucial to get a success digital development along UE countries, but considering their specific transition paths. Finally, we will describe, show up and value critically the current strategic vision in the UE, all the politics envisioned and developed by the European Commission and its expected impacts this decade. We will try finally to match our prior quantitative results transitioning European countries from one archetype to another. We will analyse how our governments hopes to capture the benefits of the data economy and if it is reliable with currents digital policies to make the transition between archetypes in our European countries. Because of the continuous changing in the roadmap for digitalization in UE, taking into considerations post COVID economical reactivation and possibly other global changes from digital value channel innovation, our research it is not completed at this moment. So, for this paper, we will present our updated and spot vision for this moment. Moreover, our research aims in the future to objectivize and to constantly scrutinize how UE Digital Sector are reacting to its main challenges considering innovation and global competitiveness.

DIGITAL DISRUPTION AND DIGITALIZATION

There are many scientific literature describing Digital Transformation, although for our research (Skog et al., 2018) we define digital disruption as those radical innovations that constitute broad systemic effects that erode the boundaries of business organizations and their value capture models.

Abundance of data, High Communication, Storage, and Calculation capacity and the *Paradigm of Open Innovation* are relevant concepts for the also known as fourth industrial revolution (4IR), also called Industry 4.0. The term 4IR was coined by Prof. Klaus Schwab, founder and chairman of the World Economic Forum (Xu et al., 2018) as a fundamental change in the way we live, work, and relate to one another.

(Baes et al., 2020) inspired by the division of (Rumana & Richard, 2017) have tried to analyse these agents that make up both the ICT sector and those of the digitized economy, trying to determine the value captured by dissemination (spillover) of digitization on a global scale, in order to research archetypes of behaviors of different countries and the corresponding most effective policies, often considering the scarcity of public resources and the need to obtain results in a relatively short period of time when the challenges of digitization are, unsurprisingly, many.

In fact, all governments drive the digitization of their countries, but their digital policies and sectors and economies are very different. Studying along them we can set those research questions:

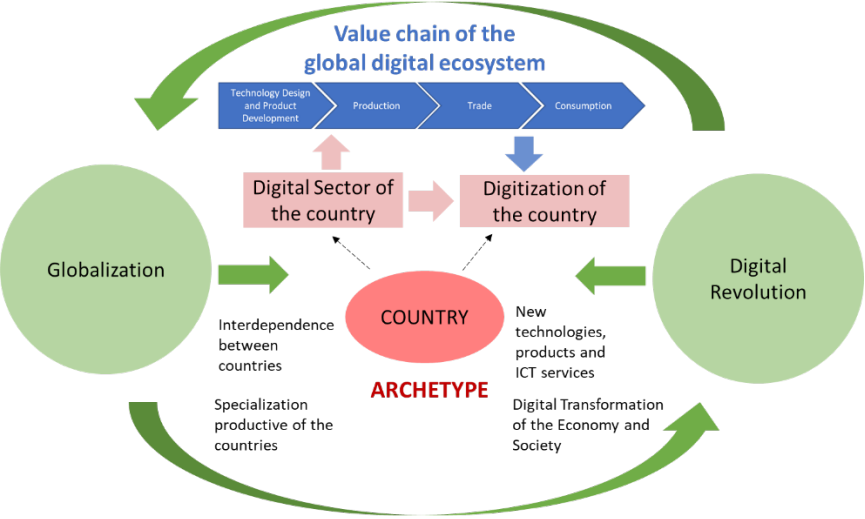
1. Can we classify the digital economies of countries into "archetypes"? How?
2. Can a country change its "archetype"? Which is the most beneficial? What needs to be done? How much time is needed?

Considering the upcoming global situation where traditional high end technological countries as the United States or Japan are challenge by players as China which are digitalizing its industry and economy with relative success (Li et al., 2020; Mao et al., 2021), it is time as Europeans to practice some strategic thinking:

- What should we do in Europe so that its digital economy has a greater global impact?
- What should Spain do so that in 10 years its digital economy is one of the most advanced in the European Union?

(Baes et al., 2020) also decomposes the global value chain of the digital economy from technological development, production, trade and consumption and performs an interesting classification and comparison between countries. For this, it will use certain indicators, among others those of patents, ICT services and exported goods, but also other indicators of economic prosperity such as GDP.

Figure 1: Digital Economy

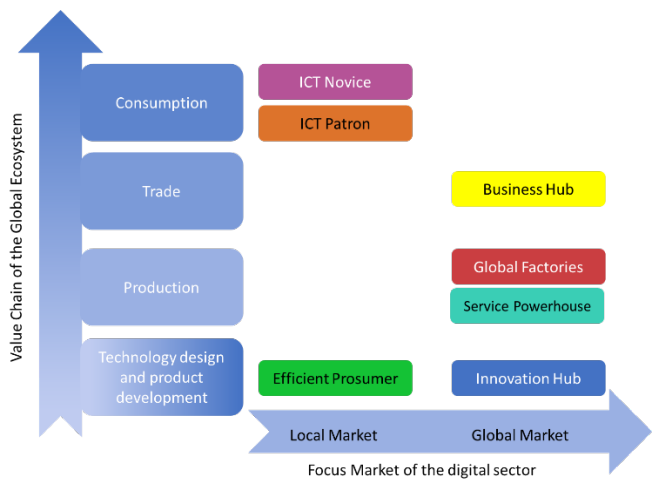


Author's own based on (Baes et al., 2020)

Throughout this research we will try to analyse how Spain should invest the Recovery and Resilience Funds in order to improve its current position in the digital ecosystem. Therefore, we have inspired our analysis in (Baes et al., 2020) in which we can find the world dividend into seven different archetypes: Innovation Hubs, Efficient Prosumers, Service Powerhouses, Global Factories, Business Hubs, ICT Patrons and ICT Novices.

We can see this classification in the figure 2, where we can find the archetypes classified along the digital value chain and its focus market.

Figure 2: Digital Economy archetypes and its Focus Market



Author's own based on (Baes et al., 2020)

Firstly, we will define the digital ecosystem, and its components, as well as the main drivers, technology, public policies, and globalisation. Secondly, we will define the archetypes and the different procedures to obtain them, for this analysis we will make use of the data available at the OCDE Going Digital Toolkit (DETF, 2018) and therefore we will only use the OCDE countries. At this moment we will be able to define the different paths Spain can take in order to improve in the value chain. Lastly, we will analyse the main countries that characterise each archetype and their path to success¹.

ARCHETYPES AND THEIR MAIN CHARACTERISTICS

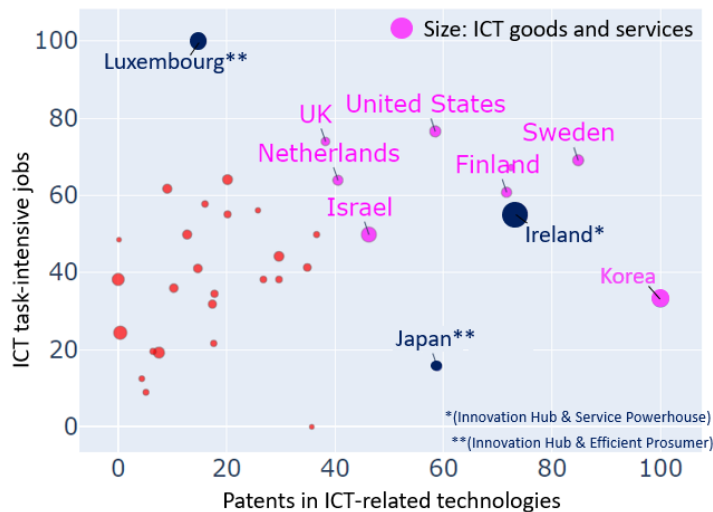
As we have anticipated we can identify seven different archetypes in which we can classify the different economy models (Baes et al., 2020). It is important to denote that a country can belong to different archetypes, for instance China is both an Innovation Hub and a Global Factory; however, we will classify each economy in the highest model of the value chain that it fits into.

