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"Decoupling" Between Cognitive Productivity and Growth, Between Technologies, AI and Life Expectancy?

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Abstract

The innovative process of the last 30 years has had - according to some research - a strong acceleration and among the triggering factors we find digital technologies and now AI which will have to be coupled with sustainability issues to redesign the structure and dynamics of entire industrial supply chains towards contamination and techno-social hybridization. According to other sources, however, we find a deceleration of the innovative process which must be investigated in particular with a drop in productivity compared to the golden decades from 1920 to 1970. It will be a question of understanding whether AI or the Metaverse will become acceleration factors just as powerful as - for example - electric energy was at the end of the 19th century. The objective of this work is to investigate the acceleration-deceleration processes of innovation in particular by exploring the emerging clustering factors - internal and external - in the transition from the organization (hierarchical and vertical control) configured by Fordism with a strong Smithian specialization of division work technique compared to the post - Fordist one. Observing the latter through a new cognitive division of labor (of horizontal and holocratic participation) which shows that it "overcomes" the rigidities of the previous model and faces change as an opportunity for shared and sustainable growth. If this trajectory is realistic then the deceleration in growth and productivity found is probably due to a process of adjustment to accumulate the thrust of the change that we will observe in the next 30-40 years and of convergence between a techno-industrial and social clustering structured along a new technological paradigm and convergence between digitalisation and sustainability. The fundamental levers of which are those of multi-specialization, hybridization and contamination between application fields that have so far been differentiated from the home to food, from agro-ecology to agro-industry to biotech, from mechatronics in a key to transforming knowledge which is nevertheless transdisciplinary and no longer simply disciplinary and supported by organizational transformations fueled by dynamic capabilities, open innovation and open roles and second-level welfare. Transformation keys that should be addressed within an eco-systemic perimeter of European and no longer simply national industrial policies to combine the well-being of people and the environment with *new clustering*.

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Introduction

Productivity, technology and growth

According to Robert Gordon, US productivity from 1880 saw a golden 50 years from 1920 to 1970, and then tended to decline, from 2%/year to 0.4% in 2004 (30 years after the Internet and 5 years after the introduction of social media). The "optimists" would say that it is due to the poor statistical ability to record the added quality of ICT to products. Measurement problems which, however, seem to have been present at least in the last century and perhaps in the last two. Gordon's explanation would instead be attributed to the "minor" technological leap of the last 60 years compared to the previous 60. In fact, since 1880 we have noted a cluster of "revolutionary" technical-scientific discoveries. Among these we remember: electromagnetic waves, use of electricity at an industrial/civil level, internal combustion engine, extension of water networks, developments in chemistry, molecular/cellular manipulation capacity, invention of elevators, machine tools, household appliances, radio televisions, telephones, bicycles, airplanes, cars, refrigeration and heating appliances, bathrooms and running water in homes. Innovations that took off with a bundle of scientific revolutions such as the theory of relativity and quantum mechanics for atomic alteration and producing nuclear energy. In the last 30 years we have had various innovations but not as revolutionary as those that arose between 1890 and 1950 and which radically changed the lives of our great-grandparents and from which we were the ones who benefited in a massive and widespread way. We will soon see whether the AI/machine learning/Metaverse coupling will accelerate this possible technological - innovative-behavioral "new leap". Because if in the "great leap from 1880-90" we saw energies and machines that produced new machines with the replacement of physical-muscular strength with mechanical ones, we will see AI at work but with machines that produce/explore new ideas and not only capable of making human action faster, "replacing" pieces of organization and *decision making themselves* in the most routine components but not only. Because we are entering an era in which man will be able to choose and decide more quickly starting from exploratory scientific research and with enormous computing capabilities to evaluate previously unthinkable options and scenarios deriving from enormous or *horizontal* databases (think of the planetary mobility of people, food consumption, health, education, Co2 emissions, etc.) and *vertical ones* (such as studies on atoms and cells or sensors in production processes or large infrastructures) available. By allowing start-up processes to be simulated for example with *digital twins,* this evolution could have a considerable impact on productivity but in the face of an "unpredictable future" compared to the "predictable and probabilistic" one of the 60 golden years between 1890 and 1950 which changed radically the life of man (and his *life expectancy* which has almost doubled from 50 to 90) compared to previous millennia and therefore the state of expectations. We will see if AI will be able to move life expectancy further forward, by how much and in how long (from 90 to 120 or even more?). Making us cross the thin border between a quantitative well-being (of access and availability of material resources for predominantly private use with low sharing) and a qualitative one with the availability of common, collective and public goods/services with high sharing as in the case of the *sharing economy)*. That is, we could witness a decoupling between an increase in qualitative well-being (BES - fair and sustainable well-being) and (non-significant) increases in physical productivity. Which will depend on the interconnection between physical and digital (fusion or confusion?), but also between demographic-migratory factors, the state of healthcare and the birth rate and on the double overcoming of the gender gap and the professional/skill gap that access to AI will bring about. grow enormously. From which will derive the same strong social nature of innovation coupled with a radical change in the nature of value from individual/local for appropriability to collective/global, inter-contextual and socio-environmental for public access. Remembering that the environment is not a resource but a *capacity* in the sense of Amartya Sen. With a competition that from singular will then increasingly become eco-systemic, regional and continental towards cooperation (*coopetition*) inclusive collaboration to attract talents, investors and new residents within a widespread multiculturalism of a "new open society". Which is the current trajectory of change in the West, Europe and Italy to be opposed to the many emerging sovereignisms and populisms that push towards anti-historical closures and autarchic self-sufficiency.

Artificial machines between intelligence and mechanized statistical automation?

The machines we use in calculation are increasingly efficient and powerful, doing the work of accumulative research of correlations on various empirical variables that human practice would do in biblical times. A research to explore invariances and/or evolutionary

trajectories and/or indicators of emerging phenomena to bring order into the chaos of natural or social worlds, atomic or sub-atomic, planetary or of infinite Universes that are out there in the laborious darkness of becoming and 'to be would say. It was naturalistic research in the second scientific revolution whose statistical results will be "transferred" first into epidemiology to discover epidemic and pandemic regularities (with and without parasites), then along the lines of psycho-social research to give birth to the well-known "g" factor ” of human intelligence then codified in IQ. Trajectories that become, in the scientific revolution closest to us, algorithms capable of developing categorizations of stimuli or enzymes or proteins in highly faster and more efficient forms (Chirieleison, 2002). But how much more creative than our nervous networks remains to be investigated and yet imposing itself with an enormous and unimaginable computing power only a few decades ago, injecting *big data* and extracting results very quickly. Such power also lies in the ability to aggregate non-standardized or unstructured data by associating them with greater linearity with information, forecasts and decisions which can in turn be integrated, monitored and corrected where useful or necessary. Therefore by enormously improving the databases on which our daily life is based and the programmatic and planning business calculations for more punctual and targeted measures and therefore improving the relationships between databases and decision-making both for more effective sharing and for superior behavioral profiling often conducted on the universe of available data and not on sample data as in the case of Twitter and localized, national and/or regional or even urban data on territorial niches. From such a wealth of data and processing power, clear improvements are derived both in the tracking and anticipation of choices and in their forecasting and predictive precision as in the case of pre-electoral surveys and also unfortunately of the actions developed for the conditioning of those electoral choices. Therefore with a robust predictive capacity, very useful in the case of epidemiological investigations on the spread of a virus or on the ability to prevent oncological diseases with timing more suitable for saving human lives by being able to anticipate diagnoses and treatments.

A set of (almost) deterministic dynamics that seem to "overcome" the singularity of individuals by operating according to the logic of *population ecology* but which certainly must be protected by working appropriately on the nature of the data to avoid intrusions into personal freedom and privacy and therefore preserving the state of law, the states of procedural transparency, the fairness of treatment which are the basis of the open societies that we frequent and which we must constantly maintain, using the same databases and with independent powers attributed to strong authorities. A regulatory trajectory on which Europe is certainly in a leading position.

From this point of view and if the synthetically drawn picture is sustainable and realistic then we can reasonably argue that artificial intelligence is at the first stage, i.e. that of discovery and exploration of the associations between phenomena and variables, but without the ability to manipulate contexts, to think counter-intuitively and to imagine the future (for now?). However, we are in the presence of unprecedented computing and association power that can help humans in their daily lives, often improving them, as can be the case in predictive and personalized medicine or in the case of urban mobility, or in weather forecasts. Just think of the ability to very quickly evaluate an x-ray spot attributable to a benign or malignant tumor, or how long our car will last based on the hundreds of sensors installed on the car which verify its short, medium or long term reliability and they help us prevent accidents due to mechanical-functional inefficiency, or what we will buy in front of the gondola of a supermarket having to choose between a few dozen available yogurts or during political elections from dozens of candidates given the hundreds or thousands of codified cognitive-emotional *biases* in our neural network by natural selection. *Bias* that AI enthusiasts (or "operators"?) can use to "guide" our choices in one direction or another, making us believe that they are voluntary and spontaneous choices without prejudice and according to an efficient rationality or a linear logic to achieve an unconditional categorization of emerging phenomena in the reality we live in. Therefore paternalistic purposes that enter the data and are used to train the machines using those prejudices to distinguish and separate (or homogenize and aggregate) and therefore "discriminating" for better or for worse and which we certainly must avoid with careful regulation and affirmation of rights of the person.

