Digital Transformation to Support Resilient Economies and Stakeholder Capitalism

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Abstract

In a world that is shaped by globalization and global value chains we must identify smarter ways to handle complexity and to build more adapted organizations to nonlinear behaviors of the environments where they operate. We highlight in this paper the role of digital transformation to assist the creation of more resilient economies in front of various crises and how this can facilitate the creation of better-balanced economic models.

Keywords: digital transformation, economic resilience, digitalization, digital economy

1. Introduction

Current and foreseeing global challenges impose adaptation of economies and profound structural changes in almost all economic sectors to ensure sustainability of businesses [1]. Sustainability deeply depends on the resilience of businesses in front of multiple shocks that shape the business environment [2], [3], [4]. Destructions or blockages generated by extreme weather conditions due to the climate change, global disturbances provoked by pandemics (e.g., COVID-19), bottlenecks and fluctuations in the supply of raw materials caused by unbalances in regional value chains, disruptions generated by current macro-economic models and conflictual international contexts dictated by egoistic political interests, as well as many other noise factors – including significant differences in terms of values and mentalities within the groups of populations worldwide – make our world more and more fragile and unpredictable [5], [6], [7], [8], [9], [10]. Under these circumstances, any effort to bring relevant and timely information about the evolution of various systems and ecosystems and capacity to put them altogether and analyze in an aggregated form would increase the possibilities to identify influences, behavioral patterns, and to define better global leadership capabilities. Moreover, the morphosis of systems by adopting information-driven characteristics for better adapting to highly entropic metasystems is desirable. Thus, digitalization and digital transformation at various levels (organizations, economic sectors, countries) is a necessity for the years to come. This is also one of the hot topics on the current political agendas worldwide. Nevertheless, things related to digital transformation are not simple when it comes the time to put them into
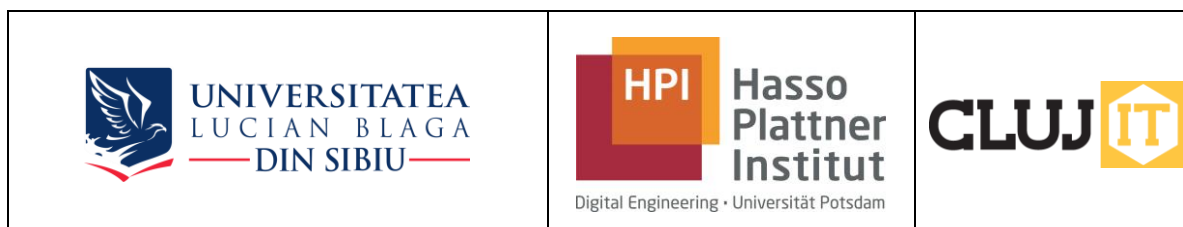
practice because transformation is about changes and radical innovation, about understanding and adopting complex technologies, and about the capacity to deeply understand where, how, when, and why to intervene in the current systems to demonstrate fast and undisputable benefits from these specific transformations. In this context, this paper underlines some key issues related to digital transformation and how they are aligned with a more ethical and resilient economic model of the future.

2. Situations that impose structural changes

Sustainable economic development is crucial for nations because this should arise with the creation of new jobs, intentionally better paid jobs, diversification of economy, business expansion (or at least retention), fortification of economy, intentionally improved quality of life, and increased tax revenue [11], [12]. Economic development entails structural transformations (e.g., in factors of production, sectors of economy, public finance, foreign trade, household consumption, etc.) [13]. Structural transformation must lead to higher productive activities. But the true sustainable economic growth happens when competitiveness at micro-economic level increases (physical productivity and financial productivity). Any other positive interventions at macro level are supportive for developing a favorable economic environment, but not sufficient. Digital transformation is only a part of the wider structural transformation, but it is influenced by several other categories of transformations, as it is shown in Fig. 1.

This means, we must see digital transformation more than digitalization. Digitalization is the process of using digital technology to collect data from organizational processes and to carry out activities using digital technology in order to increase performance in terms of productivity, quality, traceability, responsiveness, etc. and to better visualize and understand the way in which various processes take place in the value chain of the organization [14], [15], [16]. A good example of digitalization is the paradigm of industry 4.0 [17]. Digital transformation is the process of structuring an organization and significantly redefining its strategy through the widespread adoption of digitalization at the organizational level in a form in which digital technology is not seen as a supporting function but as a strategic competence in which the organizational culture is driven by digitalization and the model of relationship with the beneficiaries is a new one, based on digitalization in substantiating the value proposition and in ensuring a unique quality [18], [19], [20].
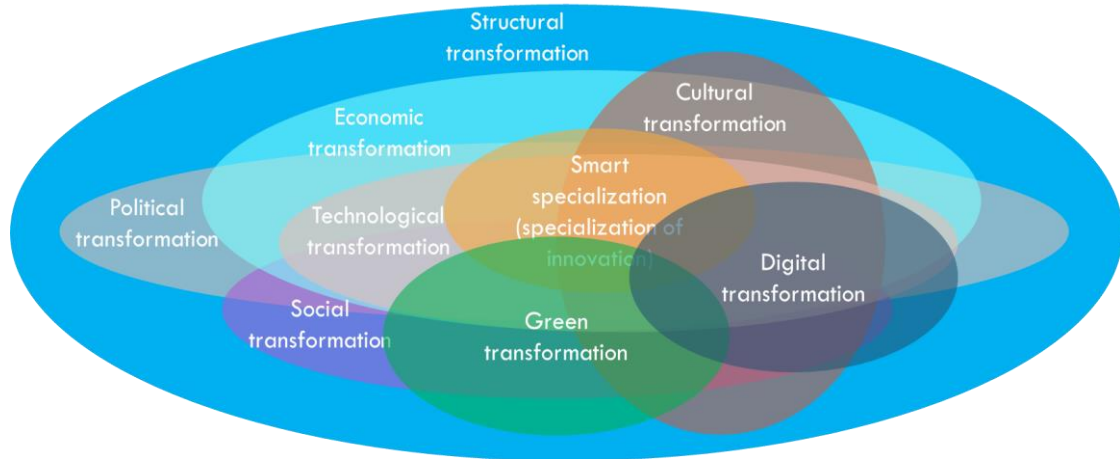
Figure 1. Types of structural transformations

We see that digital transformation is not about digitalization, even if it counts on digitalization. Digital transformation is about a paradigm shift in doing businesses; it is about more sophisticated business models where value proposition, key processes, monetization, partnerships, market channels and customer relationships are designed for and driven by digital technologies.

From this angle, digital transformation might be seen as an action designated to support those business sectors where current business models become obsolete in front of new contexts and challenges. Digital transformation is applicable to any sector, from education, health, administration, entertainment, sport, to energy, agri-food, manufacturing of any kind, mobility, construction, finance, consultancy, etc., and even to the IT sector. For example, adoption of collaborative platforms and dynamic hiring of experts using online platforms and smart contracts is part of digital transformation seen in the IT sector. In simple words, we talk about doing things smarter and better. In this context, the question is "How digital transformation can help to increase competitiveness at micro-economic level and improve the business ecosystem (aggregated productivity) at mezzo and macro-economic levels?" For answering to this question, we must first understand which are the situations when structural changes (or transformations) are necessary. Fig. 2 shows six of the critical situations where necessity for such transformations must be considered.

It is still a challenge to decide what kind of structural transformations (see Fig. 1) must be tackled in the cases indicated in Fig. 2. However, the goal must be a sustainable economic growth, which considers at economic level the paradigms of circularity [21], shared value [22], smart specialization [23], and resilience [24], prosperity [25] at social level, and at environmental level responsibility for preserving or regenerating natural resources for future generations. This leads to intelligent management of resources (natural, financial, human, technology), meaning in our view the ability of all stakeholders (policymakers, managers, employers, citizens) to solve without compromises various conflicts in the use of limited resources such that to get maximum results in a way that is ethical, responsible, and eco-sustainable. Looking to the Raworth model [26], these kinds of actions are more than simple recommendations; they are urgent necessities.

