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OPEN X AND NEO-INDUSTRIALIZATION 2.0: ON BOUNDARIES

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A B S T R A C T

This paper emphasizes the need to broaden organizational perspectives through Open X, which promotes sharing and collaboration over selfishness and competition, instead of that industrial intellectual protection through patents can divert resources essential for the growth of organizations. Faced with new realities, organizations need different management approaches with the potential to transform the reindustrialization resulting from deindustrialization into a Neo-industrialization 2.0. It does not mean tearing down or creating new boundaries but an open culture where organizational efforts have social relevance. In the face of economic interests, Open X can make organizational outcomes more plentiful and robust.

1. INTRODUCTION

Continuing the conceptualization presented in "Open-X and Neo-industrialization 2.0: An Introduction" (Putnik et al., 2023), present on the *International Conference Science and Higher Education in Function of Sustainable Development – SED 2023*, this research paper deepens the interdependencies of Open X and the emergence of a disruptive Neo-industrialization (called Neo-industrialization 2.0).

Personalization is emerging as a trend in organizations. The Open product architecture emerges, encouraging customers to trust an Open product platform to create products and gain value by collaborating with manufacturers and other consumers (Hu, 2013). Furthermore, in the dynamics of change, new leaders emerge in the new world order (Caraveli, 2016; Quah, 2011; Schweller & Pu, 2011).

Faced with new events, organizations must adapt to survive. Few large institutions seem to elude and influence circumstances. In addition to being improbable, the design of organizations contradicts the Lorenz butterfly effect (Lorenz, 1972), which implies that small actions can have disruptive consequences creating a new system, while enormous reactions can have insignificant results.

Old routines and rules in old-fashioned manufacturing systems are changing and are being transformed or replaced by new ones. Industrial robots and computerized procedures increasingly perform physical production in Neo-industrial manufacturing systems. Knowledge and conceptions about work and its

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organization use information technology, including artificial intelligence (Nwasuka et al., 2022; Sharma, 2023) that is developing and spreading sharply, shifting the economic activities (Ekstedt et al., 2003). Amid these changes, political approaches continue to privilege management methodologies supported by a "top-down" hierarchy, defending patentable models. Although efficient, this model seems saturated and does not consider social singularities and new emerging opportunities for manufacturing (Putnik et al., 2023). The transformations of the current Neo-industrialization (designated Neo-industrialization 1.0) have an economic prevalence and imply the large-scale application of innovative technologies in manufacturing to create new generations of goods and services (Inshakova et al., 2019).

Neo-industrialization 1.0 is a form of innovative development in the economies of leading countries that try to reduce dependence on raw materials through robotization and digitalization of production associated with computerization and raising the technological level of the service sector. These Neo-industrial structural transformations are based mainly on lean management and recycling technologies (Zhironkin et al., 2019).

In addition to a structural change in the Neo-industrial economy focused on sustainable economic and environmental development (Zhironkin et al., 2019), the sustainability model of Neo-industrialization 2.0 values and does not compromise human participation. Neo-industrialization 2.0 should promote radically different organizational and management models, relying mainly on large and complex networks of users (agents) and communities that enable emergence of innovative and sustainable organizational structures. These transformative changes promote the endogenous development model, the so-called “bottom-up” design, which also foresees new innovative products and services (Putnik et al., 2023). Eventually, it leads to a new manufacturing perspective that could prevail with the Open X approach, where technological platform support and digital environment embodied the community agents.

Open X is a way to face the growing complexity of the organization’s context (internal and external). It does not mean anarchy because the order of the system can emerge from self-organization. Open X has boundaries and rules embedded in the culture. But unlike traditional closed and hyper-competitive organizations that conspire to subjugate and control, Open X promotes an environment of sharing, dialogue and collaboration. Boundaries and rules are dynamic in Open X. The impossibility of conceiving an organization without structure implies the existence of boundaries that distinguish organizations.