Innovation Hubs are the highest sophisticated countries in the value chain, they are responsible for the dynamism of the global digital ecosystem, as they are home to the global digital giants and foster technological start-ups. They have created an ecosystem that joins the public, private and academic sectors to develop new technologies and innovative solutions based on them. This ecosystem has enabled them to become leaders in cutting-edge innovation and to create worldwide demand for their products.

In obtain and cluster these countries, we have made use of the number of ICT patents both by population and as a percentage of IP5 patent families, ICT task-intensive jobs and ICT goods and services trade.

Figure 3: Obtained countries archetypes: Innovation Hubs, 2021

¹ The countries studied do not necessarily coincide with the ones shown in the figure



Author's own based on data from OCDE going digital toolkit

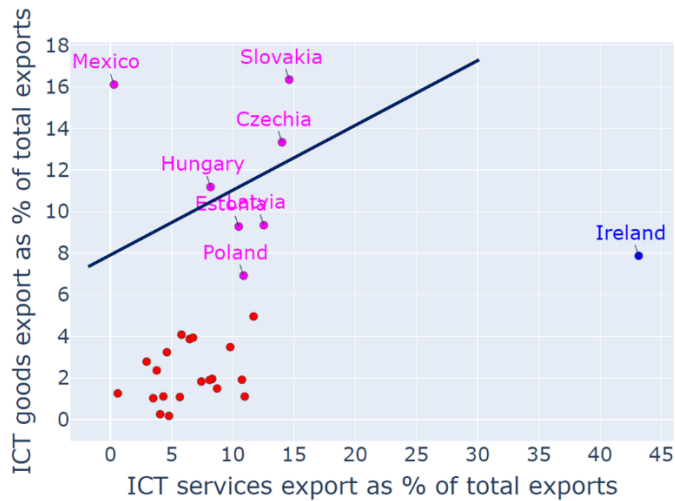
We can see in the figure how half of the innovation hubs identified are European, showing the great disparities existing inside the Union. However, we must bear in mind that due to the European single market, the exports measured for the European countries are not as representative as those of the countries that don't belong to the Union.

We have highlighted Ireland, because of their high services exports we have opted to set it as an example of a European services powerhouse; Japan, despite having a high number of patents they are still a step behind the world leaders, both in ICT jobs and exports; finally, Luxembourg, that even though they are leaders in ICT jobs, their number of ICT patents is very far away from the leaders.

Global factories are leaders in ICT manufacturing with a large active population that greatly reduces labor costs and consequently enhance the competitiveness of ICT goods prices, turning these countries into global exporters. Most of the innovations are related to production processes and tools and therefore low and very limited.

On the other hand, Service Powerhouses are leaders in ICT services supply, also with a large active population with ICT knowledge and language proficiency. These are not generally high-income countries and their innovation is limited to the creation and delivery of ICT services.

Figure 4: Obtained countries archetypes: Global Factories & Service Powerhouses, 2021

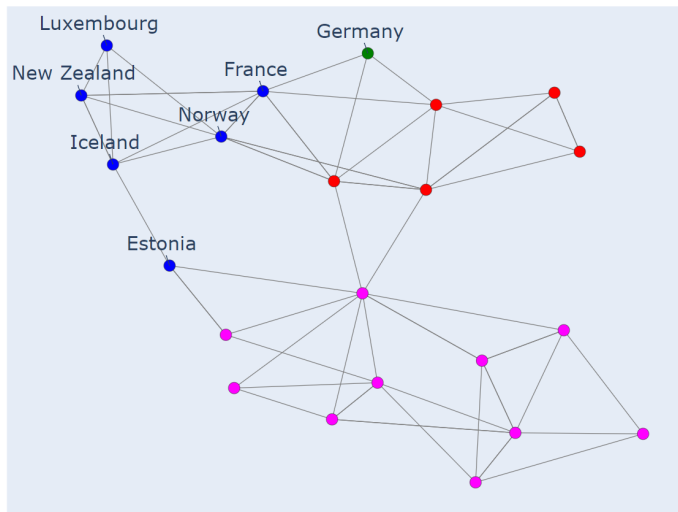


Author's own based on data from OCDE going digital toolkit

In this case we have used the ICT goods and services exports to mark out the countries for both archetypes. We can see how Ireland is the main European ICT services provider, with great difference over the rest of countries: one of the reasons backing is that it is home to the global tech giants in Europe. On the other hand, we can find the four OCDE manufacturers, three of which are European.

Efficient prosumers are niche players that innovate and deploy solutions for dominant local industries. Therefore, their competitiveness is restricted to few economic sectors within their countries. In this case we had to switch to a vertex representation due to the number of variables involved in the process of extracting the countries. Firstly, we have measured the private sector involvement through the R&D expenditure by businesses, secondly, we see the innovation ecosystem through the number of start-ups, the ICT jobs and services exports, and final the number of patents, not restricted to ICT, since they are sectorial players, and we need to measure their degree of innovation in their local industries.

Figure 5: Obtain countries archetypes: Efficient Prosumers, 2021



Author's own based on data from OCDE going digital toolkit

The first thing that we notice is that Germany, despite being an Efficient Prosumer is in a different cluster, the reason being their disproportional amount of general patents (non ICT) per million population. Secondly that with the exception of New Zealand, all other countries are European, showing their involvement in becoming digital leaders.

Business Hubs have advanced business environments and are the home to the regional headquarters of the international firms. They are politically stable and provide favorable term for trade, therefore becoming an ICT trading platform for nearby countries. They have best-in-class infrastructure, strategic connectivity to various markets, high life quality standards and flexible regulations for conducting business.

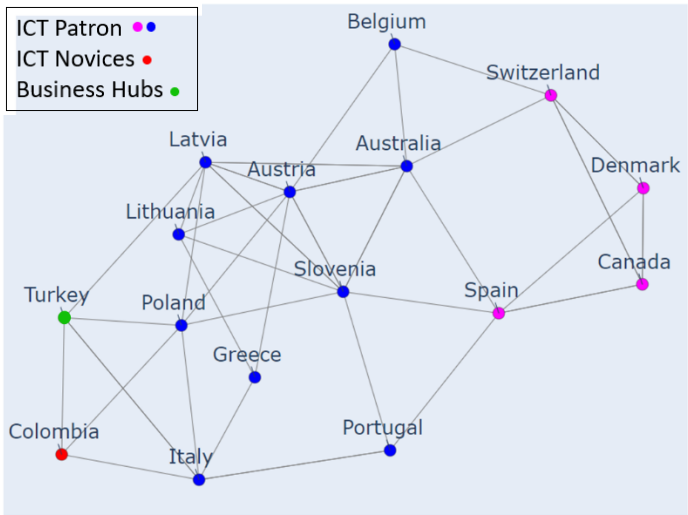
ICT patrons are global consumers of ICT good and services with little contribution to the global value chain. They are usually high-income societies with a robust ICT infrastructure and highly developed e-government. They usually have strict regulations, making them unattractive for international companies to set their HQs and therefore have little trade besides the one necessary to cover local demand.