Figure 2. Situations that require structural transformations
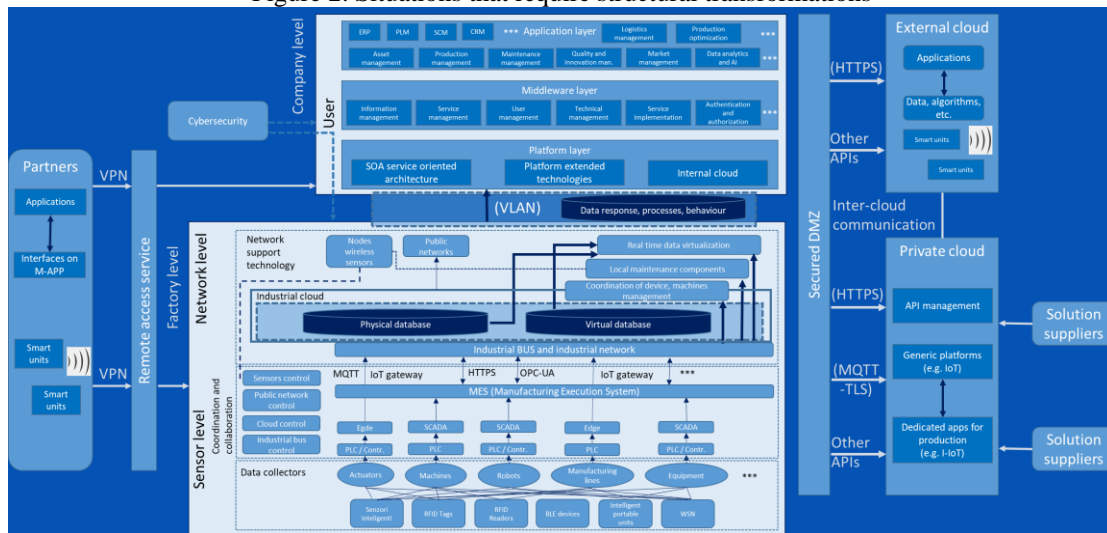
Figure 3. The architecture of a wide-digitalized enterprise

3. The logic of digital transformation

Deep digital transformation integrates digital technology into all areas of a business (see Fig. 3); thus, radically changing the way of delivering value to customers. In this respect, digital transformation encourages and assists the development of a digitalized economy. Digitalized economy is something else than digital economy. Digital economy is only an enabling economy for the digitalized economy.

Digital economy is the economic activity that results from everyday online connections among people, businesses, devices, data, and processes. It stands on hyperconnectivity of people, organizations, and machines by means of Internet, mobile technology, and Internet of Things (IoT) [27]. On the other side, digitalized

economy refers to the adoption of digital technology in a way that transforms services or businesses by replacing manual (non-digital) processes with digital ones or replacing outdated digital technology with upgraded digital technology, including in some cases the adoption of artificial intelligence (AI), cloud and edge computing, blockchain, virtual and augmented reality (VR/AR) [28]. Digitalized economy is about enhancement and transformation of any economic sector in a way that makes it more productive, agile, resilient, "creative", traceable, etc.

Figure 4. The pyramid of digital transformation at organizational level

Figure 5. The logic flow of digital transformation

The challenge for digital transformation is "What to do"? but also, "Where to do"? and "How to do"? This is a cultural issue, and it is about the commitment to evolve at individual level, organizational level, and economic sector level (see Fig. 4). In order to succeed in the long-term journey of digital transformation, an organization must start with a clear strategy for business digitalization, and with a plan for redefining the business model within this strategy. The strategy must include a pillar for developing digital skills for its employees, a pillar for digital-connectivity with its suppliers and customers, a pillar for inclusion lean-agile digital innovation in all key processes that define the value chain, a pillar for staff involvement and development
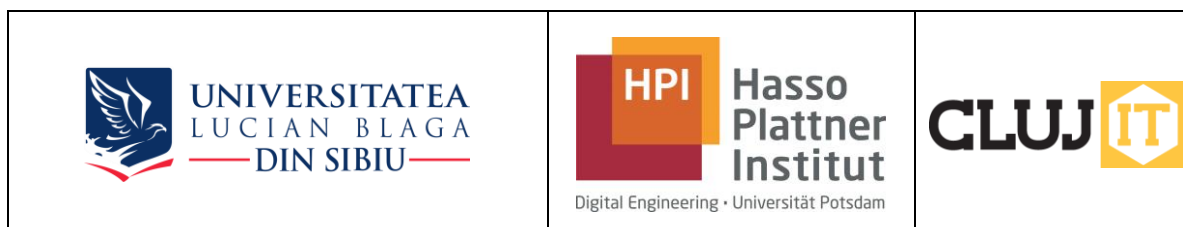
of a culture for continuous innovation, and finally a pillar for aligning the business to a model that embeds digitalization in all applicable processes (see Fig. 5). Based on an extensive digitalization process, data are collected from all relevant areas of the business and analyzed with specialized technologies (e.g., statistics, machine learning, expert systems, etc.) to be transformed into information and knowledge, which are finally used for creating competitive advantages (Fig. 5).

If data collection and analytics is a challenge (but one that can be handled with nowadays know-how), the major challenge (with a still low scientific foundation), is about what data to collect, for what purposes, and what "smart" algorithms to use to transform data into valuable knowledge. For example, what data do we need to deliver effective analyses for the board of directors and how to combine them in order to make more visible the proper evolution of the company, beyond traditional accounting and financial data? When does the breakeven point actually happen for a given equipment? What thinking pattern has each of our employees? How can we unveil hidden practices within the organization? Etc.

In other words, we must avoid "fetishization" of data, because data are not relevant without deploying them into competitive actions. We need to think in terms of sustainability, differentiation, more value added, higher quality of jobs, etc. Digital transformation must consider all stakeholders and bring advantages for all. For example, we might want to know how much value weight is dynamically brought by each department to ensure the competitiveness of our business such that to design a more ethical salary policy, and maybe to share the annual profits to all stakeholders according to their contribution in the equation of company's competitiveness.

And when we talk about stakeholders, we must consider the company itself, active and passive shareholders, managers, expert collaborators, employees in the primary and secondary processes of the value chain, customers, suppliers, partners, society in general (citizens), government, and the planet. Thus, data we collect and the means they are collected must be driven by the business strategy. Another perspective in digital transformation is the sustainability of a given business model. There are economies where most of the business models are driven by basic factors (e.g., primary agriculture, business process outsourcing, textile lohn, software outsourcing, mining of raw materials, forest exploitation), other economies where majority of the business models are driven by productivity factors (e.g., manufacturing services), and other economies where most of the businesses are driven by innovation (e.g., design and development of robotic technologies). Each national economy is a mix of the three models, but with differences in size and intensity. For example, today's (i.e., 2021) Romania's economy is mostly driven by productivity factors.

In a national economy, every economic sector is dominated at a certain moment by one of the three models mentioned above. The dominated model is maintained as long as the index of price factors is higher than the index of cost factors. Various noise factors erode over time the ratio of these indexes, making the model unsustainable. This pushes the economic sector to transform itself and adopt the upper model. Sophistication increases from the models driven by basic factors to those driven by productivity and further to those driven by innovation. To prolong the life

of their models beyond the inflexion point, some companies migrate from the parent
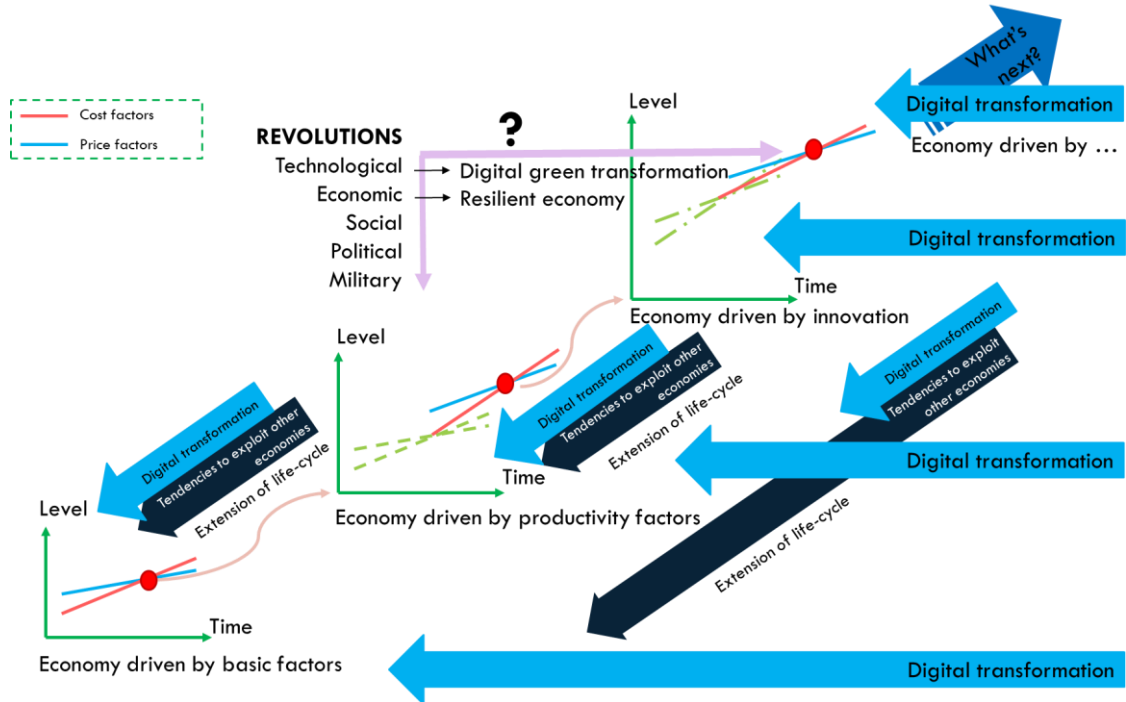