The thesis in this paper is that Open X does not change the concept of the existence of boundaries. Analyzing the evolution of the global balance of power, we research the effects of using Open X in the management of manufacturing organizations. There seem to be many overlooked opportunities, particularly by organizations that use primitive models and structures where competition and concealment predominate.

This paper consists of eight chapters. After the introduction, chapter Two presents the changing *status quo* among the three great titans of world manufacturing, i.e., United States, Euro Area, and China. The analysis intends to draw attention to China's emergence, ascendancy, and dominance over the United States and Euro Area in manufacturing and, inherently, on the world economy. Western concepts such as Industry 4.0 have tried to stimulate the reindustrialization and recovery of the relevance of Western countries in global manufacturing, maintaining closed organizations that bet on the hypercompetitive model and whose dynamics are based only on technological change. Chapter Three shows how, in recent decades, manufacturing organizations have extended to services and internal supply, soliciting feedback from consumers and their internal collaborators, respectively, in addition to their previous conventional actions. Chapter Four refers to Open X as an alternative to closed systems fascinated by the domain of intellectual property. In Open X, individuals and organizations are prosumers (producers and consumers) of resources (software, hardware, data, information, knowledge, design) with economic value. It does not imply the absence of rules or boundaries; it means that a community grows and subsists in the self-organization that comes from the dialogic collaboration of network agents’ dynamism. Rules and boundaries must soften to create an environment conducive to community participation. Chapter Five reveals the differences between Neo-industrialization 2.0 and Neo-industrialization 1.0. Chapter Six discusses the importance of recognizing Open X as a holistic and complex concept that integrates systems and depends on contexts. The foundation of Open is collaboration. Without a policy to encourage it, technology is trivial. On this point, Western culture should know Eastern culture. Chapter Seven presents examples from the automotive industry, online platforms for open design, and artificial intelligence, using openness to reduce costs, innovate, and supply the system, respectively. Chapter Eight contains conclusions and a proposal for future work.

2. WORLDWIDE MANUFACTURING CONTEXT AND TRENDS

The idea of reindustrialization resurfaces after the previous deindustrialization. However, since the first revolution, industrial revolutions did not imply reindustrialization but transformations in manufacturing

systems. In Europe, with the emergence of the Industry 4.0 neologism, in 2013 the use of the term reindustrialization skyrocketed in the scientific community, as can be seen in the occurrences of this word in the Web of Science titles represented in Figure 1. The search in the Web of Science (2023) database included