Finally appears the ICT novices, that we will not be studying at this moment since they do not contribute to the digital ecosystem and none of the European countries belong to this group.

In order to obtain these clusters we have used the OCDE digital government index, as patrons tend to have highly developed e-

Governments, fixed broadband subscriptions as a measure of high penetration, businesses with high broadband speed, Internet users and e-commerce.

Figure 6: Obtained countries archetypes: ICT Patrons, ICT Novices and Business Hubs, 2021

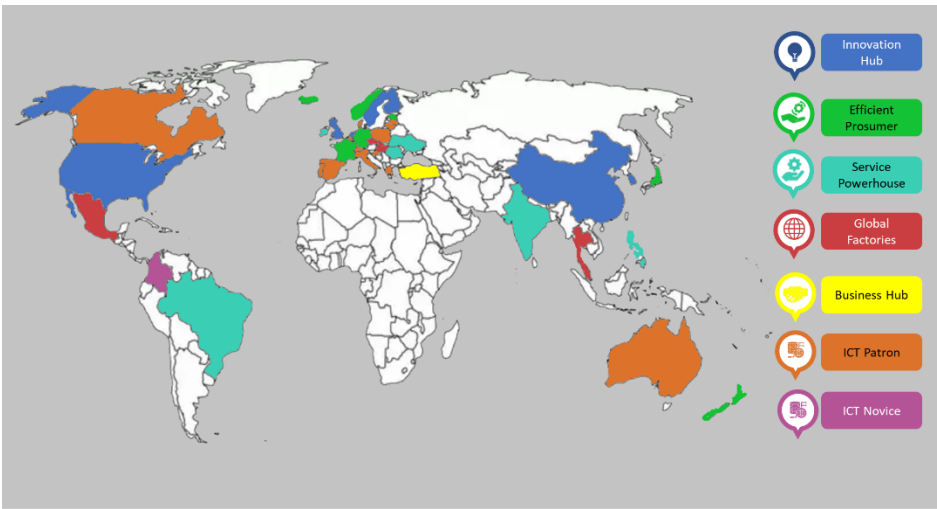


Author's own based on data from OCDE going digital toolkit

In this case we have Turkey as the OCDE Business Hub, Colombia as the novice and most European countries along with Canada and Australia as the ICT patrons.

In figure 7 we show the result of our analysis.

Figure 7: Country archetype identification



Author's own based on country classification

DIGITAL POLICIES

Selecting the best strategical path to evolve for a country should be done considering the specific characteristics for a country and their fitting policies. To do this we must group digital policies inside several dimensions understanding with will be more relevant for each situation.

So, considering (Baes et al., 2020) we must differentiate between several key dimensions: Technology, Ecosystem, Capabilities, and Industry.

Technology dimension involves all the policies to foster technology perse, mainly focused on broadband connectivity, 5G and spectrum impulse, cloud and cybersecurity with data protection, which are the technological pillars for exponential and 4.0 technologies.

Those policies create incentives to grow them among the core digital sector, that it, the most intensive in knowledge as it is defined in (Rumana & Richard, 2017)

Some of them are a must for the more developed and advanced archetypes: Science and Technology, IP Rights, National AI Policy, and Emerging Tech Developing Policies with specially intensified innovation.

Ecosystem dimension represents all the policies that will help and facilitate to create strong and dynamic companies along digital sector, specifically in its core. Those companies are agents that collaborate and compete to produce the goods and services necessary for the digitization of the rest. (Ducharme et al., 2018):

- *They produce the goods and services associated with ICT*
- *They are responsible for global platforms (which allow the search and distribution of content, electronic commerce, social networks, etc.) and platforms that enable "peer-to-peer" services (collaborative economy, "gig economy", etc)*
- *They build new applications with alternative activities and business models that are highly ICT-intensive (Industry 4.0,*

smart agriculture, Smart retail, Insurtech, fintech, Ehealth, e-government, Smart cities, etc.)

Telecom policies are among others the most common for all the archetypes in this dimension. But as is described in (Baes et al., 2020) others as Emerging Tech Regulation, Digital Business Support and Ease of Doing Business will be nearly mandatory for more sophisticated archetypes where their ecosystem relations have to foster entrepreneurship and create digital value.

Capabilities dimension represents one of the hardest challenges for the global digitalization, especially for those who want to participated between the most sophisticated archetypes: not only considering a way to promote innovation within the digitalization process of every industry by entrepreneurship (Aaldering & Song, 2021), but also transforming digital competences of the educators in higher education in a warn of a lack of skills for future jobs (Bencsik, 2020) and, of course, considering aspects of digital inclusion and awareness for the global population.

It is relevant for Western Countries to mentions policies associated with ICT Workforce Development, especially with aging workforces. Some research (Lee et al., 2022) have found that ICT upskilling can have positive effects on the productivity of older workers if they are highly educated or employed in skill-intensive occupations.

Finally, **Industry dimension** represent specialized policies create to spread digital transformation across general economy and society in different sectors, included government.

eGovernment policies are mostly appreciated for ICT Patron and ICT Novice as their first series of steps through their digitalization to ensure that digital economy takes off properly (Spence, 2021); in private sector and for Efficient Prosumer and Global Factory those sectorial policies will reinforce each particular economy and industry in which every country distinguishes.

TRANSITION CASES

After understanding the role of these policies is the moment to confront several important questions in our research:

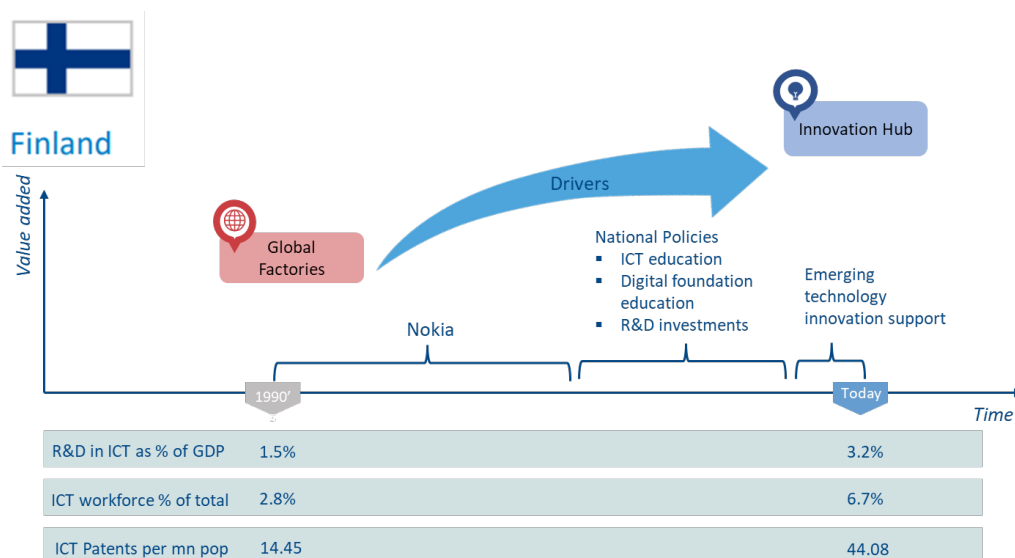
- Can a country change from an archetype to another?
- If is this possible, how can be done and how much time will last?

To begin, we highlight some samples to begin.

Finland.

Finland changed from a global factory to an innovation hub in thirty years thanks to hard investment policies for ICT education and R&D which can be demonstrate in a very high results in patents and ICT workforce percentage. There are many researching explaining this considering productivity growth (Jalava & Pohjola, 2007), for sample.