Figure 6. Economic models and related challenges

economy to other economies where the model is still viable (see Fig. 6). Digital transformation or at least digitalization is necessary in such cases to keep the headquarter and subsidiaries connected. Also, to become part of a connected business system and to build a connected value chain, companies must consider digitalization and/or digital transformation in any of the models that shape their businesses (Fig. 6).
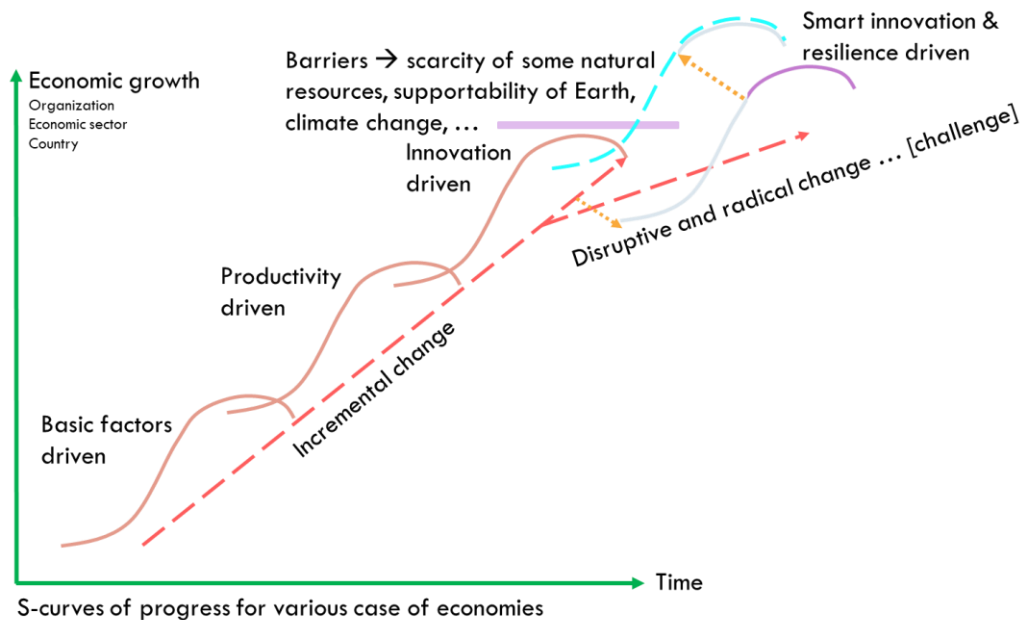

Figure 7. Disruption towards a new macro-economic model

Besides all these aspects, now we are experiencing a situation where some economic sectors and some national economies face the challenge of transition from the innovation driven model to something new (see Fig. 6). This is because the aggregated cost factors in those economies challenge the price factors, making obsolete the traditional innovation driven businesses. The problem with innovation driven models is that they are expensive and capital intensive, and many of the past and present-day innovations have also generated or are generating harmful side effects that unbalance the systems where they have been implemented or are operating nowadays. For example, fossil fuel driven cars or airplanes are great innovations, but they produced a lot of pollution on Earth. Nuclear powerplants supplied us energy, but with a lot of costs for environment and with continental catastrophes in the case of some technical accidents. Internet produced a revolution in connectivity and spread of information, but it opened the gate for harmful side effects on people's privacy, large scale tendentious manipulation of masses of population, poor quality information, etc. In conclusion, innovations must be reconsidered and "re-invented" such that to be more sustainable and resilient. We call this metamorphosis "smart innovation" (see Fig. 7). It embeds more "intelligence" and considers fulfillment in a balanced way of requirements expressed by all stakeholders.

Nevertheless, in comparison with the S-curves of progress of the current economic models, whose evolution was more incremental, "smart innovation" involves more disruption and radical changes because it faces with a complex of barriers, such as scarcity of some natural resources, climate change, supportability of our planet, etc. (Fig. 7). The VUCA crisis (vulnerability-uncertainty-complexity-ambiguity) requires adoption of digitalization and digital transformation to better understand and master the new conditions and their related requirements.

Even if economic growth is the engine of economy, economic growth must not be a goal for itself, but a way to create social welfare and wellbeing, having in mind at the same time the implications on natural ecosystems. We simply consume all natural resources in an unacceptable egoistic manner, pollute the planet without any sense of guilty, and without thinking what legacy we will leave to future generations and without thinking that we are not the single living beings on the Earth. Digital transformation makes sense only in relation with sustainable economic growth and social welfare; and it must be seen as part of the whole set of structural transformations necessary for supporting this goal, not in isolation. Digital transformation must be an ingredient in the recipe of resilient economy and must support economic resilience.

4. The new economic paradigm: resilient economy for stakeholder capitalism

Resilient economy seems to be the new transformative model for sustainable economic growth. Resilient economy is about a more ecologically and socially ethical capitalism, where all stakeholders are part of the decision-making game, not only the shareholders of businesses and politicians, as it happens nowadays. Instead of giving a
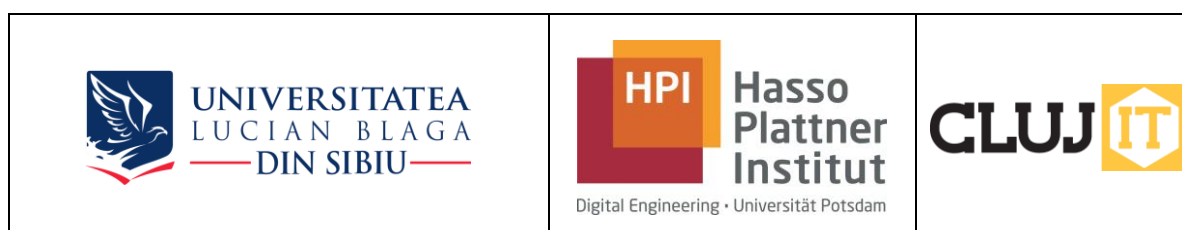
definition for this economic model, a better way to describe it is to highlight its core characteristics. They are illustrated in Table 1.