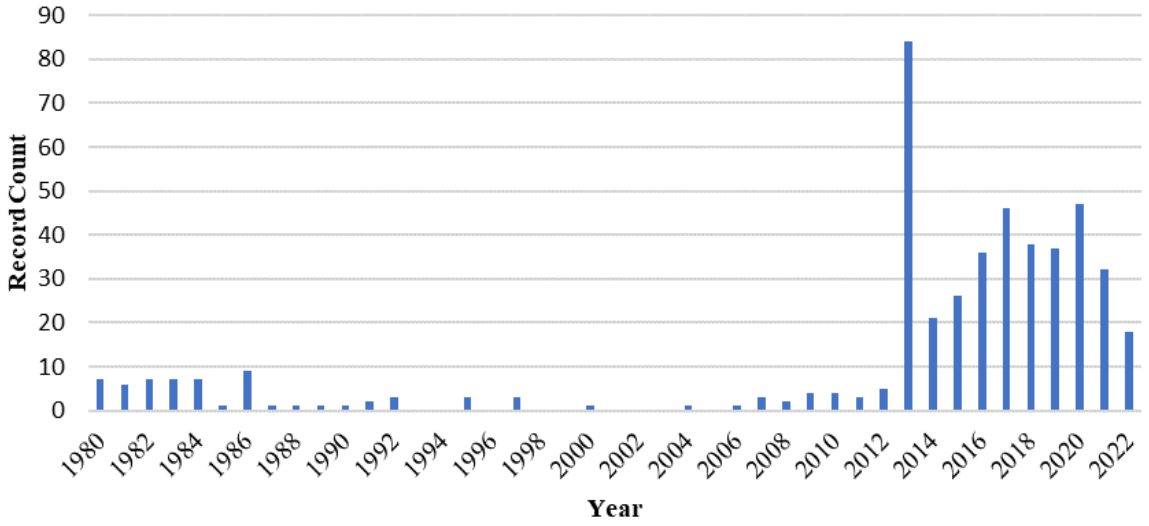

Figure 1. Number of papers from the Web of Science database that include reindustrialization, between 1980 and 2022.

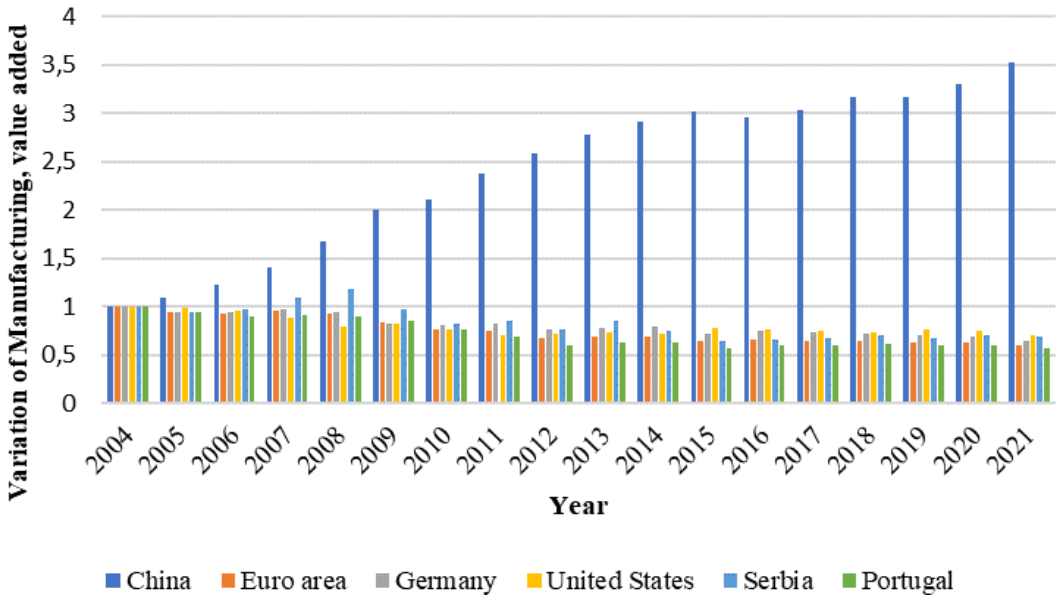

Figure 2. Variation of Manufacturing, value added (current US$ and reference year 2004), between 2004 and 2021.

the following: reindustrialization or re-industrialization or reindustrialisation or re-industrialisation.

Deindustrialization includes a decline in the share of manufacturing in a country's or region's economy and a reduction in manufacturing output and employment that deteriorates the manufacturing trade balance. This economic model increases the relative price of nontradable to tradable goods. Although sometimes pointed out as an independent cause of deindustrialization, this situation is a symptom of the economy's adjustment to the new post-boom equilibrium of another alternative option to manufacturing (Corden & Neary, 1982). However, in the analysis, the effect of the increase in the expanding sector was disregarded, as it usually increases tax collection, with the government's action on its extra revenues determining to appoint the benefit of the sectoral change instead of manufacturing.

Reindustrialization only makes sense if European countries face something similar to the "Dutch disease" and seek a cure through Industry 4.0. In economics, "the Dutch disease" warns of the perverse effect caused by an abrupt change in a country's exports that increases the economic development of a specific sector, e.g., natural resources and tourism, to the detriment of other sectors such as manufacturing, or agriculture (The Economist, 1977).