Figure 8: The transition case for Finland

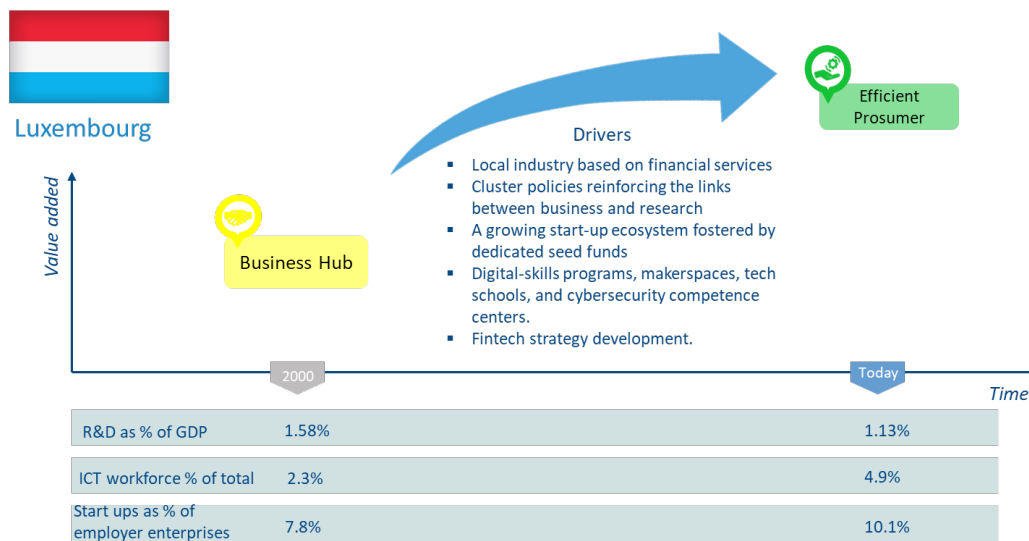


Author's own inspired on (Baes et al., 2020)

Luxembourg.

Luxembourg made a different transition. This country changed from being a global factory to an Efficient Prosumer focused on financial sector and start-ups trying to position itself as a hub for innovation and a center for Fintechs (Mouton et al., 2021).

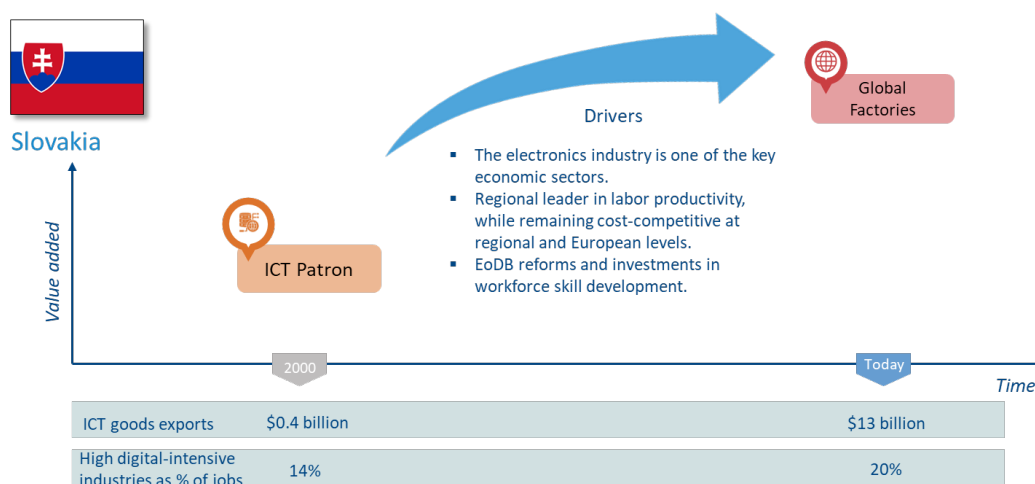
Figure 9: The transition case for Luxembourg



Slovakia.

Slovakia is still lagging behind, however has moved in two decades from a non-sophisticated ICT Patron to a Global Factory where electronics industry is an important sector fueled by reforms and investment in workforce skill development to foster labor productivity. But very close to this sharp changed appears some risks related with redundancy labor market, specially around industrial sector (Novakova, 2020)

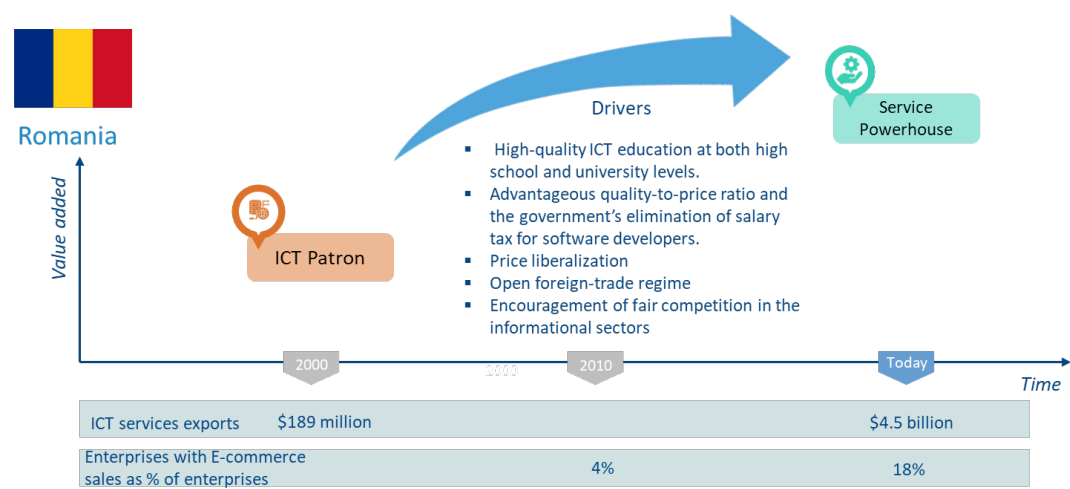
Figure 10: The transition case for Slovakia



Romania.

Finally, Romania is also moving from an undifferentiated ICT Patron to a partially specialized digital services country (Yoruk et al., 2021) thanks among others to high quality ICT Education (Wetzl, 2010) reaching good improvements but also with a long path to travel in the future (Herman, 2020).

Figure 11: The transition case for Romania



The question is: are all these studied transitions produced by these countries because some meritorious exceptions or maybe we can understand and outline some sets of policies to facilitate these transitions for other countries?

(Baes et al., 2020) suggests some other transition using their own criteria and experience highlight the probability of archetypes transitions for less sophisticated countries: ICT Novices would tend with difficulties to be Global Factories or maybe Service Powerhouse countries; ICT patron countries could move easily to be Service Powerhouses; Business Hubs could evolve to Service Powerhouse or Efficient Prosumer with higher probability.

Using public data and OCDE digital toolkit (DETF, 2018) as described in previous section the authors of this paper have created their own country archetypes classification, showed in figures 12 and 13.

As a relevant conclusion understanding the general picture of European countries, ICT less sophisticated countries will aim to choose between two general options in their transition: or to be Innovation Hubs for those small countries or to be Efficient Prosumers for the big ones (in term of population). Of course, there are some notable exceptions: Denmark as a sophisticate ICT Patron and Ireland, this last one mentioned before.