Table 1. Characteristics of a resilient economy

| Cluster	Characteristic	Description
Policy	Multidimensional indicators	Political decisions must be framed by social wellbeing and environmental quality in equal weights
	Independence between fiscal policy and economic growth	Decouple economic stability from economic growth and adopt fiscal policies for environmental protection
	Limited power and empowerment	Reduce imbalances in economy and democratic power, including new forms of democracy
	Decentralization	Diversified decentralization to be more agile in case of crises, including finance and security
	Responsibility	No dominant institution for decision making
Business	Prediction	Focus on early predictions for major threats
	Reconfigurability	Design reconfigurable organizations
	Shared value	Share value with all stakeholders
	Shifting profitability	Internalize the cost for environmental damage
	Sustainable investment	Invest more on technologies with low material consumption and more brain and labor intensive
	Smart innovation	Invest in innovations with no or low secondary side effect on short and long term (considering all stakeholders)
	Nonfinancial disclosure	Include environmental objectives in the business standards
	Sustainable business model	Adopt business models with low environmental footprint and high social ethics
Financial	Metrics for long term	Integrate life-cycle and environmental categories
	Expanded interpretation	Include environmental and social objectives in the targets of public institutions
People	Sustainable consumption	Optimize consumption by including strong penalties for some categories of products and services
	Sufficiency	Extra-charge the quantity per capita
	Affordability	Shelter, food, and basic stuff ensured for everyone
	Fairness	Smarter models to value public jobs and private jobs – pay-for-value
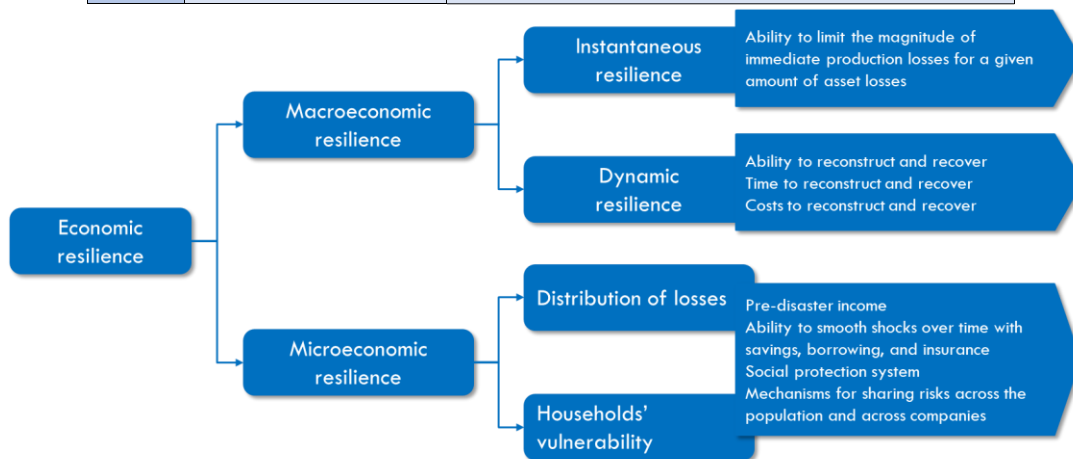
Figure 8. Components of economic resilience

Resilient economy must not be confused with economic resilience. Economic resilience is the capability of a national economy to take preparatory crisis-

management measures, mitigate the direct consequences of crises, and adapt to changing circumstances. In this regard, the degree of resilience will be determined by how well the actions and interplay of the political, economic, and societal spheres can safeguard the performance of the economy – as measured against the societal objective function – also after a crisis [29]. The components of economic resilience are illustrated in Fig. 8.

Digital transformation can generate new resources and capabilities in organizations for better facing to crises. An example how digitally driven economic sector benefits from digital transformation in the case of COVID-19 pandemic is shown in Fig. 9 (formulas are synthesis from various sources). This is due to the fact that most processes and supply chains remain functional, and most markets remain available.
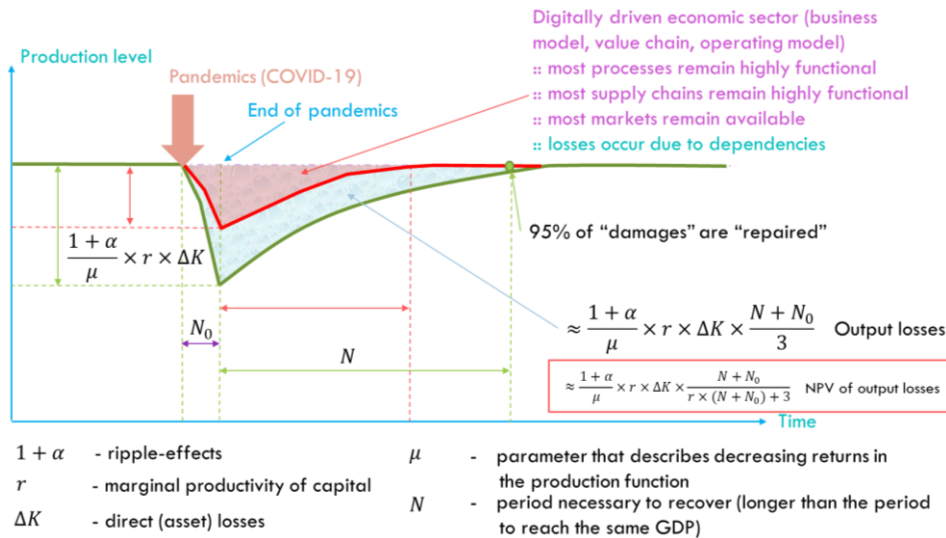

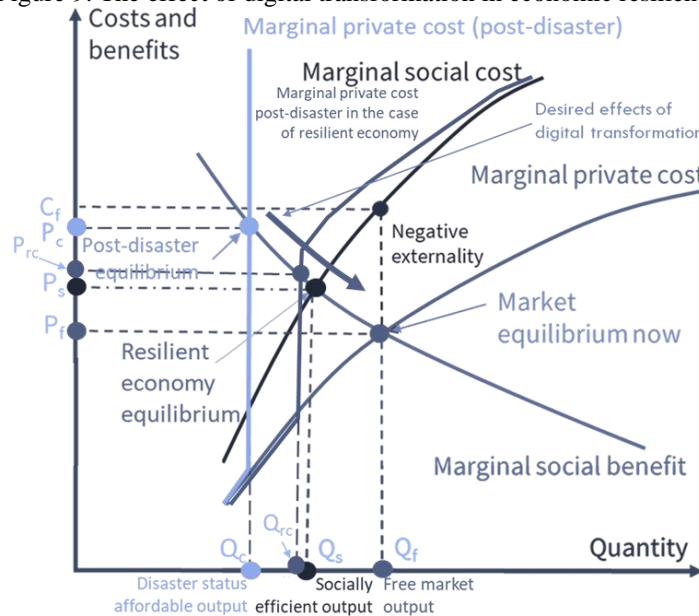Figure 9. The effect of digital transformation in economic resilience

Figure 10. The economics of resilient economy with digital transformation

In the traditional capitalism, free-market economy makes the rules, and everything related to economic growth moves around its rules. In the stakeholder capitalism, where not only the politicians, shareholders and entrepreneurs dictate the rules, but also the natural environment, employees, and citizens are included in the decision-making process, resilient economy becomes the dominant ruler. This means that negative externalities are supported by those that produce them, and not by the outsiders, as it is happening in the free-market economy. But as it is shown in Fig. 10, in the resilient economy the equilibrium is reached with lower quantities of outputs and higher prices per output. This is not attractive both for consumers and producers.

However, by changing the business models this situation can be solved. This means that, instead of selling products and services, we sell solutions to a problem. In this paradigm prices are not any more relevant. Business models move towards servitization, share of consumption, product-service systems, or total-cost of ownership (e.g., instead of selling cars, we will sell mobility solutions, as it is shown in Fig. 11). With these business models we can produce less, increase in the same time profitability for producers and savings for consumers, without affecting consumption, but making it more sustainable. As Fig. 10 shows, even disasters have less impact on economy in the case of resilient economic model. If digital transformation is part of this model, the negative effect of a disaster is even more lowered. Fig. 10 shows how digital transformation act in the context of resilient economy for lowering negative effect of expected or unexpected crises.
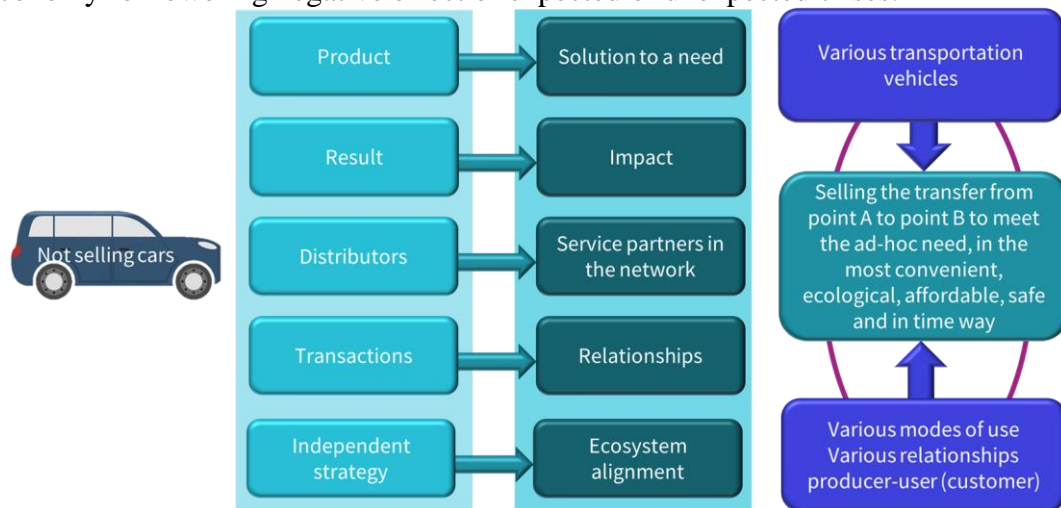
Figure 11. Example of servitization in the mobility industry