The circumstantial abundance provided by a given sector can deceive the economy with comparative advantages for the country that has them, leading it to specialize in these sectors and not industrialize or even deindustrialize - which, in the long term, inhibits the process of economic development.

Taking 2004 as a reference year (The World Bank, 2023), we observe the evolution of the manufacturing variation, in Figure 2, considering the following equation (1):

$$V_M = \frac{M_{v0}}{M_{vw0}} \frac{M_{vy}}{M_{vwy}} \quad (1)$$

Where:

V_M is the Variation of Manufacturing, value added (current US$)

M_{vwy} is the World Manufacturing, value added (current US$), in the year Y.

$M_{vy}$is the country Manufacturing, value added (current US$), in the year Y.

M_{vw0} is the World Manufacturing, value added (current US$), in 2004

M_{v0} is the country Manufacturing, value added (current US$), in 2004

From the sample, in 2021, only China has a value of the indicator above 1, which means that China's manufacturing has a more prominent global contribution than in 2004. All other regions shown in the graph in Figure 2 (Euro Area, Germany, United States, Serbia and Portugal) contribute less to the global context. According to the "Dutch disease" assumption, the problem is the difference between what you pay and what you get. We can add other factors to the analysis, such as population growth in China of approximately 9%, between 2004 and 2021. But the 252% contribution to world manufacturing in 2021 compared to 2004 is too impressive not to be considered a premeditated governance option (between those who offshored manufacturing and those who accepted it).

The United States and the Euro Area together, in 2021, had a smaller share of world manufacturing than China. Figure 3 shows that, since 2010, China has become the great "factory" of the world. This change in global balances causes the system to adjust through currency devaluations or inflationary jumps.

Do economies increasingly dependent on services assume the marketing that it is possible to have a service economy without products? If the products determine a service, why do some countries ignore manufacturing? For example, hardware resources allow the software to run and not the opposite.

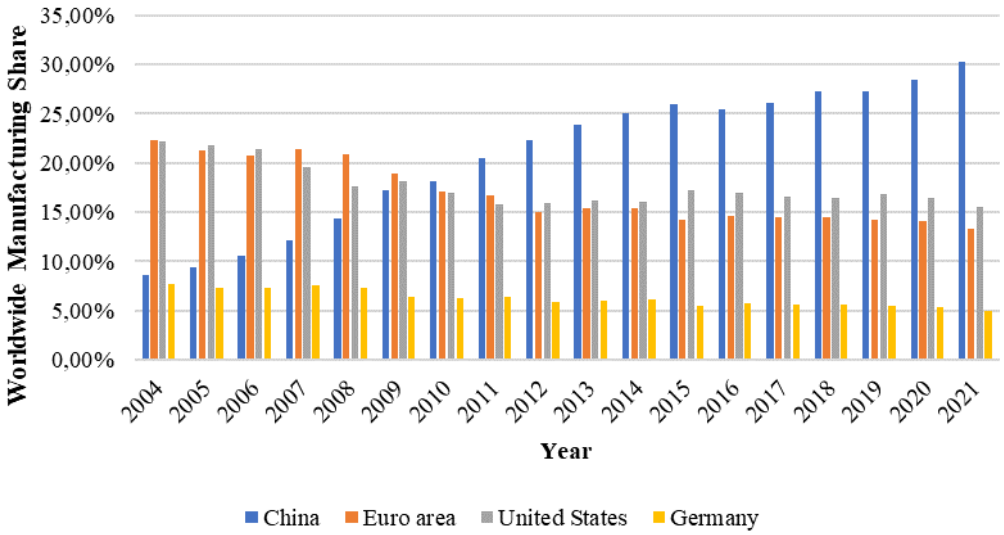

Figure 3. Share of world manufacturing by China, US, Eurozone and Germany

3. INNER SOURCING

"Inner sourcing" is defined as using "open source development techniques within the corporation, or with a cluster of key customers - even if they aren't ready to take the step all the way to releasing their software as a public open source project" (O'Reilly, 2000), though different organizations have used other terms to denote this (Stol et al., 2014). The organization may still develop proprietary software, but its development internally is open (Capraro & Riehle, 2016).