For this reason, uncertainties on a social-behavioural level are especially crowded in the development of "populations of algorithms" which could cumulatively find gaps in the control perimeters for self-organization and effectively represent a threat to our founding values. A risk that was already clearly described by Norbert Wiener almost 75 years ago for the disastrous results in the development of totalitarian systems. Systems that can - and already do in some cases - adopt systems of

widespread and systematic public control to draw up fluid rankings of people (by ethnicity, origin, skin colour, religion, etc.) managed and "regulated" by algorithms to this end educated with specific *social credits.* According to Cristianini (2023) natural selection mechanisms such as "invisible hand" could be formed which through "gravitational pushes" are oriented or deviated in specific directions with *unintentional negative consequences* with respect to the useful uses and socio-political achievements achieved and therefore distorting free and open democratic play in favor of specific political choices that are discriminatory and in conflict with universal freedoms and rights. Hence the EU's great effort in regulation with the *AI Act* of 2023 with pioneering legislation putting in place beacons and posts for efficient regulation.

What regulation and for what security in AI in Europe?

The European Commission's AI Act is not only useful but necessary in regulating AI-based software used both privately and publicly for decades. The primary objective is to reduce the risk of introducing prejudice and social discrimination by going to the basis of the control of the *training data* of these machines. Furthermore, putting tools into the hands of the end user to defend themselves from intrusion and in particular making them aware of entering an area of interaction with programs generated by AI starting from a database that tracks all the different applications active in the different phases of use. In particular, paying attention to what emerged with the new version of Open AI / Chat-GPT in 2022, a *generative source that* is enormously more complex than what was known until then, clearly separating itself in scale and power of action from traditional "search engines". ”(and primarily by Google), trained with an online database published and updated until 2021 and with results whose effects proved unexpected even by the most attentive experts due to the high quality of the answers compared to questions formulated in natural human language. The delicate point of the whole process is that the strategy with which Chat-GPT achieves its objective is often obscure, starting from contents that could be defined as harmful to society and individuals. This is why they require reliable and efficient interfaces for a highly secure mediation between user and AI machine that surpass traditional cyber-security ones which have the function of mitigating or attenuating potentially harmful responses or solutions, making the methods of choice and design of the algorithms transparent with learning traces. Mediation or blocking mechanisms that may not always be activated and therefore not detecting - or estimating - a low level of danger in the responses. The *AI Act* approved by the European Commission has the objective of monitoring and controlling the nature of the new risks emerging from these *Generative Artificial Intelligences.* It is now clear to all the major experts in the sector that as the complexity of the delegated functions increases, the damage caused by responses that are not adequately "filtered or selectively interfaced" will also tend to increase, for example in relation to political disinformation which can damage the quality of democracy and elected officials along the entire chain of democratic representation, distorting the outcomes of the democratic process.

So the essential point to reflect on concerns the *degree of autonomy* to be transferred to generative artificial super intelligences in the creation of software beyond the "safety threshold", given that we may not be able (beyond that threshold) to intervene if that software were in capable of intentionally (less probable but not impossible) or due to inefficiency (very probable) inserting errors that are irreversibly harmful to human and/or environmental safety, as is quite evident in the case of accidents due to autonomous driving. Much will depend on how much this intelligence can develop in the next 10-20 years, because we may not be able to identify, stop and/or defuse any errors (voluntary or involuntary) as they are due to a cumulative super intelligence which will be significantly superior to that human as it is expanded on global and planetary neural and learning networks. Reason that must make us careful and rigorous with the regulation of what happened with the activation of Chat-GPT compared to what we had before that *intelligence threshold.* That is, exploring precisely this pivot point with research, that is, with the explanation of the process of generating a strategy by a *super AI* starting from its design up to the forms of training to verify its safety throughout its development cycle limiting its uncontrolled proliferation which can lead to chains of irreversible and harmful errors for mankind. Controlling its operation throughout the complex and articulated *life cycle assessment* to contain possible risks should be the objective of the *AI Act* of the European Parliament just released and to be updated over time through a *super-specialized independent authority* acting on behalf of the Commission (and only for that and therefore being a full-fledged organism) as happens for nuclear proliferation or for the Court of Justice in The Hague. Because risk analyzes and compliance tests released by the same companies that produce super AI or by third parties

guided by pure market logic are certainly not enough, because all the maximum-minimum risks connected to security and any circumventions must be verified and bound to requirements stringent, demonstrable and public. Therefore an *evolutionary AI Act,* continuously updateable based on the transformations of the object of investigation in all the forms that will be assumed by the *generative Super AI.* Furthermore, it can be a guide to many other technological trajectories such as that connected with *biotech* in relation to health and the food chain.

New technologies and supply chains in the role of *Digital Twins*

On the manufacturing frontier of technology today there is a lot of talk about digital twins, meaning by this a virtual model of a physical object capable of *executing-controlling-adapting* its life cycle and using the real-time data transferred from the sensors on the object itself to simulate its behavior and monitor the progress and continuity of operations on the "real twin". Therefore, digital twins can replicate (almost) infinite elements of the real world in various sectors, from minimal factory equipment to more complex installations, such as giant dams, nuclear plants or wind turbines and even entire cities. Digital twin technology allows you to supervise the performance of a process-resource with *crash tests,* identify potential failures and make more informed maintenance and lifecycle decisions by reducing errors and interruptions, i.e. assigning great continuity and reliability to processes.

The advantages of digital twins are notable and we can list them below.

Improvement of micro and macro process performance

The information bases and *real-time monitoring* provided by digital twins (GD) lead to the optimization of the performance of equipment, systems or network or individual structures. Problems can therefore be resolved as they emerge, ensuring continuity and reducing downtime.

Predictive capabilities

GDs offer an overall and complete visual and digital view of a production plant, production-commercial building or network which may include tens, hundreds or thousands of pieces of equipment. Through distributed intelligent sensors it is possible to monitor the output for each individual component, reporting interruptions, problems or faults as they occur and at the same time the possible technical-structural-functional solutions. In this way, problems are anticipated and action is taken before the "system breakdown" occurs.

Remote monitoring

The virtual nature of GD allows remote monitoring and control of all structures and/or plant networks, minimizing the number of people dedicated to these functions.

Accelerated production times

It is therefore possible to accelerate production times of products and structures before they even exist by creating perfectly identical and three-dimensional digital replicas in order to continuously verify the impacts of the individual product or process-system for differentiated scenarios *before* physically starting the processes.

Multiplicity of application sectors

There are numerous and varied sectors that employ these processes of virtualization of the physical structure, from construction to manufacturing, energy, healthcare, food, transport, etc.

In the different sectors of the economy we see differentiated impacts

Building

Construction design teams create GDs to configure better residential, commercial and infrastructure projects by providing real-time, systematic representations of existing real-world projects. Thus architects use GD as a *planning lever* for individual projects by combining 3D modeling of buildings with resource and process planning activities, before, during and after their construction. So much so that with GD, commercial buildings can monitor historical and current data of multiple operating variables: temperature, occupancy and air quality inside rooms and open spaces in order to increasingly improve the well-being and comfort of occupants. important for system productivity, as well as for their implementation with highly safe construction sites and capable of eliminating the "plague" of mortality in the workplace by anticipating stress, fractures, imbalances, well in advance.

Manufacturing

GD are used throughout the entire production life cycle, from conception to design - planning up to maintenance of existing systems. With GD prototyping it is possible to monitor equipment and production systems in operation by extracting and analyzing data on performance, output and possible interruptions of parts or the entirety of the plant or network process.

Power

GDs are very widespread in the energy sector to support the strategic planning of projects and the optimization of performance and life cycles of existing resources (as in the case of offshore installations, refining plants, wind farms and solar projects, photovoltaic power plants, oil pipelines or aqueducts).

Automotive

GD in the automotive industry serve to create digital models of production processes but also of the vehicles themselves to provide detailed information on the physical behavior of the vehicle under conditions of specific chemical-physical-mechanical-functional stresses, as well as on software, mechanical and electrical models. An area of great importance for the use of very valuable predictive maintenance because in this way it is possible to alert an assistance center or a user when a problem with the performance of the components is detected and therefore be able to intervene before breakages that can have consequences even catastrophic.

Healthcare

GD in healthcare have various purposes - as is known - and among these the virtual creation of entire hospitals or operating rooms, multiple healthcare facilities, laboratories and human bodies to model organs and perform simulations to show how patients respond to specific treatments and how they react to bio-chemical-mechanical interventions.

Nutrition and food

GD in the food sector are used to simulate production processes subjected to chemical-physical-mechanical-toxicological stress tests and anticipating the effects on the output both in direct terms on the products and/or on the packaging or on its transport and conservation. Best evaluating both resistance and degradation or degeneration and which could be linked to the home conservation of the final consumer and/or restaurants/hotels.

For this purpose, different types of digital twins are therefore generated which often can

I - work in parallel in the same system;
II – replicate only individual parts of an object and/or process;
III – act in a systemic and integrated way through a virtual representation.

Among the most well-known and common types of GD we find the following.

Component / Parts Cufflinks

They digitally represent a single piece of an entire, more complex system, for example an engine propeller that is part of a geothermal or wind turbine.

Resource Gemini

Resources represent two or more components that work together as part of a more complete system as a virtualized expression of the ways in which the components interact and produce information on performance and structures, fundamental for analyzing and making informed and conscious decisions.

System twins

A variant of resource twins are system twins as a level of abstraction above the integrated ensemble unit level. Therefore showing how different resources interact with each other within a broader system with visibility of the technological system to make prevention, improvement and development decisions in the efficiency-effectiveness of performance.