To develop a resilient economy, value chains must be digitally driven. This is required because life-cycles approaches, circular economy, transparency, stewardship, controlling, accountability, and traceability are parts of resilient economy, and the new business models and their value chains are significantly more sophisticated. An illustrative example is shown in Fig. 12. As in the example from Fig. 12, the original equipment producer (OEM) must develop long-term partnerships with a wider and more diversified market players. Flows are more sophisticated, and, without an

extensive digitalization, the partnership cannot be realized and maintained. In this
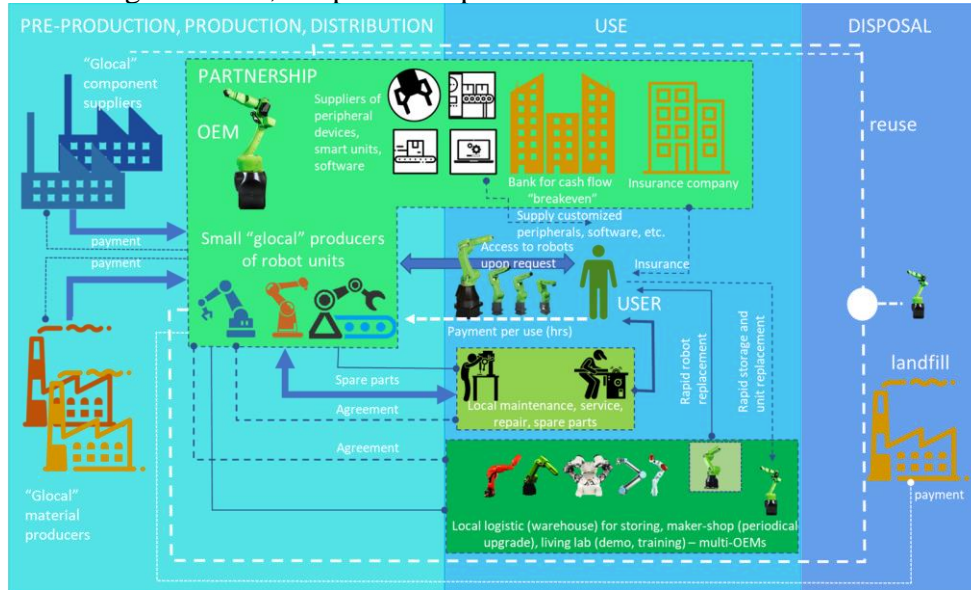
Figure 12. An example of value chain in the resilient economy

partnership, smart contracts, and autonomous economic agent (AEA) models might be seen as good practices. This is illustrated in Fig. 13. Also, without digital transformation the business is not sustainable (e.g., smart connected products and subscription-driven business relationships with consumers).

Figure 13. Example of supply chain optimization using autonomous economic agents

In the resilient economy circularity and servitization sustain each other. As Fig. 14 shows, servitization involves 24/7 remote control of equipment, 24/7 support and

assistance, smart maintenance, pay-per-use, service-driven business model. Circularity requires value optimization, transparency, collaboration, and stewardship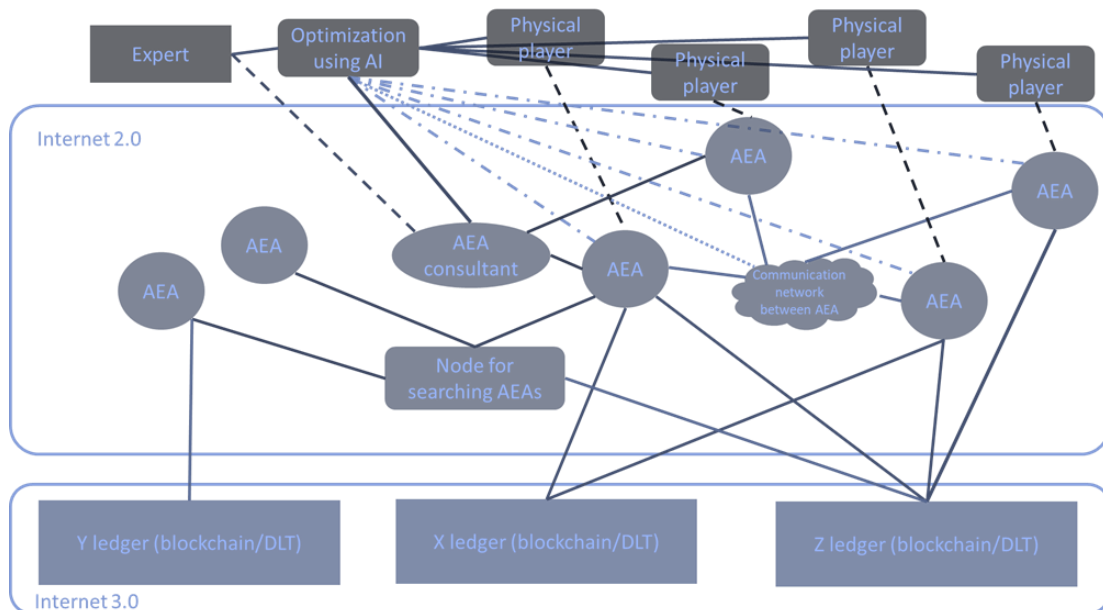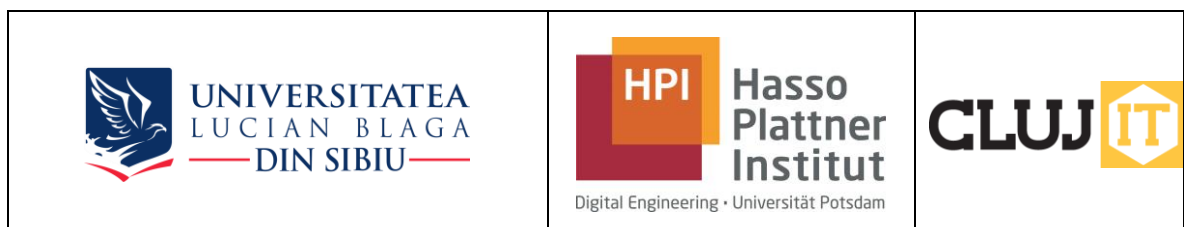. For materializing these requirements, digitalization and digital transformation are necessary. Digital transformation embedded within circular and servitization business models also ensures more economic resilience, because it is known that economies with more experienced workforce, higher rates of entrepreneurship (including higher share of self-employment), and which combine high diversity with high sophistication of the economic sectors, are more resilient.
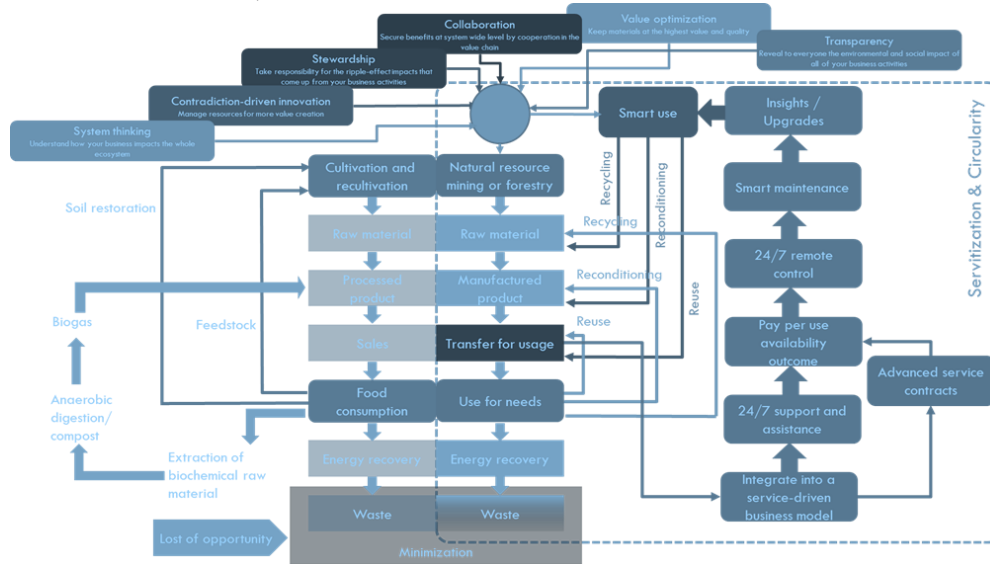