At the beginning of the third millennium emerged the idea of Inner Source, also called Corporate Source, i.e.,

the application of concepts, perspectives and methodologies of Open Source to all developers behind the firewall of the corporate environment. The benefits of Open Source became available to organizations' internal projects, although the size of the participating community is smaller than the Internet (Dinkelacker & Garg, 2001).

Instituting Inner Sourcing was a good way of fostering a culture of collaboration that includes support for open communication (Brasseur, 2018). Whether it's Inner Source or Open X, communication and engagement are essential to community sustainability. Communication should not encompass and comprise everyone and be part of a collaborative culture that promotes sharing and contribution. The strategy must be open to new inputs that benefit the final design. The Inner Source is often similar to Open Innovation which is nothing more than using the economic opportunities of Open X to feed the selfishness of organizations. Open Innovation promotes the exchange of information within company boundaries and does not belong to the open approach since knowledge transfers are limited to organizational contracts and are not freely available outside the organization (Boisseau et al., 2018). Thus, Open can have two perspectives. The first refers to intellectual property, while the second guides organizational structures.

The main difference between Inner and Open Source is the conservation of the intellectual property in organizations or individuals that contributed to the design development (Höst et al., 2014; Stol et al., 2014), as Table 1 shows. However, it is unclear whether the effort to protect intellectual property is smaller than the gains it provides.

Table 1. Design attributes in the process and intellectual property dimensions, adapted from (Höst et al., 2014).

		Process ("Community boundaries")	
		Closed	Open
Product (Intellectual Property)	Open	Controlled Open Organization	Open Organization
	Closed	Traditional Organization	Inner Source

In Inner Source, additional roles may emerge (Stol et al., 2014) and drive new relationships and designs. For example, Huawei started a program in the second half of 2020 to encourage the application of Inner Source (T. Dey et al., 2022). The number of departments involved, the number of contributors, and the size of the code base across all Inner Source projects grew exponentially. The adoption of the Inner Source tries to explore and streamline agility through new organizational designs for product creation. Nevertheless, the strategy boils down to the internal context and ignores the external potential.

4. THE RISE OF PROSUMERS

Outstanding historical changes come about through small changes in everyday behaviour. One of these changes, almost forgotten, occurred in the early 1970s, when a new product began to invade pharmacies in European countries. The new product was a do-it-yourself pregnancy test kit. In 1980, millions of women were performing a task previously performed by doctors and laboratories (Toffler, 1980).

Recently, in the SARS-CoV-2 pandemic, do-it-yourself testing has become commonplace. It was yet another tool that made it possible to understand the evolution of the disease and allowed everyone to participate in solving the problem.

According to Toffler (1980), the first industrial revolution transformed people from prosumers (simultaneously producers and consumers) into consumers or producers. The third industrial revolution created the conditions for people to become prosumers again. Toffler called this the third wave, which we experience as the do-it-yourself movement and drives Open X.

Past research has shown that people overvalue the products they own, suggesting that more time spent touching objects can increase feelings of value and ownership. However, the experience of Norton et al. (2012) shows that the affective value - and consequently the perceived economic value - only increases when the effort spent on making an artefact is successful. An increase in the value of an artefact self-induced by the prosumer characterizes the IKEA effect. In addition to being a consumer, he is a "co-author" of the product, which leads the prosumer to self-attribute higher value to a given product. Being a prosumer elevates work from a hedonistic perspective, both by do-it-yourselfers and beginners, only when the work results in the successful completion of tasks; when there is destruction or failure to complete the artefact, the IKEA effect fades (Norton et al., 2012).