Process twins

Process GD explores the digital environment of an entire object by generating information on how its various components, resources and units work together in their complex space-time interaction, being able to analyze each component.

Clearly we record a strong integration of these components/parts and therefore we can say that a GD works by digitally replicating a physical resource in the

virtual environment, including its functionality, characteristics and expected behaviors through (more/less) realistic simulations. The key to all this connective tissue lies in intelligent sensors distributed along the complex process-system to monitor its "life cycle" and intervene preventively from the prototype phase, to implementation up to its final disassembly phase for the management of the "end life".

This is why the GDs integrate various tools from different technologies to create a configuration that is efficient, functional and continuously monitorable: from the Internet of Things to AI-Artificial Intelligence up to the simulations and sensors of the GDs which will have an efficiency-enhancing impact on the resource planning systems and the necessary (or useful) human interventions on the overall cycle to ensure its continuity.

Internet of Things

The term IoT as known refers to the collective network of connected devices and technologies that facilitates communication between multiple devices, devices and clouds. Low-cost computer chips and high-bandwidth telecommunications have led to billions of devices connected to the Internet. GDs depend on the data emitted by IoT sensors to transfer information from the real world object to the digital world object which can communicate "actively" through software platforms or dashboards that make all real-time monitoring and updates possible.

Artificial intelligence

Artificial intelligence (AI) is a field of computer science development dedicated to solving cognitive problems commonly associated with human intelligence, such as learning, problem solving, and pattern recognition. *Machine learning (ML) refers* to the AI technique capable of developing algorithms and statistical models used by computer systems to carry out activities without explicit instructions and instead relying on inference models. GD technology therefore uses *machine learning algorithms* to process large quantities of data deriving from widespread and integrated sensors to model performance and behavior emerging from Big Data. Artificial intelligence and machine learning (AI/ML) therefore provide very detailed information on data relating to performance optimization, maintenance, emissions and efficiency, as well as any "corrections" that derive from learning on the fly. which these machines can be trained and hence obviously also the many problems connected to privacy and security, which for example the European Union is trying to appropriately regulate with specific Digital Acts.

Digital twins and simulations

Therefore, for the considerations developed above, GDs enable the development of systematic virtual simulations of processes based on models, with some differences that should be mentioned. Simulations are in fact generally used for design activities and, in some cases, for offline optimization related to monitoring. Designers then insert changes to the simulations to observe *what-if scenarios* and analyze the outcomes. GDs are therefore complex virtual environments with which it is possible to interact and which can be updated in real time and therefore often take on larger and more integrated dimensions for scale and applications.

For example, if we consider autonomous driving this represents a simulation in all respects. A new driver can have an immersive test experience, learn how various parts of the car work and deal with different real-world scenarios while driving virtually. Therefore fusing real and virtual dimensions. However, the scenarios are not always connected to a real physical car. A car GD is connected to the physical vehicle and allows you to know everything about the real car, including vital performance statistics, parts replaced in the past, potential problems recorded by sensors, previous maintenance and monitoring records, verification activities and systematic review.

But what are the legal, social and ethical implications of these processes, for example on the road accidents that may result and the responsibilities? What is the boundary between automaton decision and human decision and how to "attribute" responsibilities? We could ask the same questions about other issues connected with food or nutrition and the implications deriving from the use of a certain type of natural rather than artificial food for our health and what solutions we could adopt and which we could represent through the *metaverse* to explore possible integrations, exits or adaptations.

Metaverse between technology, ethics and responsibility: human action at an epochal turning point in the transformation of forms of value creation and business models

The *metaverse* is a virtual place (space) of collaboration between people through their digital identities, which

takes on a social value capable of influencing the world in which we live both in consumption, production or services and in entertainment. The *metaverse* can bring benefits to society, for example with the possibility of immersive sessions in education and training, healthcare and workplaces , simulating behaviors and outcomes from which to choose. However, there are also disadvantages that should be highlighted regarding the social impacts of the *metaverse*. According to 43% of respondents, the *metaverse* will further increase the power of tech companies over real-life institutions. Furthermore , according to 30% of those interviewed, the *metaverse* will amplify economic and social inequalities because it will require adequate skills both to accommodate the greater advantages and to control the disadvantages. All this will depend on the system of useful and/or necessary rules to offer users a perimeter in which to move with safety and transparency, as well as with awareness of what the Metaverse represents as a transformation of the living space in which we are immersed to work, consume, learn, have fun. But the critical question is whether we need this virtualized world. An expansion of space that we have already seen over time as an expansion of writing in the 19th century with *telegraphy* (telegraph) and in the 20th century with the voice which became telephony (telephone), then followed by images with television and *cinema.* Now with the Internet we can project all this into an *entire imaginary integrated* in a virtual way in a sort of parallel reality as in a personalized (and massified) cinema useful for communicating who we are, where we are and what we do and which we find for the first time in 1992 in the novel (and then in the film) *Snow Crash* by Neal Stephenson, American writer (Baravelli, et al., 2023). Here a post-capitalist reality was imagined with the Metaverse acting as an interface between people and things. It will then be in 2021 that with Facebook and the "maturity" phase of social media that we will see the Metaverse elevated to the *New Frontier* of the Internet so much so that it will be adopted as a new name: *Meta.* Perhaps also because the original cycle of Facebook and Google or Amazon and Tencent has ended and another one is beginning but one whose boundaries and development possibilities are not yet known. In a short time, the Metaverse has become a term among the vast global public that was initially mysterious but then penetrated into the common lexicon aimed at representing a complex ecosystem of virtual-immersive environments - *interconnected and interoperable* - capable of integrating everything that has been invented up to this point in doing, having fun, imagining between working, playing, socializing, interacting and purchasing. An ecosystem that adds to the various *devices* that we have seen in the last 100 years for the automation of writing that has now passed through and expanded into/from communication (from the telegraph, to the telephone, to the computer and to the smartphone): viewers and *avatars.* The viewer to "move and act" in virtualized space through *avatars,* i.e. "humanized or domesticated" virtual subjects-objects that interact in that environment by simulating and/or imagining parallel realities by moving arts and visions and experiencing exploratory emotions. What makes that context virtual - that is, a Metaverse - is its own

1. open accessibility (via registration and authentication),
2. its persistence (existence independent of the people and objects that populate it),
3. its appropriability of objects and spaces and, finally,
4. its interoperability between subjects-objects-avatars on the basis of gradually defined rules (Biffignardi, 2013).

We are therefore faced with a "living and interacting" ecosystem that actively and cumulatively integrates multiple technologies but whose mission and direction, utilities and threats still elude us. An eco-system where we find virtual reality contexts and viewers, but also blockchains, the *Internet of Things* (IoT) and the perimeters-rules of *cybersecurity* interrelated by discursive-transformative fabrics of AI, *cloud computing* and *machine learning*. We will soon see what real impact these interactive-relational fabrics will produce, but even before that we will have to fully understand how they function along the transition from Web 2.0 to Web 3.0, aiming at what Web 4.0 or 5.0 will be and what the system of useful and necessary rules will be. To guide the good functioning of these complex cyber-systems between human-machine cooperation and coexistence and risks of "fusion" as in the risky trajectories offered by Transhumanism. First of all, considering the decentralization processes allowed by the Blockchain whose transactions will be regulated by the now well-known NfT (*NoFungible Token*). From here we will be able (we will have to) understand more deeply the emerging potential of these integrations and interactions between subjects, objects and contexts in shaping business models and transforming production systems as well as in changing the forms of entertainment and communication as well as use of the same devices as the traditional PC or smartphone or the TV as we have known it so far. For the moment we are still witnessing what happens on the surface in the uses of the Metaverse by surfing on marketing techniques given that only 4%

of potential corporate users make systematic and solid use of it, while over 25% declare they do not care about it and the 65% declare that it is in the study and evaluation phase which is certainly a data of interest while waiting for the wave of movement and push for effective uses starting from communication. The greatest limit probably still lies in the very high variety available of these worlds in search of useful standards and "convergence" which - as the Polytechnic says - are at least 141 and of which less than half have characteristics that make them recognizable as a Metaverse (i.e. accessible, persistent, interoperable, appropriable). A significant part are Focused worlds, that is, specialized in a particular field of interest and/or business (or gaming, or commerce, or working life, or training or, again, *shoroomingworlds,* i.e. virtual showcases). Hence the differences between Meta's Horizon Worlds, or Fortnite and Microsoft Mesh world or MuseeDezentral (virtual showcases) and the whole great world of "virtual games". Just as there are temporary spaces dedicated to specific events or demonstrations developed by multiple companies from retail to information technology to entertainment. So where we notice a lot of communication on brands to create visibility and traffic around them without particular developments, because we are in a source and innovative-creative phase where we still see little of the lines of convergence and common standards which however will arrive shortly, jumping from *gaming* to communication useful for attracting customers and generating interest around brands but without using real integrated platforms. Effectively spreading the *customer experience* through immersion even to audiences who would otherwise not be involved except with these tools and transforming the customer into an active actor of attractiveness towards the brand through intelligent socialization practices capable of strong loyalty. Hence the second opportunity to broaden and transform sales channels by integrating virtual goods (NfT) and physical goods (to view, try and purchase). Furthermore, pre- and post-sales technical assistance can also change with more attractive and engaging methods for many products with repeated use, especially but not only (think of food). Finally, the collection of data that is connected to consumption styles and lifestyles changes radically and therefore provides more useful information for marketing managers to set sales policies and evaluate their effectiveness as well as for possible ongoing adaptive correction actions of work given the greater details on biometric and bio-behavioral data. The next Alpha and Z generations will be able to relate better than older generations who are more compatible with the "physical world" of shops and materiality and of voice with respect to avatars and chat-bots, but it is clear that brands will have to move towards substantial *omnichannel* by operating continuously as an option extended to the entire spectrum of consumers-customers-citizens of multiple generations in "hybrid" forms as already happens in retail, real estate or tourism with platforms such as Dworld of the Principality of Monaco. But what are the user targets and for which differentiated audiences that can favor a correct and stable *value proposition* useful for their diffusion in time and space given that in the Italian case 2 million Italians have already tried this immersive reality?