Figure 14. Symbiosis between circular economy and servitization for a resilient economy

5. Types of digital transformation to support economic growth in resilient economies

In the past the focus was to ensure more static and stable businesses, with little innovations. Today such approaches are lethal for most of the businesses. To overpass this fragility, nowadays efforts are done to achieve flexibility, agility, and robustness. This comes with investments in digitalization. However, future is destined for super-agile organizations, where adaptability and dynamism are key qualities. These issues call for digital transformation, which moves many of the business activities in a new dimension, the digital dimension. To achieve this goal, intelligent constructions of organizations are required. On one hand this involves proper people and technologies to act agile and flexible. On the other hand, this calls for capacity building to combine strengths of people and digital technologies. Digital and digitalized technologies are focused on productivity, ensuring endurance, speed, accuracy, consistency, repeatability, specialization, and contributing to resilience. They also provide support to analyze complexity and optimize decisions. People, on the other side are focused on doing complex things. They bring a series of capabilities, such as creativity, dexterity, versatility, problem-solving, responsibility, adaptability, and also resilience.

Thus, digital transformation is about digital technologies, digitalized technologies, and digitally skilled people.

Within the value chains, companies operate in different positions. This influences the types of digital transformation which is suitable for a given company. Considering the specificity of economic models that characterize various economic sectors (see Fig. 6), the type of digital transformation is also related to this issue, too. We can extend this analysis at country level, too. In this paper we underline four types of digital transformation that might be applied to organizations, economic sectors, or national economies. They are shown in Fig. 15 and lead to either reconfiguration, modernization, diversification, or radical genesis of ecosystems. All these four types of digital transformation might be seen in an organization, economic sector, or national economy. Nevertheless, one of the models prevails for a given case.
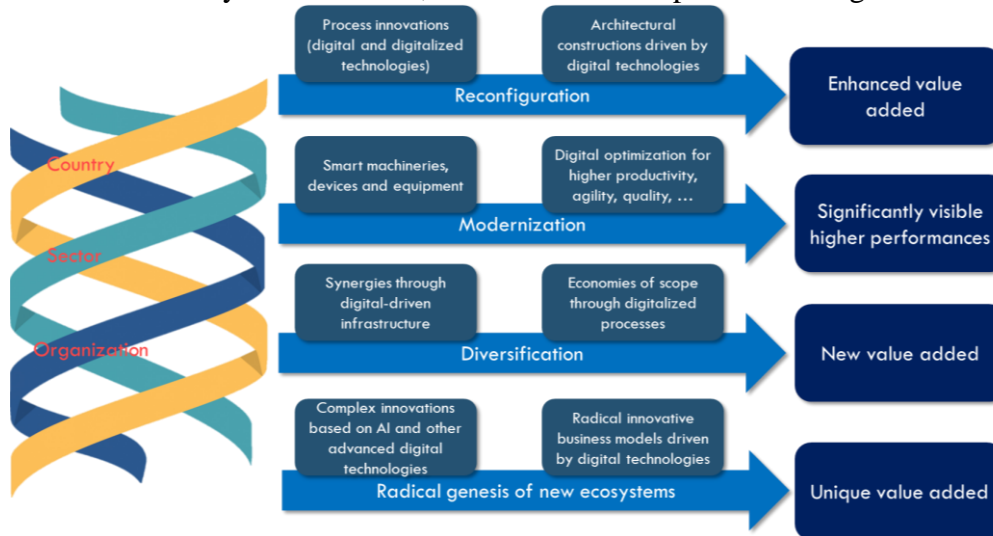

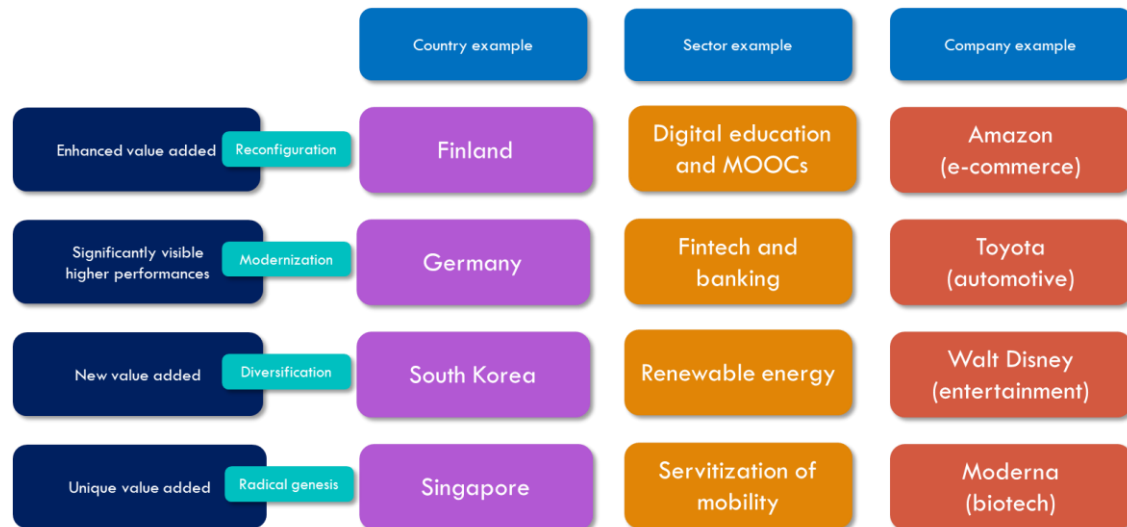Figure 15. Types of digital transformation

Figure 16. Examples of digital transformation initiatives

Fig. 16 indicates some illustrative examples of digital transformation initiatives at organizational, sector and country levels. Finland is a good example of country that is prepared for reconfiguring its economy through digital transformation. In this respect, its digital transformation strategy is focused on the so-called "platform economy". It is an appropriate example of country with a low size of population, but with highly educated people. Germany is a good case of large country where digital transformation is led by modernization through a major focus on industry 4.0. South Korea directs digital transformation to diversify its economy. This is visible in the synergies between different industries and economies of scope that make a small country, but with a large population and many educated people to excel in many economic sectors. Singapore, a very small country, with high density of population, highly educated people and agglomerated in a knowledge hub, is one of the best examples of countries that uses digital transformation to radically reinvent its economy. This country sees its economic growth by synchronizing emerging technologies, such as blockchain, Internet of Things (IoT), artificial intelligence (AI), personalized medicine, social robotics, green technologies, smart city, intelligent agriculture, renewable energy, etc.

At sector level some suggestive cases are also highlighted in Fig. 16. For example, the use of online platforms, augmented and virtual reality, web-based simulations and other digital innovations enhances the value added of education and large-scale accessibility. Students can learn at their peace and from any place, can interact with their mentors and mates in a flexible way. Another example of economic sector that benefits from digital transformation is the banking and financial. The transfer of more and more of the banking activities and interactions with customers in the cyberspace has brought visible higher performances in terms of speed, timesaving, and flexibility. But this sector is also shacked by a radical digital transformation, observing the remarkable development of virtual currencies. Energy sector is another example of sector that benefits a lot from digital transformation. Relevant examples in this respect are the smart grids and smart contracts in energy supply, as well as remote management of new sources of energy. In the automotive industry we observe a movement from selling cars to selling mobility solutions. This is driven by digital technologies.