The IKEA effect can benefit the growth of a crowdsourcing process. Crowdsourcing is openly outsourcing work to an undefined and usually large group of people. Crowdsourcing often relies on altruism, which involves a broader spectrum of participants and may require little technical skill. Naturally, there must be control mechanisms that can guarantee the adequate performance of autonomous agents that participate in virtual organizations. These mechanisms may include behavioural norms and member voting that regulates membership, rules,

institutions and sanctions, and self-regulation through professional reputation (Olson & Rosacker, 2013).

5. NEO-INDUSTRIALIZATION 2.0

Neo-industrialization tries to create new impulses for the formation of technological platforms capable of providing transactional and relationship processes of the participants, in which they exchange information, change status, improve the organization and create a consolidated way of reducing the individual transactional costs of the transaction process collaboration (Inshakova et al., 2019).
Neo-industrialization 1.0, with the digital transition, associates other forms of knowledge and other forms of exploitation of available resources that determine another type of intensive capital in the industry (Ekstedt et al., 2003). In addition to the involvement of local agents driven by the connection of the digital community, the impact of the ecological footprint of products can decrease thanks to the decrease in the transport of physical products (Putnik et al., 2023). Industrial change assumes new alternative forms where production ceases to be predominant (Ekstedt et al., 2003) to include other variables (other realities - artificial, virtual, augmented, metaverse - energy, environment, economy, society). Neo-industrialization 2.0 allows the transition from traditional systems of centralized production and global value chains to digitized products manufactured by local agents supported by a decentralized production system (network resources - people, machines, computers) (Putnik et al., 2023). But it also makes it possible to decentralize knowledge crucial for decision-making processes (individual and collective) and the emergence of new forms of thinking.

Taking advantage of culture and environment of making, open development in Neo-industrialization 2.0 can attract several elements that are related and interconnected:

1) open contribution, which stimulates the participation, involvement and mutual benefit of the agents that collaborate in the development of the community;
2) establishment of new products, new services and creative solutions;
3) manufacturing embraces, benefits from, and participates in expanding collaborative open communities;
4) the collaborative context increases the opportunities for the emergence of different business models.

The scalability property provided by the large and complex networks of Neo-industrialization 2.0 seems to have a superior potential to develop and implement so-called exponential technologies compared to traditional organizational models or Neo-industrialization 1.0 (Putnik et al., 2023)

In traditional manufacturing systems, the old ways of doing prevail, while in Neo-industrial systems emerge new ways of doing. What distinguishes Neo-industrialization 1.0, increasingly adopted by industry, from Neo-industrialization 2.0 is the way of thinking. Using new technologies does not mean changing ways of thinking, learning and knowing. Neo-industrialization 1.0, while using the rhetoric of collaboration, continues to value closed knowledge systems and attempts to control and achieve convergence of complex systems. Complex systems are ambiguous and divergent. They require new ways of thinking, which is the differentiating element of Neo-industrialization 2.0, as shown in Table 2.

The Neo-industrial organization 1.0 aspires to be a meta-organization that links physical and virtual realities. In this process, it uses technology to gain competitiveness against its rivals. The aim is not to help anyone but to defeat opponents (e.g., through convenient associations). The principles (of the art) of war remain. Although the emergence of the Neo-industrial organization 2.0 requires dissipation, this destruction is mainly of cognition, which allows new ways of thinking. In the Neo-industrial organization 2.0, the objective is to enable humans to be free and not to use the human through technology.

The awareness of the simultaneity of different realities reveals the emergence in the complexity of organizational systems and, with it, the uncertainty and indeterminacy of results linked to “free” elements (agents, contexts, internal and external). This consciousness is still reasonably conditioned by most organizations, which prevents the implementation of a Neo-industrialization 2.0. Although Neo-industrialization 1.0 does not change the way of thinking, the strategy in the context of the new economy involves a change in the industrial model of the organization in which the determining time is the future, and the context determines it (Davis, 1989). Thus, Neo-industrialization 1.0 fixes new ways of doing things, accepting that it is easier to change machine behaviour than human thinking.