Impacts of AI on employment and investments

Therefore we are faced with a long road which, although just started, seems to be accelerating towards a *continuum* between the physical and digital world of which we will have to understand the forms, potential and impacts (qualitative-quantitative) as well as the direct-indirect effects on employment which show indicators growing and widespread throughout the world as evident in these simple data in Tab 1 and 2.

It is also clear from these data that the expected "Great Convergence" between physical and digital connected to AI will be "disruptive" and for this reason it will not be enough to simply acquire digital skills and capabilities as "incremental and continuous improvement in a linear sense", but an enormous training investment will be needed along the entire educational chain from compulsory to university and beyond. Because the "replacement" effects will be strong and to which we will be able to respond with work and training policies coordinated at a continental level and not only of *up-skilling and re-skilling* but by redesigning the technological and organizational alphabets held up to now also by "unlearning" what we have known so far, also with injections of strong responsibility and exploration of the virtues and positive motivations of people with extensive corporate and participatory welfare programs. Which means having welcoming organizations, companies and visionary leaders to encourage the necessary wave of *disruptive change* that will accompany it and that we already see in private investments in the race to use AI in the table below.

An underlying trend that shows clear "overshoots" in global GDP growth and in technological investments in particular. Suffice it to note that digital investments in Italy between 2019 and 2022 increased by only 4% on average in real terms and GDP less than 1%.

The obstacles to a diffusive perspective of the *Metaverse*: technical, cultural, regulatory

It is clear that among the first challenges we find the forms and methods of regulation differentiated according to the continental contexts involved but which in the medium term will have to converge towards common standards and rules of this virtual and decentralized world where the physical life of atoms is not yet successful, however to integrate completely with the digital one of bits despite the gush of more or less significant widespread activities and initiatives.

Because, *first of all,* it is a question of asking ourselves what is lawful and what is not, which if in other "real worlds" is easy to understand, in this case multiple attentions and very precise "regulatory boundaries" are required on which behaviors are lawful, which laws can be translated between real and virtual and in particular how to certify digital identity, i.e. whether for example to make avatars coincide with physical identities. Then between Blockchain and NFT how to regulate virtualized transactions and the legal validity of contracts, i.e. what coincidence between a contract in the Metaverse and the real one and with what transitions and "compensations" for potential violations. In short, it will be a matter of carefully evaluating the boundary and contamination between the real world and the virtual world dependent on the transfer of information.

Secondly, the technological issue is actually critical because it conditions the key activity connected to the interoperability between multiple virtual and real worlds, allowing (real) people to transit from one to the other without problems. In fact, if there were no interoperability, a consumer or a financier would risk remaining "hostages" of the virtual boundaries into which they have penetrated without being able to escape, crumbling the very concept of the Metaverse. To this must be added the evaluation and operation of connectivity or access to the physical infrastructure and its quality (broadband and 5G as basic characteristics).

Thirdly, there is a behavioral challenge connected to the use of specific devices - such as viewers - which have an impact on physical, mental and cognitive well-being and on the relational quality in general between oneself and the virtual world in which sensations of movement gush out despite being essentially at a standstill with non-trivial side effects of *cognitive and physical sickness* which require future developments at least in terms of mitigation and containment.

Fourthly, we are certainly faced with the great issue of computer security which becomes the supporting heart of this complex context of communication, interaction and simulation where antiviruses will probably not be sufficient, exposing these new devices to a broad and profound vulnerability which will need to be evaluated and which suitable systemic and ecological solutions must be found, especially to protect the widespread and massive biometric data that are mobilised. Because it is therefore clear that the diffusion potential of these context and ecological-systemic tools will be able to spread adequately if and only if the trust perceived by potential users is considered high or in any case adequate. That is, perceived as useful for ensuring their robust adaptive protection in the presence of malicious uses and identity theft which will become the most powerful threat for this "new techno-virtual and emotional-fiduciary-relational landscape for transferring information, closing transactions, mobilizing virtual objects.

This is why regulation, security and trust are inextricably linked and the control system must be highly reliable to avoid precisely those violations that can tamper with its functioning and therefore spread through malicious uses and cyber crime. Hence the need to raise awareness, training and education, including ethical ones, on the use of these tools in order to ensure trust, security and accessibility with widespread and systematic control shared on a planetary level, given that the Metaverse will be the natural evolutionary transformation of the Internet spreading into real worlds such as mobility, medicine or food or entertainment and tourism or education.

In such a complex world we certainly cannot think of replicating traditional business models *sic et simpliciter* but we will have to work to change it and make it compatible with this virtual world by adequately selecting user targets to reach and retain in a future yet to be written but whose regulation must already be ready before its massive diffusion, avoiding the distortions and anomalous concentrations that occurred with the Internet and Social Media after 2001.

AI, machine learning and banking

The great race for generative artificial intelligence has also begun in banks after the launch of autonomous driving in the automotive industry. Bloomberg's data on expected investments for 2020-2032 are eloquent (Fig.1) indicating that the business values that can arise from this are of enormous importance. So much so that

Bloomberg's estimate of the expected explosion of chat-GPT and Google Bard (and related developments) is estimated at $1.3 trillion by 2032, albeit starting from the low $40 billion level of 2022. The revolution has begun, but to do what? Such as the impacts on employment, consulting, customer services, on the organization of e.g. large global investment banks. JP Morgan, for example, is developing an AI platform with the (patented) Index-GPT project to support investors in their operations and choices on the financial and stock markets. In this case, the generative AI-based software helps clients analyze and select tailor-made securities, feeding a personalized profile of their investments.

Other banks are operationally exploring other "internal" functions and among them: a - supporting software engineers to create code faster and more efficiently-effectively; b - support their financial advisors with their operational questions, both organizational and commercial (towards customers or internal partners).

But JP Morgan's commitment could represent the first investment in a proprietary platform aimed at managing purely financial functions and that will engage an army of 1500 engineers focused on development. So, on the one hand, investments in technology and expertise are growing, and on the other, some typically consulting functions are being replaced by technology. The balance will also depend on training investments for the retraining of front office functions (such as some back office functions) but it certainly cannot be defined - in jargon - as a "gala lunch" and which will involve all organizational and hierarchical levels of banks. What are the organizational effects and impacts between centralization and decentralization? It will depend on the prevailing context, culture, and organizational climate.

Other banks such as Goldman Sachs have launched other types of platforms, in this case more oriented towards social and Big Data for operational management on the front end. In this case, the software automatically creates strings of user profiles from an employer's databases and injects news feeds useful for a proactive connection between people who would potentially have "usefulness" from getting to know each other and pooling multiple activities to generate shared benefits.

Morgan Stanley has developed other activities through an agreement with Open AI to access the use of Chat-GPT to support its asset managers in a more open and "on-demand" way. This frees up valuable time for these advisors to focus on the more sophisticated, value-added customer service support functions that improve loyalty, but in a more open way like "shelf access." But what are the effects on the back office and on the "centralized" structure of the bank?

With regard to Italy, Banca Intesa San Paolo has also planned activities in the AI area, providing for 2000 hires and whether more oriented to the back office or front office (or both) we will soon see, as well as on the effects of centralization / decentralization.

Therefore, diversified approaches to the use of AI and yet with still little awareness of the organizational and/or substitutive impacts of labor and technologies. So much so that on the other hand, many of these banks have banned employees from using chatGPT itself, which is also consistent with restrictive choices on the use of third-party software and which should lead to the use of proprietary platforms that seems to be JP Morgan's orientation but which will not necessarily be followed by all the banking-financial giants on the planet, because it will depend a lot on the dominant organizational model and business model choices. Of course, all banks are exploring ways to exploit the potential of generative AI with "in-house" projects to better integrate cost reduction effects, increases in effectiveness, speed and decision-making flexibility with increases in creative capabilities. However, the choices that will be consolidated will depend on the necessary or useful changes to the prevailing organizational models and their outcomes on business models as well as on the banking-financial ecosystem.

On emergent life differences between error as bias and noise for *decision-making hygiene*

Emergent organization go back to biology suggesting that *Evolution* is not the "linear path" from the simple to the complex, but an uninterrupted, discontinuous and imperfect chain of experiments and errors, largely involuntary that Lamarck first and Darwin then has photograph with intelligence, persistent curiosity and rigor opening up the modernity of thought and science of Life as we know it. They described those "jumps" between darkness and light of which the Man who will come will not be the most evolved result but one of the many branches (between processes of serendipity and exaptation) that Stephen Jay Gould will repaint beautifully in *The Wonderful Life*.