At company level, Fig. 16 exemplifies four well-known cases. For example, using autonomous mobile robots and automatic management of resources in its global warehouse network, Amazon has made a step forward in the e-commerce industry, by speeding up and diversifying delivery. Toyota is a great example of improving production performances by extended digitalization of technological processes. Walt Disney is diversifying its business portfolio by adopting digital technologies and building up a "scalable dream factory". From cartoons, to movies, entertainment platforms and thematic parks, and vertical partnerships Walt Disney is one of the most prominent innovators in the entertainment industry by means of digital technologies. It also uses digital technologies to create and sustain brands. The last example is Moderna, the start-up that has revolutionized the pharma industry by adopting artificial intelligence, cloud computing, IoT, and robotics to create a new drug in a matter of minutes and then to instantaneously
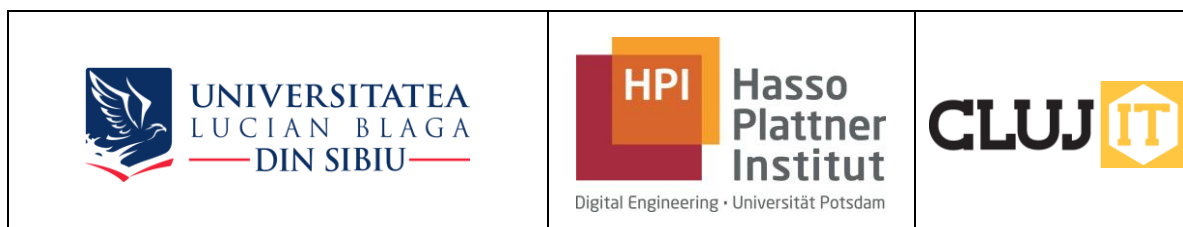
transfer the results from the lab to the production facility. It uses the global network intelligence to collect data and design its products.

Through digital transformation organizations are capable to translate from complex constructions where most people usually perform simple tasks, to simple constructions, where people are assisted to perform complex tasks. If in traditional organizations information is led by people, in a digitally transformed organization people are led by information (e.g., with the assistance of artificial intelligence). If nowadays processes are designed to shape people's behavior, in the future smart organizational processes are designed to shape technology. Thus, in the future, people will assist technologies (e.g., man-in-the-loop), whereas nowadays technologies assist people. This is a radical paradigm shift in operating and doing businesses.

Value of digital transformation must be seen at the business model level, operating model level, and value chain model level (see Fig. 17). Digital transformation must create and capture value if it is proper embedded in the business model. At operational level digital transformation produce value due to various economies arising from scale, scope, and learning. At the value chain level, additional value is created by digital transformation from the networking effect, collective innovation, and extension of the business systems. All together shall be deployed into various key performance indicators, such as wide interoperability, extended connectivity, high agility and adaptability, high flexibility, capacity to better predict evolutions, faster generation of results, better capacity to customize results, faster recovering in the case of crises, increased automation, capacity to visualize behavioral patterns, traceability of operations and outputs, increased work discipline, and capacity to achieve a much faster scaling-up. All these key performance indicators are related to sustainable development. Digital transformation scripts a rethinking of how an organization uses technology, people, and processes in search of new business models and new revenue streams, driven by changes in customer expectations around products and services. The benefits we highlighted at organizational level can be extrapolated to economic sectors or national economies. Therefore, digital transformation must be seen one of the priority areas of intervention at organizational, sector or national levels for the years to come.

Depending how wider and deeper adoption of digital technology is achieved within an organization, there are expected various levels of impact on business performance (e.g., output volume, diversity, customer satisfaction) (Fig. 18). Utility of digitalization and digital transformation is related to the complexity of the business. Not all businesses need sophisticated digitalization. The type of business and the level of complexity of the results have an influence of the sophistication of digitalization.
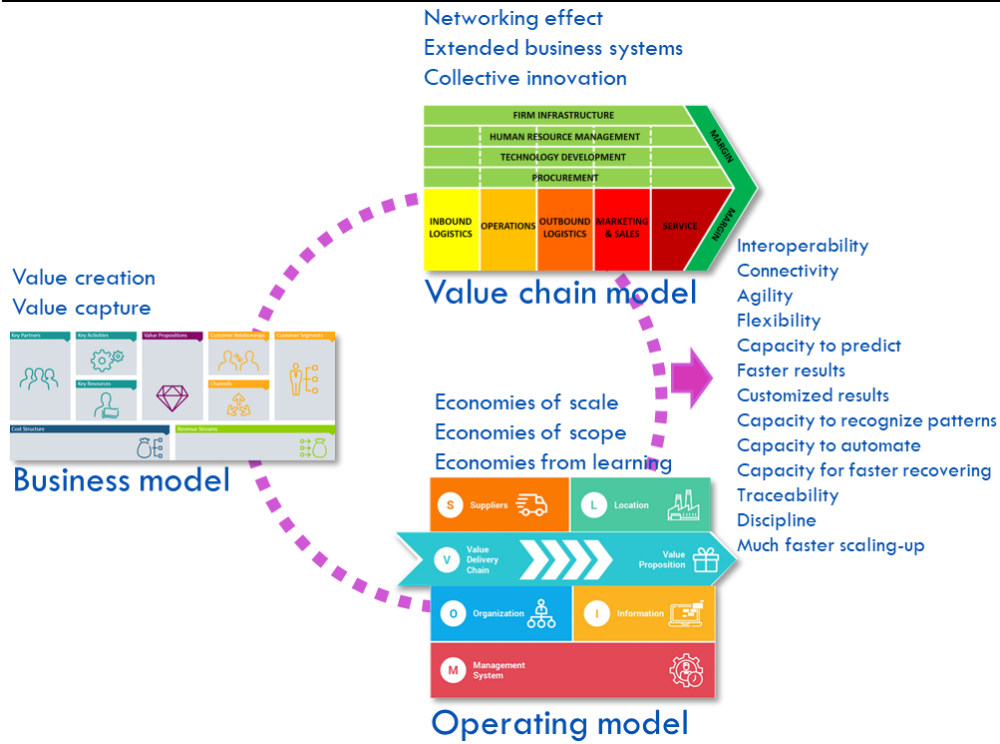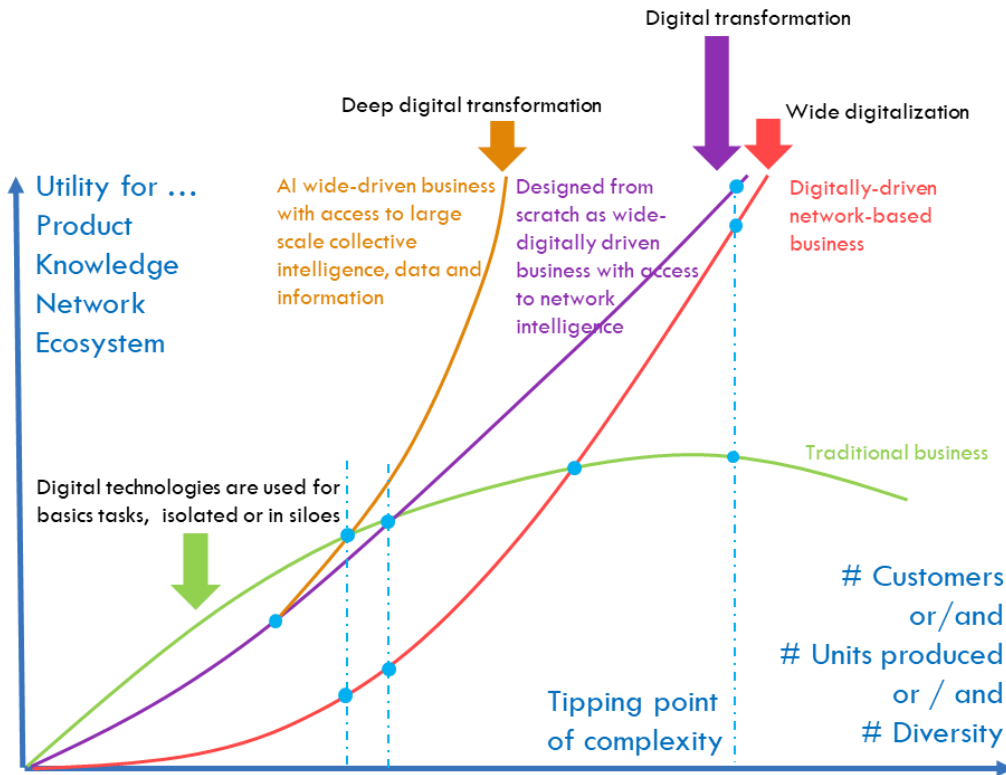
Figure 17. The value of digital transformation

Figure 18. Effect of digital technology adoption

For example, in many traditional businesses, lack of wide digitalization does not necessarily impact competitiveness if complexity of outputs is not high. Isolated use or in siloes of digital technologies for assisting secondary processes such as accounting, payroll, or for automating some operations might bring value added. However, beyond a critical point, maintaining the processes in the traditional paradigm of digitalization will rather lower the impact than improving it, because complexity comes with additional costs in such cases. Above a certain level of complexity, wide digitalization creates exponential higher benefits, meaning that it opens the gate for rethinking both processes, and business systems. These benefits can be obtained even at lower levels of output complexity if digital transformation becomes part of the business strategy, because it redefines both the business model and the portfolio of products and services (e.g., smart connected products, servitization, data-based services, etc.). This is also facilitated by the fact that, digital transformation can lead to wide connectivity with knowledge flows, supplier networks, customers, etc., thus benefiting of collective intelligence from the wide knowledge network. A deep digital transformation delivers even more benefits because of the intensive use of artificial intelligence in many areas of the business (e.g., over 200 areas of a business can adopt artificial intelligence).