Figure 12: Classification in archetypes of European countries

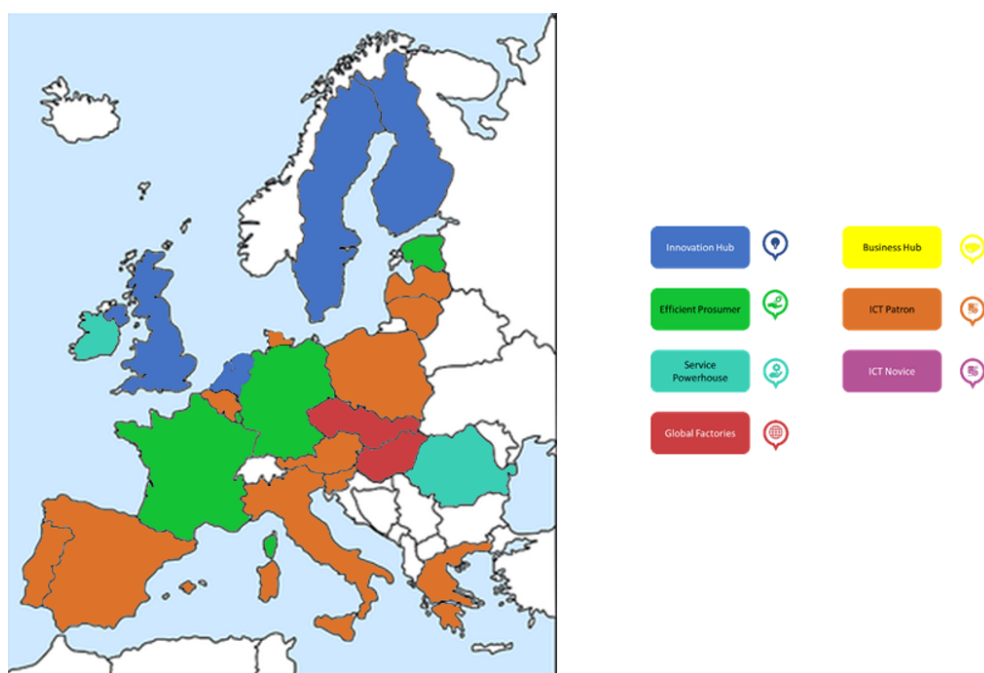
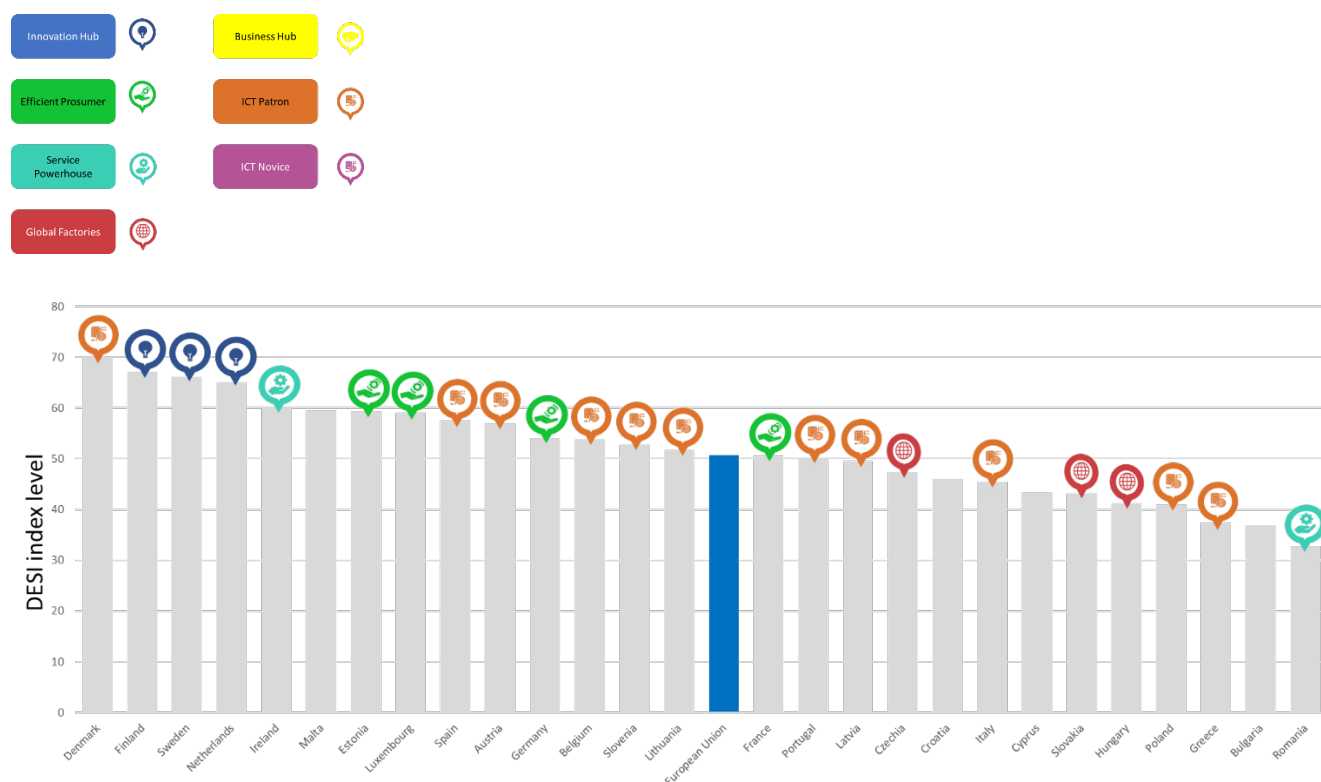


Figure 13: DESI index level and Classification in archetypes for European countries



Author's own based on data from OCDE going digital toolkit

Considering our last finding we ought to be concerned about these two key strategic recommendations for that transition:

- Europe must take advantage of its current strategic industries with digitalization.
- Europe must consider emerging its whole opportunity of transition as a Digital Single Market.

Digitalization in strategic industries

In Europe, there are several industries that encompass some unique large companies (considering for instance its market capitalization in Euro Stoxx50) with innovative cultures and business that cannot be found anywhere else in the world, and where their digitalization will be a key process for keeping them competitive: Automotives as BMW or Volkswagen (Henig & Lee-Makiyama, 2021), financials as ING Group (Ha, 2022), Technologicals as SAP, Chemicals and Pharma as BAYER or BASF, Retails as Inditex and in general large companies around manufacturing sector (Gruber, 2019). Those companies may represent the landing head and the source of digital "spillovers" within the EU economy.

The Single European Market. Opportunities

One capital idea in our research is that the Digitalisation must take advance of European Single Market. European Single Market allows goods, services, citizens and capital to flow freely though the territory. From its beginning it constitutes one of the bases and achievements of the European integration and permit the creation of a Digital Single Market (DSM).

There are many reasons in favor of a Digital Single Market: first, offers enterprises inside the Union access to an internal market of almost 448 million people to digital goods and services across Europe. Second, provides the right conditions for innovative services to flourish. And third, maximized the economy and society growth potential of the digital economy (European Commission, 2015).

(Marcus, 2019) has identified 177 billion euros in potential annual economic gains from full implementation of the legislative measures legislated or expected to be legislated, corresponding to 1.2% of 2017 GDP.

However, regarding the future, the single market must accomplish these steps:

- To be a key element for the success of both the environmental and digital transitions of the EU
- To constitute the core for the new industrial strategy of the EU
- To represents the driver for competitiveness, growth and recovery from the COVID-19 crisis in the EU.

To summarize, The Single Market is the driver of good jobs and competitiveness for the future.