Because the Earth is perhaps the only place in the Universe - of which more than 98% remains unknown to

us according to Stephen Hawking - where Life has blossomed as it is known to us today including the envelope of oxygen that has arisen and that surrounds it and that has also gemmed that distributed intelligence that has made it vital and gushing, even without a thinking and unifying creator brain. A specificity of Life that has made unique this Earth that we trample on, where we breathe and drink, that we should protect from the reckless use of its finite resources - especially of the last 250 years - as a common good and the only possible home between 10,000 meters below and above the sea. Because that oxygen is entirely produced by the organisms and living beings that have lived there for hundreds of millions of years, starting with the single-celled (and then multicellular) ones capable of developing photosynthesis.

A representation such as to signal that between us and the world there is an invisible, distant and inextricable continuity and that through the planetary living macro-organism to which we belong its depth is revealed that accompanies us "*through the world rather than beyond the world*", as the warm verses of Wallace Stevens indicate to us. Such as to push us (perhaps) towards a humanity more aware of the animate and inanimate, immersive and transformative in a constellation of multiple Selves, which unites and differentiates us, in that wonderful and shining *Network of Hermes* that we are tearing apart.

Studies that highlight a nature of the mind as a "sensitive configuration" on the one hand and, on the other, as an expression of biological and physical-biochemical processes. Results that question us on human decision-making processes and on the consequences of the actions that derive from them, sometimes rational and sometimes even irrational, procedural and / or creative, abstract and / or concrete, individualizing and / or cooperative and therefore on coupling or decoupling between strategic choices and organization within strings that are not always linear or sequential but also inverse, following intuitions or heuristic simplifications assigned by custom or noise, between right and wrong. It is clear that for the octopus or the dolphin the "decisions" (if we can say so) are always "genetically right", but not so for the man who can choose according to an ethics or an aesthetic ("responsibly") between several options and can make mistakes whose "coexistence" should guide us (and often it is) to improvement and also to evolution.

So the man in decisions has to deal with the background "noise" as Daniel Khaneman, Olivier Sibony and Cass R. Sustein (2021) tell us in the interesting book "*Noise"*. According to these scholars, "noise" does not coincide with error as "bias", because the latter arises when in a set of judgments almost all errors tend to go in the same direction, as an expression of an average error, which we could define as objective and therefore also measurable. According to these scholars, "noise" does not coincide with error as "bias", because the latter arises when in a set of judgments almost all errors tend to go in the same direction, as an expression of an average error, which we could define as objective and therefore also measurable. While noise is coupled with a variety and plurality of visions, values, opinions or taste therefore connected to the diversity of this humanity that is cultural, aesthetic, ethical, experiential or behavioral also due to habits. So it is not a mistake and it is difficult to measure being strongly subjective, as they have also detected in behavioral reactions to the pandemic and vaccination (not mandatory in any country) due precisely to the differentiated background noise present in the different countries and which has shifted the perception of the objectivity of the facts on the basis of glasses subjectively - therefore culturally or ideologically - oriented. Each of us develops a kind of chain of justifications that can support our own assessments able to support their own evaluations where errors are difficult to calculate because they are "*dirty*" by "evaluative judgments", because errors require a "real comparison threshold" that the "evaluative judgments" have not generated precisely halos of noise. So for Kahneman, Sibony and Sustain improving judgment and minimizing noise means, on the one hand, acquiring the skills-knowledge useful and necessary to support a correct cognitive style and, on the other, adopting a specific "decision-making hygiene". The latter focuses on six basic principles:

A – to make accuracy prevail over simple individual expression;
B – thinking in statistical terms;
C - structuring judgments into independent tasks;
D – resisting premature intentions;
E - obtaining independent judgments and aggregate them;
F – preferring judgments and relative scales.

Adopting "*decision-making hygiene*" schemes can be very difficult but just as necessary as *"personal hygiene*", especially if you want to attract rather than reject to help reduce noise which would also show a reduction in resources, improving security, but also increase equity in the world, offered and perceived. Subjectivity would be

contained within physiological margins also for a clearer separation between decision and action useful to better understand the consequences of one and the other in an independent way "*choosing*" those automatisms that often imprison us. As for those microdecisions that we pocket every day in eating, in the use of water or electricity and many devices that accompany us as well as the habits in educational choices towards sons or children.

Adoption of decision-making hygiene is supported by flexibility and plasticity of our brain in a continuous interaction with environment by multiple experiences pushing for the extremely richeness of neurons (86 billion strictly connected with other 10.000 for everyone as estimate by bio-neuroscience) nonetheless the relative poor number of geness (estimated in 20.000).

Why we can see that apparent paradox? Because the evolution has generate by the origin a brain largely incomplete and transformable by experience and it exmaplains physical dimension of our brain and its plasticity respect to other animal with necessarily more time to growth our child if compared with a small horse that in few minutes can walk. In particular, with a brain specialized in two symmetric emisphere but in a certain grade with a hig level of substitution in case of a crash of one of the two for accident or pathology and in a continuous activity also by night with dreams that probably change the nature of its as demonstrate by Eagleman.

The stimulation of brain for new experiences (cognitive and/or practices and/or honiric) is important for maintain neurons network in high level of activity both by day and night. It is able to reduce routines day-by-day with a continuous innovation of our simple practices, for example using left hend of feet if normally we use right of both for simple activity (eating or teeth washing or playng a ball with friends) towards growing plasticity. Following Drucker (1986) we can say "*the strengthening of our senses derives from the ability of the neurons of the cortex to manage any type of input data. As with computers, even our brain, if printed by new data, will tend to organize itself to extract what is needed to expand its model of the world*".

It becomes more clearly the reasons why a brain with two symmetric parts «specialized» (left/rational and right/emotional) for only 20 thousand genes and 86 billion neurons x 10 thousand connection for everyone …as a powerful neural network. Simple, because, adaptability, plasticity and flexibility to learn by experience (by vibrant resonance activate also with emotional intelligence supported by the other 4 – analitical, practical, social, relationale) not available for many other animals or mammals (Eagleman, 2020) between bias and errors for building and empowering cognitive vibration for … emergent consciousness and mindfulness for fluorishing sense making and a vision of the future. Vibration moves all type of intelligence for dyanmic cognitive (and physical) functions able to compensate some crasch (e.g. from Alzeimer pathology or any other accident to brain).

Our brain functioning is able to learn by experience in condition of hyper-innovation or stress with high level of substitution of different area of specialization as an emergent ability of the neurons of the cortex to manage any type of input data.

A differenziation that in our modern organization influences the non-linear connection, distance and priority between decision and action in building strategy in front of (internal and external) uncertainty. Emotion, curiosity and passion of people in organization are useful to accelerate the vibration of community brain able to transfer knowledge and information as neurons in every single brain. A dynamic condition for improve better the following process:

A – forecast new phenomenas
B – create new vision
C – building new activity
D – generate new connections and relationships.

One of the main reason why organization of the future needs of advanced trajectories of participation model as an integrated platform mind of an organic community brain towards resilience. In that case we can say that organization "prevail" on strategy and everytime is necessary to answer rapidly to environment changes by new experiences and data and could be relevant to stress action respect to decision *strictusensu* able to learn by new emergent experiences expanding *model of the world.*

Emergent changing conditions where solutions could anticipate problems as in case of exaptation phenomenas reordering chaos for new order. Consequently we need of organization where people "vertically" specialized have to develop forms of collaboration more hard with people "horizontally" specialized for new team building able to explore always new field of applied knowledge oriented to variety of projects by hybridation and contamination.

Dynamic capabilities between complexity and digital-sustainable transformation towards ecology of value

Digital and environment evolution push the organizational transformation towards disruption of traditional capabilities in front of obsolescence of current skills, traditional competence and resources changing the architecture to achieve and sustain competitive advantage as an ecology of value. Dynamic capabilities can reconnect action and decision to adapt in continuous changing environment, coupling with internal and external ones reconfiguring purpose of the firm.

Following Teece *et al.,* (1997) we can define dynamic capabilities as an ecology capacity of an organization to redesign, create and transform basic resources as in case of digital transformation crossing green adaptation to change environment. The strategic management literature have to shift to study dynamic capabilities in a complex and interdependent world changing value creation processes, traditional organizational task and competences able to rebuild business performance and value (Teece, 2018; Wackernagel M, Beyers, 2020; Weick and Sutcliffe, 2007) as an ecology of value (Pilotti, 2016). To engage interdependence between digital transformation and sustainable trajectories of evolution towards an ecology of value ask to the firm anew set of capabilities able to sustain new business model on external boundary with a flexible and adapting organization on internal one. Teece (2007) suggest a microfoundations of tridimensional leverages to create dynamic capabilities oriented to build – we can say - ecology of value in the organization and its network as an integrated organism adding a fourth leverage:

- *Sensing* (and shaping new opportunities involves activities such as scanning, creating, learning and interpreting and entails identification, development, co-development and assessment of technological opportunities in relationship to both customer needs (Teece, 2007, 2018) but also to working people and management needs. Digital and sustainable sensing capabilities need to be built by firms in order to better understand unanticipated developments in a changing business landscape and to take actions to manage change (Jacobi and Brenner, 2018)
- *Seizing* (as capture the value of potential business opportunities and to decide what specific changes are needed throughout the organization to seize the value of new opportunities overcome gap in capabilities as in case of digitalization and sustainability (Karimi and Walter, 2015; Ellstrom *et al.,* 2022).
- *Reconfiguring capabilities*(able to transform organization and assets as better matching between trajectories of firm growth and the environment changes for profitable sustainability (Teece, 2014; Teece, 2018)
- *Routines hybridating* resources as in case of digital and green/sustainable quality of those, building new resources overcome current gap in the resource base of firm (Yeow *et al.,* 2018).