Digital transformation is not a panacea to future VUCA challenges. Organizations must consider several other transformative paradigms, such as organizational development, collaborative and open innovation, and management of resilience (Fig. 19). Organizational development is an approach that assists organizations build their capacity to change and achieve greater effectiveness by developing, improving, and reinforcing strategies, structures, and processes. Organizational development considers multi-lateral diagnoses and adoption of various good practice standards, such as total quality management, innovation management, circular economy principles and standards, strategy management, etc. But the limited internal resources at the disposition of an organization for fast adaptation to changes calls for open collaboration with external partners, in novel collaborative models, such as polycentric innovation. Unexpected crises often create jumps in VUCA. A good example is the crisis created by COVID-19, when organizations had to reinvent their workspaces and the concept of work-office. Operational processes suffered wide transformations and new supply chains have been invented or activated, too.
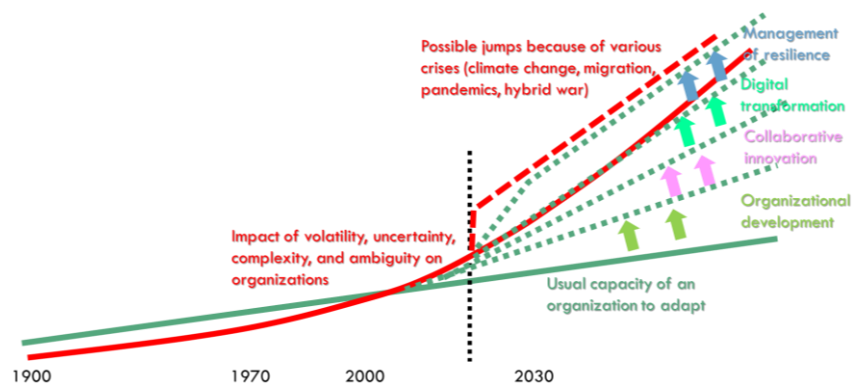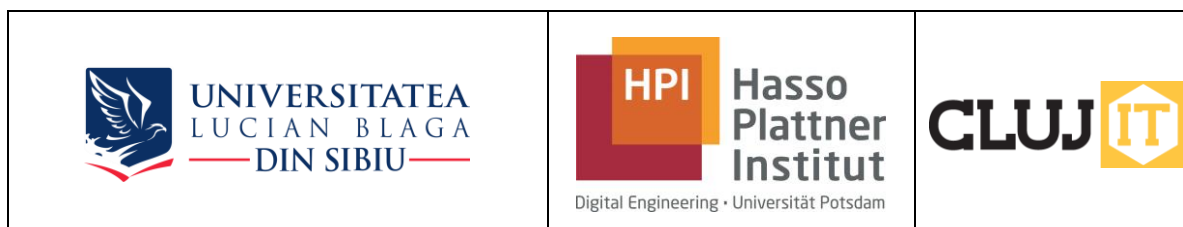

Figure 19. Digital transformation as part of a kit of concepts towards the power to adapt to crises

Thus, a new objective function must be considered by organization; that is, resilience. It appends to the list that already includes productivity, quality, innovation, safety, and ecology. Digital transformation will help to build an effective resilience management system; or seeing from a different angle, we might say that without digital transformation organizations will strive to put in place a highly resilience business system.

A short reflection on system evolution highlights an interesting fact. Evolution does not simplify things. It comes with a payment for each gain. For example, we can increase productivity and agility without human operators, but technologies that are put in place to make this are more and more sophisticated. In fact, this paradox is true, because we want to replace something very complex and complicated – which is the human operator or human expert – with machines and machine-based processes. Therefore, the more transformations towards an "autonomous economy", the higher the challenges for people to design and implement adequate technologies to face these challenges. So, the new normal for this ambitious journey of humankind is VUCA. Are we prepared to deal this ambition? If we look back, we find that people have always found solutions to the proposed goals of progress. This should give us confidence in the success of our future endeavors.

6. Conclusions

This paper looks to digital transformation from micro, mezzo, and macro perspectives to reveal its potential and benefit in the future economy. The analysis is done with the intention to reveal its value from a transformative understanding; that is, how to use digital transformation to transform the current micro, mezzo, and macro-economic models into something that is more sustainable, ethical, and resilient. So, beyond any short-term interests to adopt digitalization and digital transformation for improving competitive advantages, this adoption embeds a huge potential to construct a better world and facilitates the effective adoption of several other powerful paradigms, such as circularity and resilience.

The problem of adopting digital transformation models is not simple, because a deep digital transformation requires system and architectural innovations that exceed the borders of organizations. Deep digital transformation of your organization without similar efforts done by your suppliers and partners is less effective. It is like the revolution of vehicles, from fossil fuel engines to electric motors. It is not sufficient to innovate the car driving unit, but also the network of charging units in cities, towns, and villages, and along the roads, and also the redefinition of the energy generation and supply technologies. Even if the electric car has lower carbon footprint over its lifetime of operation, if the technology for provision of raw materials for batteries and the sources of energy are pollutant, we make worse things than better. Thus, additional energy required by the future electrical vehicles must be supplied from renewable sources of energy, and the processes required to manufacture the systems that produce renewable energy must be clean.

It is the same situation with digital transformation. It is expected to obtain new or higher value, higher agility, higher resilience, and less costs from systems driven by digital transformation paradigms, but we must investigate the overall ecosystem, and

to promote a holistic perspective, to also understand its side effects. It is not sufficient to investigate the success stories of digital transformation, because it might happen to also have failures in some other companies following the same strategy. Because digital transformation counts on data, we need to avoid the "Wald effect"; that is, to be sure that we look to the right parts of the system when collect and analyze data. We need to avoid the trap of looking only to those parts of the system that are accessible and to resources that are visible. The problem in many cases arise from areas that are less accessible or invisible; that is, solution to a problem might not be in what is seen and present, but in what is missing.

It is also necessary to engage digital transformation in synergy and in parallel with other transformations and improvements within the targeted system. Investments in digital transformation in an environment with poor cultural transformation and lack of innovations in marketing and networking has little chances of success. Digital transformation is not to invest in digital technologies just for having access to data. Digital transformation brings new processes, thus additional costs. To be financially feasible, reforms in rethinking process to generate savings is necessary. And, as in any other cases of successful innovations, adoption of digital transformation requires alignment to the "9x effect"; that is, the benefits obtained from this adoption to be significantly higher than the efforts and discomfort generated to give up to current processes and behaviors.

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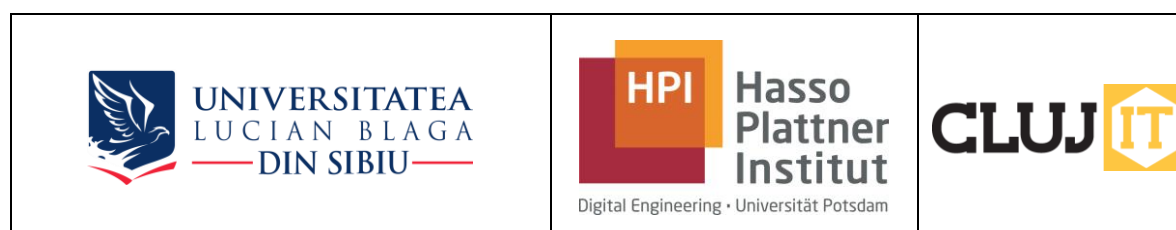
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