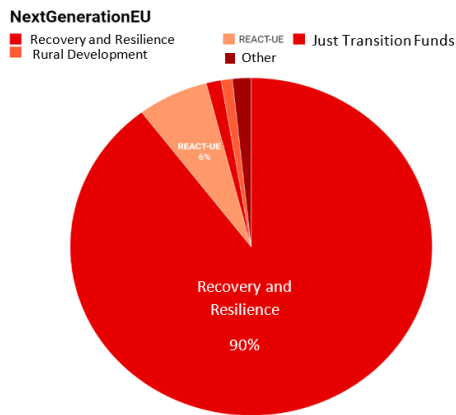
But reinforcing such as DSM is not easy. We have to take into account that exists a continuous potential of harm coming from the digital divide because of a North-South polarization (Lutz, 2019) or even an heterogeneous pattern of industry 4.0 servicitization (Capello & Lenzi, 2021) between regions and an clear and effective regulation will be necessary to solve this, specifically for the case of Platform Mergers (Afilipoaie et al., 2021), Data Sovereignty and technology dependence (Robles-Carrillo, 2021).

The “NextGenerationEU” and the National Recovery and Resilience Plans

Advancing in the DSM and in line with its priority strategy, in 2020 the EU has launched its "Shaping Europe's Digital Future" program for the period 2021-2027, complementing "Horizon Europe" and a third strategic program called "Connecting Europe Facility Digital Program", for improving connectivity infrastructures of common interest to European partners. However, the most important mechanism of this digital shock comes from an unexpected element, the Coronavirus pandemic and unfortunately this subsequent economic crisis, which, accelerating great changes, represents a milestone and inflection in all financing policies until now considered in the EU.

The 21 of July 2020, the European Counsel approved the NextGenerationEU, with a budget of 750,000 million euros. It is a set of economic measures both extraordinary and transitory to tackle the effects of the pandemic in the economy of the EU countries where The Recovery and Resilience Fund (RRF) is the main component of the Next Generation EU (NGEU).

Figure 14: Next Generation EU Distribution



Author's own based on data from (Darvas et al., 2022)

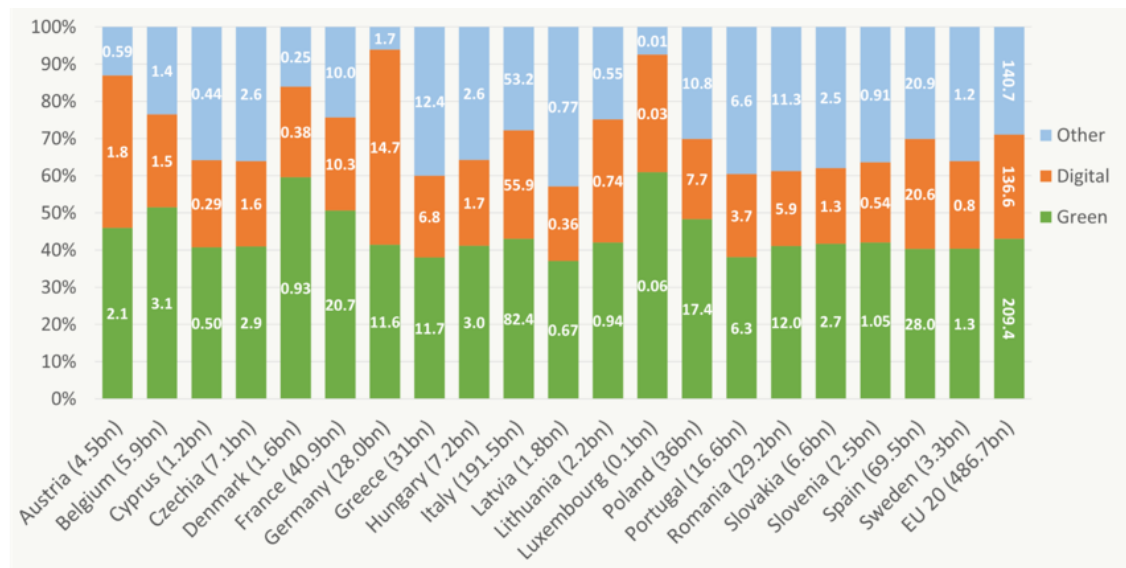
To receive the financial support, the European Member States had to prepare the Recovery and Resilience National Plans for 2021-23, in which they had detailed:

- The coherent reform packets and public investment projects that, besides tackling the economic and social consequences of the pandemic, also contribute to the green and digital transitions and empower the creation of jobs and the economic growth of the member state.
- Also, the digital and environmental components must have a minimum of 37% and 20%.

How have the member states distributed the funds?

As it is showed in figure 15 (Darvas et al., 2022) significant differences between countries appears. Countries that receive relatively smaller amounts from the RRF as a share of their GDP presented plans that concentrate on green and digital spending (Germany, Luxembourg and Denmark), while countries that receive larger amounts presented more diverse plans with higher 'other' (non-green and non-digital) shares of spending.

Figure 15: Overall resource allocation in national recovery and resilience plans (% of total and € billions)



Source: (Darvas et al., 2022) based on the recovery and resilience national plans presented.

Note: The numbers in parenthesis after the names represent the total amount in euros to be spent from the Recovery and Resilience Budget, while the numbers inside the bars represent the amount of euros of each of the components (in thousands of millions). In the case of Italy, it is included both subventions and allowances from the RRF. Take into account that there is a certain overlapping between the expenditures in green and digital, but that due to the level of detail in most of the plan we are not able to separate both completely. This image shows the green and digital numbers, not considering said superpositions.

Does it make sense for each country to have its own model?

Apparently, all the plans were assessed very positively by the Commission. By far, most countries obtained the same score with A ratings, but it doesn't mean that those criteria included some European orchestration in favor of a orchestrate DSM.

Who must lead this process? This is an interesting point. Some research advice of important delays depending the Governance finally chosen (Crescenzi et al., 2021). Giving more freedom to the countries could be beneficial to accomplish local priorities and develop its digital regional clusters (Reggi & Gil-Garcia, 2020); but, on the other hand, powerful transitions will need multi-country projects, specifically for those strategic investment as Security Operations Centres, Quantum computing and high performance computing and digital

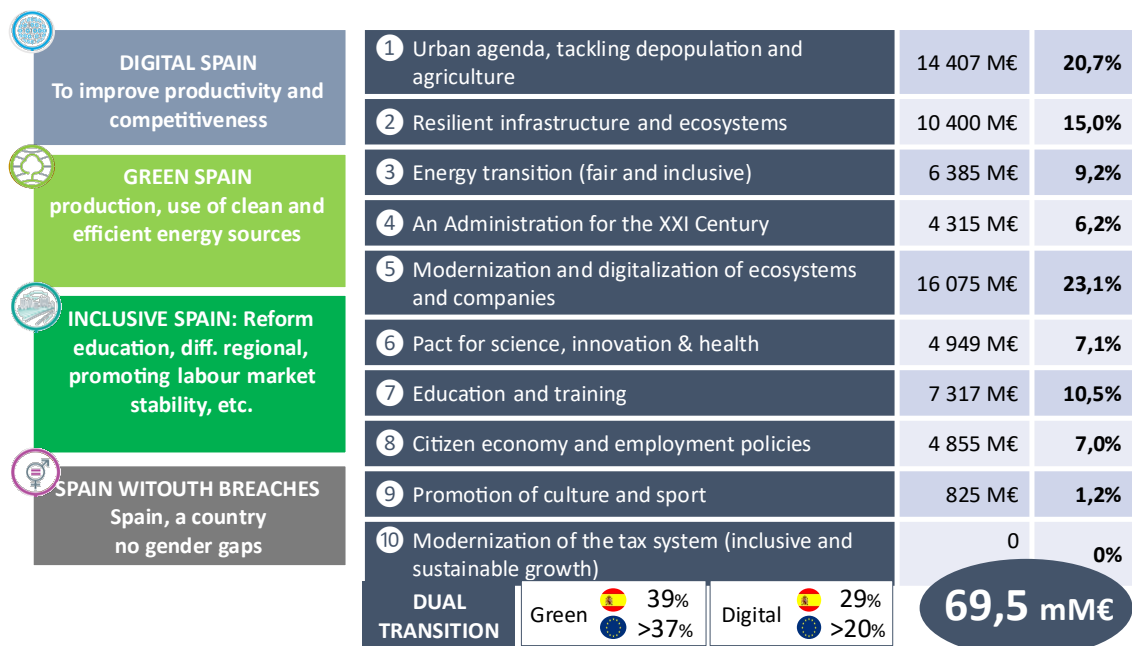
innovation hubs, among others (World Economic Forum, 2019) all of them crucial to compete with other pioneering outside European regions.