This paper redefine dynamic capabilities as a mixitè of routines, competences and abilities oriented to learn by continuous change inside and outside of organization crossing digital and green transformation creating ecology of values hybridating by hard and soft skills, scientific and communication competences, technology and relationship abilities. We see an emergent multi-level and integrated organism of hybridation supported by a participating model of organization enable to include and mobilizing emotional intelligence of grouping in a large community of the firm (internal and external) (Baravelli and Pilotti, 2022). For successfully implementation of these change of organization is necessary the diffuse commitment of business leaders knowing needs to be in place in the organization to different levels and about skills and abilities introducing open roles and multifunctional areas of operations for transdisciplinary competences by workgroups of projects. Consequently, dynamic capabilities are not useful only as a response to market changes because a resource advantage might become disadvantage when those market conditions change, but a leverage required to adapt to changes in the business environment as a preventive factor to absorb those changes. The main reason is that dynamic capabilities alters the resource base of a firm becoming a driver of triangulation between creation, evolution and recombination transforming old resources into new sources of competitive advantage (Teece *et al.,* 1997; Eisenhardt and Martin, 2000). Along this trajectory we can build ecologies of value as transformative glue between inside and outside the organization for profitable and sustainable growth reinforcing life eco-system of the firm by participating and collaborative intelligence.

Developing the organization's dynamic capabilities: experimental 'circular' models and the Credem case

As a result of the above, we believe that on the question of how dynamic capabilities are generated, a distinction should be made between those that come directly under management - 'dynamic managerial' capabilities

(Ambrosini and Altintas, 2019) - and that impact on the resource base, and those generated by the resource base itself. While at the various hierarchical levels, management builds, integrates, modifies and reconfigures the resources and competences of the enterprise (Adner and Helfat, 2003) according to a top-down approach, in the "Free-Auto-Emo"(F-A-E) models, it is in fact the resources that are self--renewing thanks to the organizational functioning and it is their conduct that directly determines the competitive advantage so that the skills and competences that they acquire (and/or transfer in inter--functional and inter--divisional forms), developing and transforming from below within the whole organization that incorporates them, cannot be put in the background. Consequently, the operating characteristics and the nature of the organizational model that nurtures these capabilities and competences, and that systematically develops them, as our analysis suggests, assume pre-eminence. In other words, in organizational models based on organizational decentralization, *empowerment* and self-organization, where the formal hierarchy no longer plays a central coordinating-integrating role, dynamic capabilities self-develop and accumulate in core resources that adapt, integrate and reconfigure in circular ways (bottom-up and top-down) in the face of external changes and internal business problems thanks to the particular modes and properties of organizational functioning and not only as effects of established processes and routines.

In this perspective, the question of dynamic managerial capabilities should be referred not only to *top management* but also to *middle management* and the more operational managerial levels (Ambrosini and Altintas, 2019) because the emphasis on the characteristics of the organizational model recalls the evolution of the dynamic capabilities of the entire enterprise in horizontal and circular forms.

Precisely for the purpose of exploring and evaluating the applicative possibilities of these organizational models and their concrete effects, the authors of this contribution participate in *research-intervention groups* that follow experimental cases of organizational transformations in the banking sector towards forms of decentralization and self-organization following the principles and objectives that we have outlined above. The considerations we report refer to these practical experiences. A case that we consider explanatory in this regard and which we believe should be briefly commented on is that of Banca Credem (Credito Emiliano) whose experience (Credem Semplice) is reported in the updated Italian edition of Laloux's book (2022).

Credem is a private banking group present in all Italian regions with about 600 branches and more than 6000 employees; it operates in commercial banking, *retail banking* and *wealth management*; its mission is to create value for shareholders by excelling in services and customer relations that it carefully looks after. Faced with a constantly changing environment with the presence of large competitors favored by economies of scale, Banca Credem has set out to create a flexible organization based on granting widespread freedom of action to people along lines of self-organization so as to enhance the value of people and streamline business processes by introducing greater elasticity and adaptive flexibility realizing something that has been done elsewhere or applying something old in a new way to reach organizational sensing also with digital networking helps in the ecosystem of the bank. We can say – with Teece (2007) – that the essence of the sensing dynamic capabilities is the key to identify new emergent opportunities for the Credem bank as specific routines to anticipate markets trajectories and scan information and developments outside in order to collect useful information about those opportunities (Mousavi *et al.,* 2019; Ellstrom *et al.,* 2022).

Credem has developed an *ecosystem of communities of practice* that counts the adhesion of over two thousand people on the operating principles of the new organizational model in order to create project sharing on various areas from information asset management to agile practices to the development of concrete solutions to the problems emerging from the new model. Networking becomes important dynamic capability of endeavor to seek new opportunities creating grouping and community also to emphasize the recombination of traditional ideas in novel innovations as a powerful cognitive mechanism (Heckscher and Adler, 2006). In 2018, experimentation with the new model started at some central offices and group companies benefit from having routines for acquiring, storing and retrieving external technological / organizational knowledge as transfer of internal entrepreneurial resources oriented to develop creativity, foresight, intuition and alertness to new (or emergent) opportunities connecting core of their business ecosystem and periphery.

The changes involved the reduction of hierarchical levels, the enhancement of skills and the self-activation of people emphasizes the need for deliberate interchange learning efforts. Management figures are no longer understood as bosses but as facilitators and managers of people's development and growth, with the aim of

developing in the bank the principle that leadership must be diffuse and collaborative. People and management have therefore had to review their way of working and internal relationships oriented to achieve both digital and organizational transformation.

Overall, strategic planning schemes themselves have changed, relying on principles of adaptive 'proximity' and learning with team-work logics and archipelagos of inter-functional and multi-competence projects interconnected by the molecularity of 'arborescent' circular dynamic capabilities.

Strategic-operational governance trajectories that make Credem Bank a "living and dynamic organism" by sensing capabilities as routines to evaluate digital – organizational -infrastructure solutions in a continuum of adaptability. It has to be clear to all employees what the goals of transformation and its sustainability initiated by the bank.

In fact, based on the analytical contribution of Laloux (2014), the project, managed according to the classic top-down system, followed a more broadly participative approach in the years following 2019, leaving people the autonomy to reorganize their own units or aggregation of units resulting from the restructuring and unification of parts of the bank.

The guiding principle has been that of continuous confrontation and learning, the activation of common decision-making processes and shared decisions by systematic triangulation of adaptive change, interfacing technologies and access to information, and mobile and circular team-work in the training and transfer of dynamic skills able to be flexible and adaptive with regard to new opportunities, internal and external ones.

In particular, building a basket of dynamic capabilities to quickly prepare a strategic response to competitors' activities as well as customers' changing demands (Ellstrom *et al.,* 2022) by seizing the value of new opportunities overcome gap in traditional capabilities.

The change is continuing and is being monitored by a mixed (academic-managerial-consulting) analysis-intervention *research group* that functions as an operational observatory on the transformations taking place with the objective of monitoring and understanding how the new model - reflecting the "Free-Auto- Emo"(F-A-E) paradigm - influences organizational behaviour and performance taking into account that *team-works* are devoid of formal hierarchy and are only assisted by *tutorship* roles consisting of *team leaders* and *competence leaders* who guide and orientate the "*flight of the flock of starlings*" (Parisi, 2021). A trajectory able to favor both r*econfiguring capabilities* and *routines hybridation*. These objectives include the testing of the learning process and the creation of dynamic (circular, incremental and regenerative) capabilities concerning:

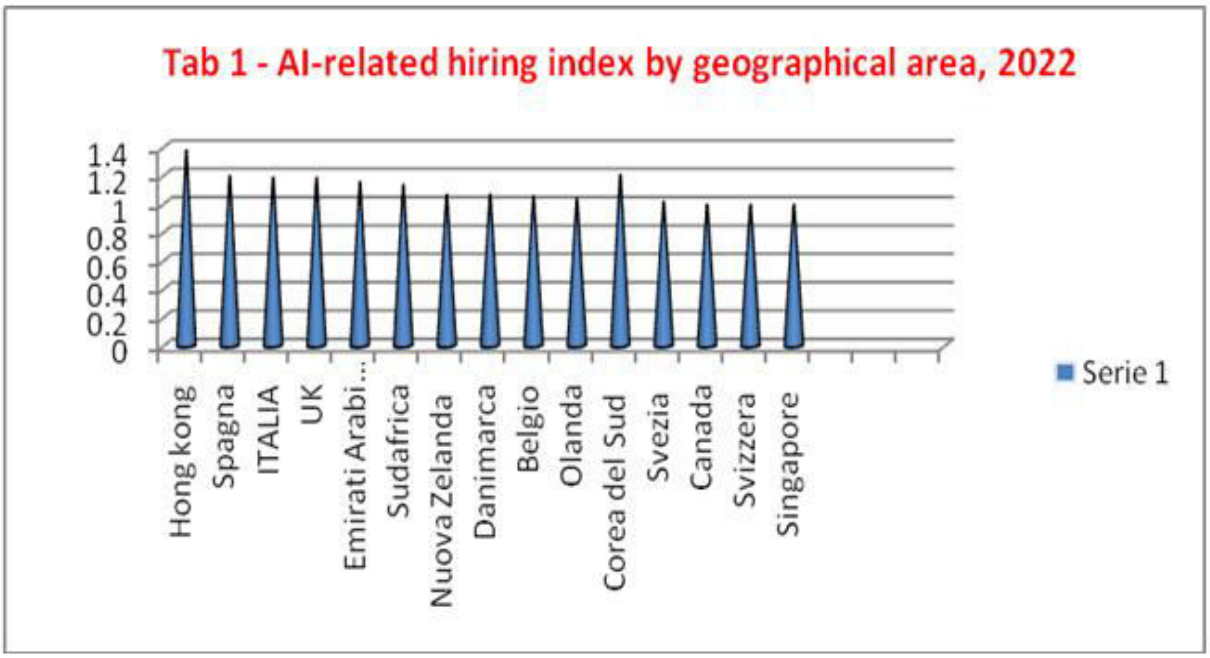
a- quality of service and customer relations,
b- speed of execution, efficiency, flexibility and adaptation to the market,
c- product and business model innovation.
At the same time, the focus is on:
d- evolution of corporate culture,
e- motivation and cohesion among staff,
f- degree of cooperation and mutual trust,
g- acceptance of error as a learning moment.

Considering what has been observed by Eisenhardt and Martin (2000), we believe that the "Free-Auto- Emo" (F-A-E) model, applied to the banking sector, offers elements to reconcile the different conflicting views on dynamic capabilities (Peteraf *et al.,* 2013) that would be subject to *boundary conditions* and thus unable to sustain competitive advantage in the face of any environmental dynamics whether moderately fast or high speed.

The critical aspect absent from this debate is the role played by the organizational model. Unlike other models - especially the hierarchical-bureaucratic ones that operate with relatively stable routines - the "Free-Auto-Emo"(F-A-E) model thanks to self-organization modifies routines (*hybridation*) and regenerates (*reconfiguring capabilities*) them according to the trends and problems of the external and internal environment within a continuous circular dynamism.

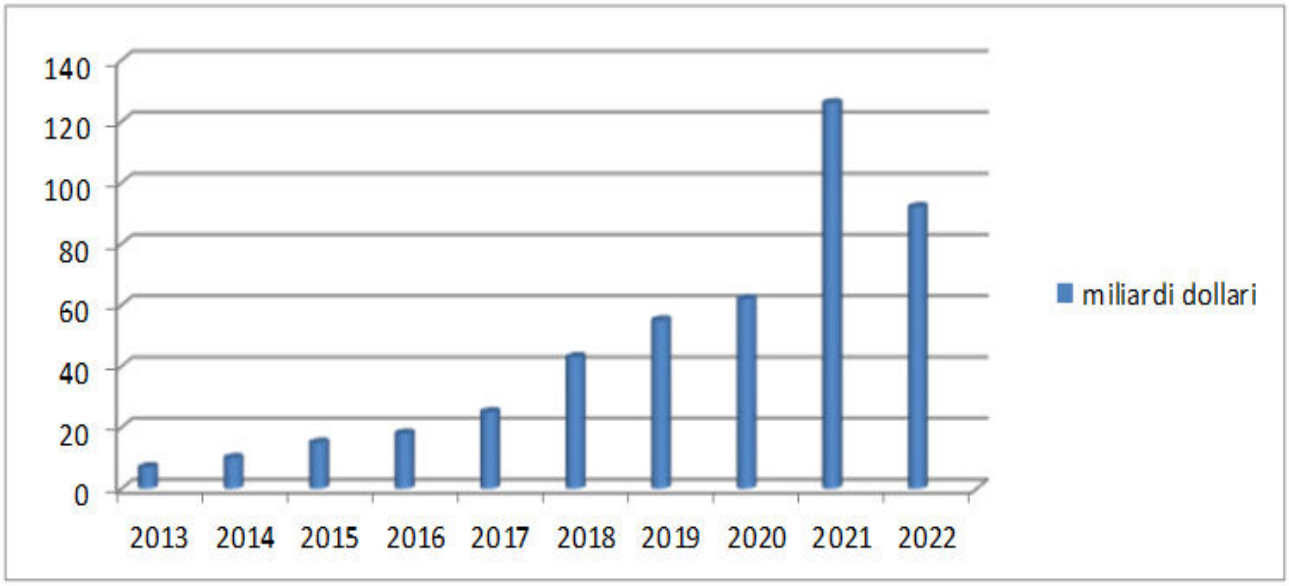
When the environment becomes very dynamic, the *best practices* of rigid organizational models that have been consolidated in a moderately dynamic environment are not rapidly modifiable because they are strongly *path-dependent* and are therefore 'displaced' by external change and unable to restore competitive advantages or renew them; conversely, in lean, organic models, such as the 'Free-Auto-Emo' (F-A-E) models, it is not so much the routines that are decisive for learning as the nature of the organization itself that learns by self-modelling, recombining and hybridizing resources more rapidly in the face of unpredictable changes, widening the area of action and intervention with respect to the traditionally narrower area of control.

Figure.1 AI-related hiring index by geographical area, 2022



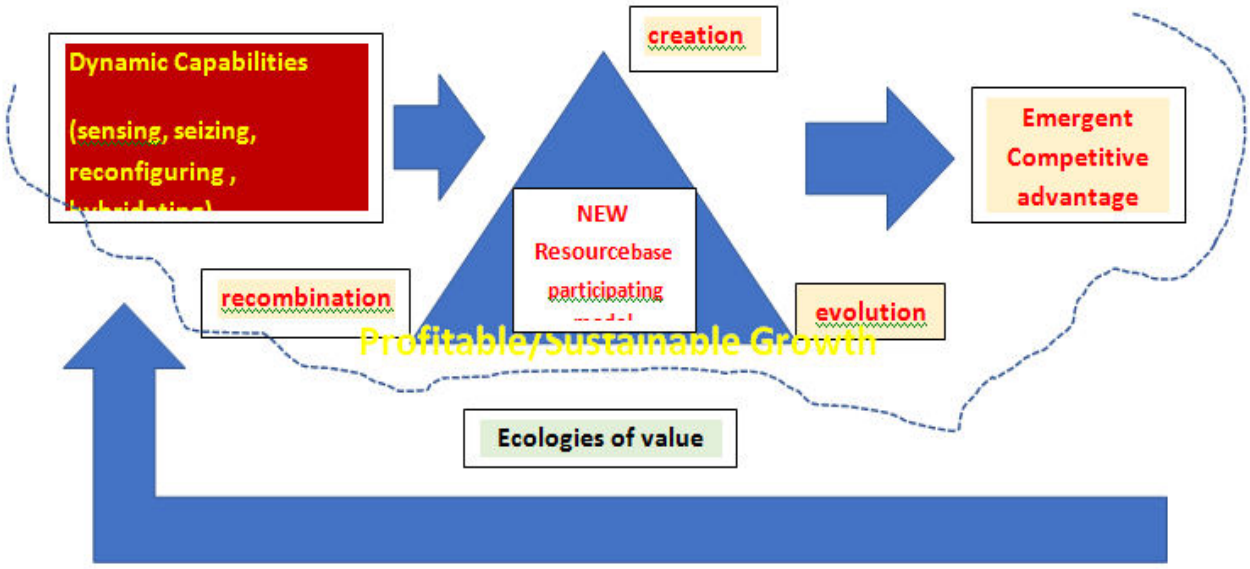
Source: Linkedin, 2022

Figure.2 Private investments in AI world



Source: NetBase Quid, 2022 (2022 partial estimate)

Figure.3



The enterprise is able to recreate value by assuming the role of *first mover*. The dynamic 'circular' capabilities are unstable but re-creative of adaptive potential due to the organizational model that forges resources and transforms them. As Eisenhardt and Martin (2000, p.1118) argue*, 'long-term competitive advantage lies in resources configurations, and not only in dynamic capabilities'*." The main reason is in emergent ambidexterity describing two different (but connected) phases of transformation: a period of exploration where flexibility is emphasized and another one of exploitation where resources are committed to strategy realization towards new options for expansion. In that phase could be generate semi-structures where some priorities or responsibilities are fixed while other absolutely not as in case of Credem with reinforcing/empowering middle management and re-connect actions and decisions reducing conflict and errors. It could be re-emerges also with the evolution of applied AI to organization of banking or retail services modifying positively if not focused only to reduce work (and automatization), but change it towards reinforcing intelligent collaboration, inside and outside.

Metaverse, blockchain, cryptocurrencies in the food eco-system between marketing and innovation, greenwashing and uncertainty. The case of catering

Cryptocurrencies and the food industry have already shown that they mirror each other by trying to make digital and physical worlds "coexist". In fact, the first real use case for Bitcoin (BTC) was related to food. The social media narrative noted that “on May 22, 2010, Laszlo Hanyecz made the first documented BTC trade transaction, purchasing two Papa John's pizzas for the princely sum of 10,000 BTC.” A date now inscribed in the history of cryptocurrencies as *Bitcoin Pizza Day*. From here the "food era" of Bitcoin seemed to begin with many reminders in multiple restaurant chains and crypto companies in exploiting marketing opportunities albeit in a still gray world with few rules. A debut of Bitcoin as a means of exchange in the food sector such as *Bitcoin Pizza Day* which opened up the relationship with cryptocurrencies, in a relationship that we will see how much it can blossom and above all flourish, especially with the support of Web3 and the Metaverse. Food and fashions are therefore the privileged channels - as they are poorly regulated and often gray - to penetrate the various diffusion markets often with widespread failures as demonstrated by the multiple imploded currencies: Baconbitscoin, Onioncoin and Barbequecoin. While Pizzacoin still appears on Coinmarketcap. In most projects that piled up on the initial coin offering (ICO) train, these tended to be tokens without any underlying technology to support them and therefore with great fragilities and weaknesses. A first phase which served to improve the second with the advent of the DeFiera, bringing a new series of protocols to the food table, which in alternating cycles seem to "surf" on the uncertain bitcoin markets and among these SushiSwap

and PancakeSwap. With what stability we will soon see also in relation to the performance of the markets of these currencies which light up in the phases of development and turn off in those of fall among "obsessions, manias, fads" emphasized by social media. In fact, with the ICO “craze” and the bull market of 2021, there have been many other developments in the parallel convergences of blockchain, cryptocurrency, and the food industry. The topic of food traceability has proven - rightly - to be a critical and sensitive area and therefore with the maturity necessary to explore emerging opportunities. It's no coincidence that solutions like IBM's Food Trust are often associated with groceries, as are Nestlé and Carrefour, but the company has also developed partnerships with seafood restaurant chains in California to try to bring more transparency into the origins and treatment of its menu items before they reach the table. Because this is the main road to penetrate with a certain stability beyond fashions and fads, precisely, introducing useful information resources and countering easy slips into *greenwashing*.