STRATEGIC APPROACH FOR SPAIN

If we zoom in for the specific case of Spain and its “España Puede” plan, we can test prove if it will fit in our idea of potential archetype transition.

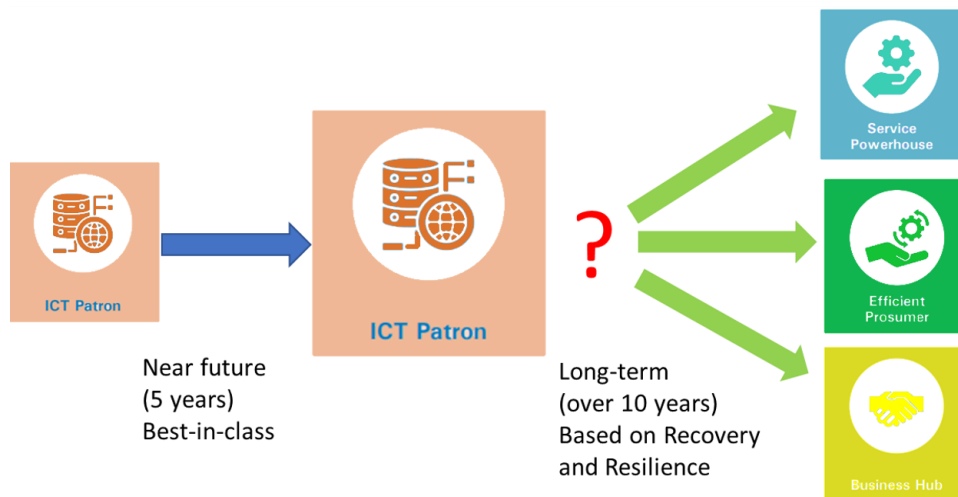
As a first sight this plan is thought to be designed to get a dual transition, totally aligned with the EU strategy, green and digital as the transition way to keep up our global competitiveness and prosperity.

Figure 16: “España Puede” funds distribution plan



In our research we stated that Spain would belong to ICT Patron with a near future option to improve its archetype and looking for a 10 years transition to become a Service Powerhouse, Efficient Prosumer or maybe a Business Hub according to (Baes et al., 2020). We show this in figure 17.

Figure 17: Long-term and short-term transitions for Spain

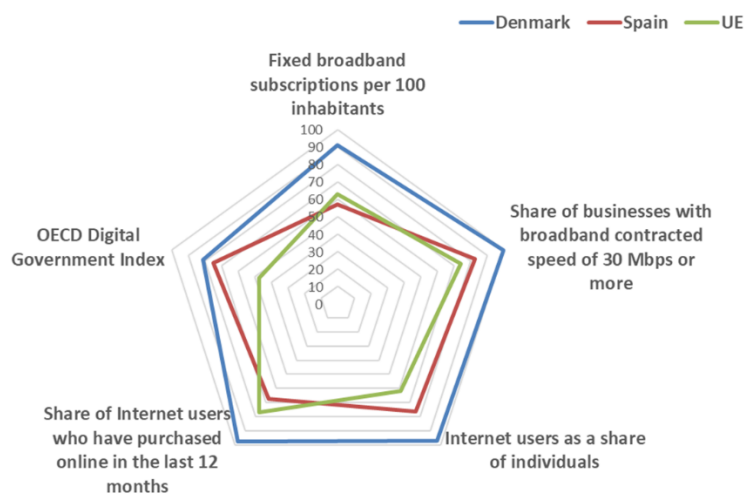


How much can Spain improve as an ICT Patron country?

We can compare in figure 18 Spain with Denmark, to understand how far is for a nearly ideal ICT Patron country.

Denmark has an economy dominated by its information sector where approximately 60% of the economy value added is right now coming from this (PASHKEVICH et al., 2021). Denmark also has had since the 1990s a very long journey pioneering ICT usage with strong governmental leadership, and for instance common techno-infrastructure such as personal ID and digital signature, with a support of the best in the class broadband infrastructures (Igari, 2014).

Figure 18: Spain vs Denmark and UE as improved ICT Patrons archetype



Spain as a Service Powerhouse.

Another valuable option for Spain in 2030 could be to transform itself into a Service Powerhouse.

Maybe we can recognize ourselves for their formidable positions in the *global supply of ICT services* and for having *large, active populations* that were effectively translated into surpluses of *ICT workers*, which resulted in low costs for delivering such activities.

But on the other hand, *Service Powerhouse* are not generally *high-income countries* and they suffer for *high levels of digital divide* in which *ICT revolution* even holds possibility of creating new means of *social exclusion* (Tewathia et al., 2020). Their technology innovation efforts are relatively low compared to the two previously mentioned archetypes and are limited to processes involved in creating and delivering ICT services. For Spain, nearly in the medium of PIB per capita for the UE countries and being the fourth, considering the total PIB in Europe, would not be a good strategical choice.

Spain as an Efficient Prosumers.

Finally, can Spain aspire to be an Efficient Prosumer?

In our findings described in this paper we have emphasized that *Efficient Prosumers* could be a valuable transition path for European less evolved ICT countries, in special for countries with large population as an option for an enhanced ICT Patron to evolve, but for this it will be necessary to acquire proficiency in several aspects:

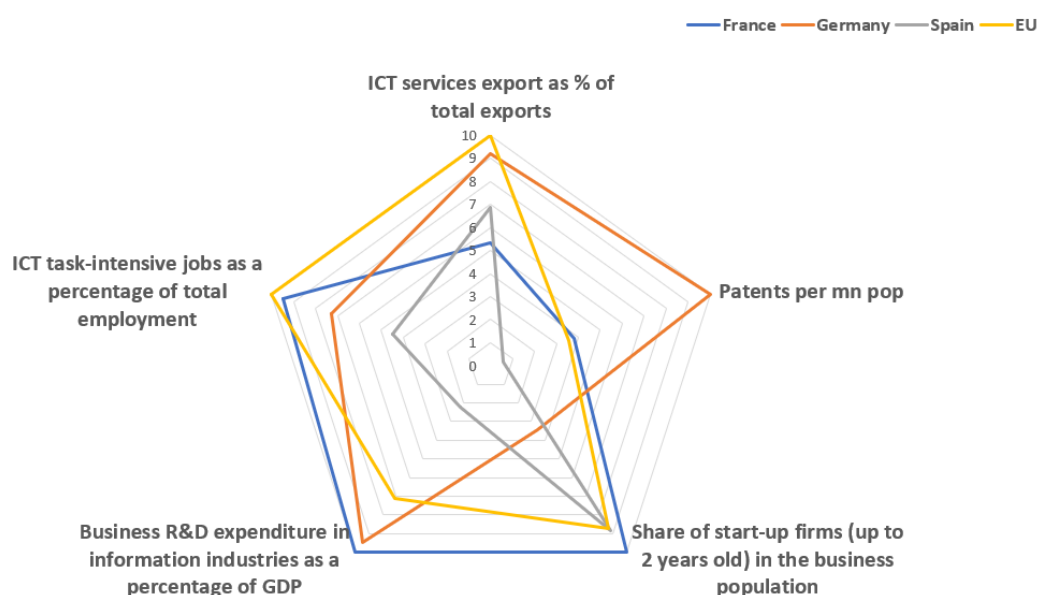
First, *Efficient Prosumers* must be leaders in niche players that innovate and *deploy solutions for its dominant local industries*. Second, they must develop *strong ecosystems* that promote research and development (R&D) activities around emerging technologies. Third, they have to focus their efforts on *developing technology solutions that will enhance the competitiveness of a single or a few economic sectors within their countries*.