Because it is only by building a stable and long-term relationship with the customer through information and trust that we can "enable" these technologies beyond fashion. A process that has been emphasized post-pandemic with the spread of emerging platforms such as Uber Eats, partly following what has already happened with transport, tourism and hotels (Airbnb) and music (Spotify). It basically means developing a long-term relationship with the customer, from the reception of the service as an experience to the forms of payment, to data management up to loyalty that reduces the risks of lack of transparency of the more or less stable and recognized platforms and which can lead to unjustified price increases.

It will be a matter of understanding more deeply whether a balance that the pandemic has reduced can be restored and whether Blockchain and cryptocurrencies will be able to re-establish that useful and necessary direct connection between restaurants and customers within new relationships of trust. Because the blockchain is a trusted infrastructure that can provide food operators with an intelligent and stable interface, reputed and reliable as a one-stop shop that is easy to access and use to consult and explore a plurality and variety of menu choices, within a free interaction and unmediated which can distort supply and price conditions. That is, it allows the customer to pay directly without third parties. Third parties should simply function as infrastructure providers for restaurateurs and grocery stores, providing only the tools to efficiently run businesses but without taking away entrepreneurship or management skills. Taking into account that this is only a part of the entire food eco-system that goes back upstream and downhill and which can be simplified with the diffusion and consolidation of the Metaverse, especially in terms of transparency and balance of the performance of the entire chain also with NFT experiments in relationships with food to increase the food experience.

Will the Metaverse succeed in this trajectory of building a richer and more engaging culinary experience between virtual and real?

Emerging experiences in the USA – always an application laboratory– they try to break the glass ceiling without producing fractures. Note the Halloween experience - in the US restaurant chain Chipotle - which opened a virtual restaurant for the Roblox player communities: "users who entered the restaurant lived a spooky Halloween-themed experience and then received a promotional code for a free burrito in the real world.” We will see whether and how well it works over time with the advancement and consolidation of the catering service in the Metaverse as a continuation of a digitalisation journey that has just started and is in its initial stages. It will be a question of understanding how integrated the platform system can be and how to balance virtual experience and real experience in a substantial multi-channel environment. However, starting again from food delivery and takeaway, with the now codified options of the online restaurant experience supported by Google or TripAdvisor or exploring new options and business models? Since here the big question always remains about who and how produces those meals beyond the virtual showcase of the platform and looking at the menu with attractive and persuasive images will not be enough. Because you will have to follow the real service by having your avatar accompany you "outside" in the real market. Will tastings and aromas be necessary? Of course when you are ready to order, the form of payment will have to be instant and with cryptocurrencies with a meal arriving within 30 minutes. The same if you want to amaze your guests with a virtual tour - like in a museum - also chatting with a virtual chef (or sommelier) perhaps participating in the preparation of the meal with ingredients and complements. Will this be the customer experience lever?

On the restaurant side, the experience could be further enriched if after a virtual tour the restaurant requests, for example, a reservation deposit to be made in

cryptocurrencies using an escrow system based on smart contracts. Perhaps solving one of the biggest problems in catering regarding reservations due to no-shows. If the person does not show up, the smart contract could simply transfer the funds to the restaurant in escrow and/or become the lever for a subsequent "cumulative" reservation.

In short, there are many opportunities for the catering industry which has only partially exploited the potential of digital, but we are only at the beginning and certainly the rules, codes and information for greater transparency will have to change, also by examining the dining room and kitchen environments, such as in museums or in real estate. Blockchain and cryptocurrencies offer multiple possibilities for reviving this sector for a new relationship between food traders and customers, but more transparency, trust and courage will be needed on both sides (including third parties). However, the Metaverse will have to improve the overall picture to find coherence of the entire ecosystem for shared value creation.

References

Adner, R. and Helfat, C.E. (2003), "Corporate effects and dynamic managerial capabilities", Strategic Management Journal, Vol. 24 No. 10, pp. 1011-1025.

Ambrosini V. and Altintas G. (2019), Dynamic Managerial Capabilities, Business and Management, June. https://doi.org/10.1093/acrefore/9780190224851.013.20

Baravelli M, Pesic V. e Pilotti L. (2022), Nuovi modelli organizzativi nelle banche: metriche di controllo, Bancaria,10.

Baravelli M. and Pilotti L. (2022), Digital Bank e organizzazione innovativa partecipata, Sviluppo & Orga-nizzazione, n.302, Dicembre.

Biffignardi S. (2013), The Lombardy Demographic Agro-Food Panel (PAADEL). An infrastructure for monitoring innovation in the production and consumption of the agri-food sector; F. Angeli

Chesbrough, H. (2012), The Open Innovation Model Research Technology Management, 55(4),20-27

Chirieleison C. (2002), Le strategie sociali nel governo dell'azienda; Giuffrè

Drucker (1986), The Frontiers of Management. Where Tomorrow's decisions are being shaped today; New York Truman

Eisenhardt K. M. and Martin J. A (2000) Dynamic capabilities: What are they? Strategic Management Journal, 21 (10/11).

Ellström, D., Holtström, J., Berg, E. and Josefsson, C. (2022), "Dynamic capabilities for digital transformation", Journal of Strategy and Management, Vol. 15 No. 2, pp. 272-286. https://doi.org/10.1108/JSMA-04-2021-0089

EU (2022), *The EU Farm to Fork Strategy: can we make the European food system healthier and sustainable?;* 7 March, REPORT European Commission

Heckscher C., and Adler P. (2006), *The Firm as a Collaborative Community – Reconstructing Trust in the Knowledge Economy;* Oxford University Press

Jacobi, R. and Brenner, E. (2018), "How large corporations survive digitalization", Linnhoff-Popien, C., Schneider, R. and Zaddach, M. (Eds), Digital Marketplaces Unleashed, Springer, Berlin, pp. 83-97.

Karimi, J. and Walter, Z. (2015), "The role of dynamic capabilities in responding to digital disruption: a factor-based study of the newspaper industry", Journal of Management Information Systems, Vol. 32 No. 1, pp. 39-81.

Laloux, F. (2014), Reinventing organizations. A guide to creating organizations Inspired by the Next Stage of Human Consciousness, Nelson Parker (trad. It Guerini, 2022)

Makadok, R. (2001). Toward a synthesis of the resource-based and dynamic-capability views of rent creation, Strategic Management Journal, 22 (5). https://doi.org/10.1002/smj.158

Parisi G. (2021), In un volo di stormi – Le meraviglie dei sistemi complessi; Rizzoli

Peteraf M., Di Stefano G. and Verona G. (2013), Strategic Management Journal, 34 (12).

Pilotti (2016), Scaffolding come leva delle trasformazioni dell'organizzazione resiliente, Sviluppo & Or-ganizzazione, n.12, Este Edizioni.

Pilotti L and Micheletti A. (2020), Causality and effects "beyond" strategy reinforcing organization: The process of decoupling decisions-actions towards ecologies, Journal of Business and Social Science Review, 4 (1)

Teece D. J., Pisano G. and Shuen A. (1997), Dynamic capabilities and strategic management, Strategic Management Journal, 18 (7).

Teece D. J. (2018) Business models and dynamic capabilities, Long Range Planning, 51 (1).

Wackernagel M, Beyers B. (2020), *Ecological Footprint - Global Footprint Network;* Environment Editions

Weick K. E., Sutcliffe K. M. (2007), Managing the Unexpected, Resilient Performance in an Age of Uncer-tainty; John Wiley & Sons, N Y (trad it. Raffaello Cortina, Governarel'inatteso, Milano, 2010)

Yeow, A., Soh, C. and Hansen, R. (2018), "Aligning with new digital strategy: a dynamic capabilities approach", The Journal of Strategic Information Systems, Vol. 27 No. 1, pp. 43-58.

Zollo M. and Winter S. G. (2002), Deliberate learning and the evolution of dynamic capabilities, Organi-zation science, 13 (3). https://doi.org/10.1287/orsc.13.3.339.2780

Mousavi, S., Bossink, B. and van Vliet, M. (2019), "Microfoundations of companies' dynamic capabilities for environmentally sustainable innovation: case study insights from high-tech innovation in science-based companies", Business Strategy and the Environment, Vol. 28 No. 2, pp. 366-387.

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https://www.eea.europa.eu/en/topics/in-depth/agriculture-and-food

Https://wwweufic.org/en/food-production

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