Then, you can compare in figure 19 Spain with others sophisticated Efficient Prosumer archetype as Germany or France. Both share a good figure of ICT task-intensive jobs as a percentage of total employment; but, overall, they reveal remarkable figure in Business R&D

expenditure in information industries as a percentage of GDP which shows an advanced digitalization in its core local industries. Furthermore, in the specific case of German we see is supported by their outrivaling in general patents.

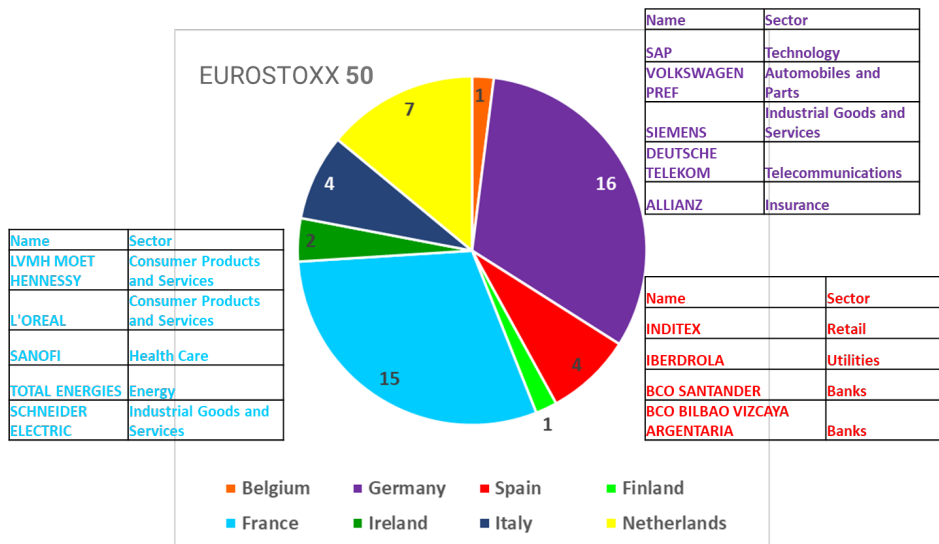
Spain it is far below all figures apart from the share of start-up firms; unfortunately, most of them lack to include much innovation, which maybe could show a potential opportunity for Spain promoting digital skills and encouraging entrepreneurial digital ecosystems; so, connecting these vitaminic digital start-up to its core economic sectors which would speed up new product development in a ambidexter strategy which simultaneously combine exploratory and exploitative innovation (Ferrerias-Méndez et al., 2022).

Figure 19: Spain vs Germany and France as an Efficient Prosumer archetype



In figure 20, we highlighted large companies that represent the Spanish more capitalized enterprises. Inditex, Iberdrola, Santander and BBVA would represent hypothetical dominant sectors, but is not that the real case because their aggregate contribution to the economy in Spain is ruled by others: for sample, Construction, Tourism and Agricultural Manufacturing are relevant sectors in Spain but for those cases those companies are in general neither sophisticated nor big capitalized enterprises and are just beginning their digitalization process.

Figure 20: Stoxx 50



Finally, as a third point, according with (Baes et al., 2020) those archetypical transition will happen only for countries focused on education and innovation and a high level. According with DESI index in 2021, Spain ranks 12th among the EU countries. 57% of the people in Spain have at least basic digital skills, just above the EU average but still far from the EU target of 80% of the European population with at least basic digital skills by 2030. A point in favor for Spain its infrastructure and broadband development, one of the most advanced in Europe in terms of penetration and with interesting incentives to quickly deploy 5G ranking number 3 according to DESI index.

OPEN CONCLUSION

Firstly, develop one strong DSM in EU is our mayor and key opportunity for this next decade. Fortunately, this is being working out intensively with the Digital Compass policy and its pillars and targets (EUROPEAN COMMISSION, 2021) that will chase to build a Global European Actor defending its particular values of humanism and green transition. But there were some shadows appearing: if Covid was apparently a positive revulsive for EU digitalization present new

times challenges coming from the Ukrainian war and its political and economic implication as a Union could unbalance our current digital transition agenda.

Transition for the EU less digital developed archetypes could be possible, as we have evidenced, although this is not a free movement instead of a restricted set of possibilities. This could be more feasible for small countries specially in they aspired to be innovation hubs or exhibiting a mixed behavior as well as Efficient Prosumer.

Large countries will need an additional push, upgrading their digital skills penetration and expert profile of workers overall, but also encouraging digitalization for their main local sector and industrial ecosystems, including besides its SME enterprises (Peillon & Dubruc, 2019), aiming that after that upgrade their local market shall contribute to the global digital value chain.

Then another challenging question appeared: EU is not finally (at least at this moment) a process of country integration, so it won't be possible to ambition a fully set of very advanced countries with common competitive rules being all or innovation hubs or efficient prosumers. Competition is inevitable and will take place between all EU members. This country heterogeneity and digital divide must be managed by Resilience and Recovery Funds and this ambivalence have to lead at the end to some kind of region specialization which will incentive competitiveness balanced with economic equality, social mobility, democracy, and economic growth for each country.

For Spain specifically should transition in a first phase to an improved ICT patrons and then maybe evolve to an Efficient Prosumer, but in the middle time it will have great challenges to assume, associated with the lack of a significant group of companies of relevant size and the lack of digital sophistication in its leading economic sectors. Last point is being highly treated using RRFs and revolving digital transition with an advanced and unique set of instrument named PERTES (Spanish Government, 2021) or "Proyectos Estratégicos para la Recuperación y Transformación económica" which encouraged strategic projects for key sectors with great driving force for economic growth, employment and the competitiveness of the Spanish economy, with a high component of public-private collaboration considering digitalization as relevant driver. Up today there are initiatives lunched for connected and electrical vehicle, health,

renewable energies and renewable hydrogen, agrofood, naval and aerospace industries and, of course, semiconductors that intend to foster critical inter-European initiatives. Maybe these will significate a revulsive for Spanish archetype transits, but we couldn't also forget that considering Spain as an enhanced ICT patron as Denmark could be another interesting path in its future.

To conclude, this decade will oblige to EU countries to create its personal evolution along digital sophistication and economical impact. Maybe at the end frontiers between EU countries will deluded and archetypes will be then an obsolete tool to measure our digital progress. Nevertheless, until that hypothetical moment, those kinds of strategies are fundamental to compare country policies and set cooperative directions for our common progress.

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