One of the most socially valued aspects is stability. Stability requires permanent organizations. Even tolerance towards old, bureaucratic and unresponsive organizations seems undisputed by the instituted pseudo-stability. Differently, Neo-industrialization 2.0 systems nurture temporary organizations whose existence depends on their transformative and creative capacity. When that capacity dissipates, another organization emerges.

Neo-industrialization 2.0 calls for temporary organizations, which are very responsive in action-oriented, agile and flexible projects, while permanent organizations sponsor mechanisms to transform learning into explicit knowledge in well-defined structures and

organizational cultures that emphasize rhetoric (Ekstedt et al., 2003).

In manufacturing, there are no permanent and perfect models. Change is a requirement, not an alternative. In change processes, there is no right path to guarantee transitions from the lowest to the highest levels of complexity in organizations (van Eijnatten et al., 2007). Therefore, there cannot be a definitive economic science that solves all social problems.

Table 2. Characteristics of Neo-industrialization 1.0 and Neo-industrialization 2.0.

	Neo-industrialization 1.0	**Neo-industrialization 2.0**
Structure	Regular Network	ComplexNetwork
Way of Doing	New	New
Way of Thinking	Old (Technological reductionism)	New (Metanoia)
Philosophy	Modernism	Post-modernism
Change Process	Reformative	Transformative
Change Outcome	Incremental	Disruptive
Progression	Linear/Geometric	Power-law
Engineering Philosophy	Concurrence	Collaboration
Knowledge Dynamics	Convergence	Diffuse
Management Process	Self-ordering	Self-organization
Management Goals	Stability/ Innovation	Dissipation/ Emergence
Context outlook	Predictability	Uncertainty/ Indetermination
Construction	Learning	Unlearning
Growing Process	Maintain and Increase members	Nurture connectivity / Increase connections
Economy domain	Metanomics	Humanomics
Economy philosophy	Capitalist	Post-capitalist
Economy model	New Economy	Sharing economy

With the growth of post-industrial society, the technological factor has replaced the social one. Hence, the neologism “humanomics” supports the need to study the human problem of living simultaneously in these two worlds, the personal social and the impersonal economic (technological) (Smith & Wilson, 2019). The “social factor” is essential and not simply additive (Pratt, 2000) and it is a distinctive factor in Neo-industrialization 2.0 over other forms of organization. Neo-industrialization 1.0 is a consequence of a post-industrial society and benefits from the evolution of technology. In this evolutionary process, a meta-economy (metanomics) emerged based on technologies adjacent to the Internet and information technologies. Services promote the expansion of a new economy. Despite warnings about the need for vigilance against easy economic and technological reductionism (Pratt, 2000), Neo-industrialization 1.0 seems to ignore risks and alternatives.

6. OPEN X AS A HOLISTIC PARADIGM

Technological evolution, the transition to the knowledge economy and globalization have transformed individual and separate national markets into a single unit (Arici et al., 2022).Globalization has changed the economic game, but the political focus remains fundamentally about winners and losers (Lake, 2009). To describe the complexity of this game, Lake refers that globalization allows "individuals, corporations and nation-states to reach around the world farther, faster, deeper and cheaper than ever before" but ignores that it “is also producing a powerful backlash from those brutalized or left behind by this new system” (Friedman, 2000). According to Friedman (2000), in control of this system are agents in two groups: the “short-horn cattle” (individuals or financial institutions) who produce nothing and just play with the money and the “long horn cattle” that are the multinationals - General Electrics, General Motors, IBMs, Intels, Siemenses - that expand globally, building factories all over the world.

The intuition that open projects can demonetize them is false. As shown in Table 3, some Open X frameworks are priced high and remain open. These examples only serve as a reference that Open X does not mean without economic value or boundaries. The boundaries, in these cases, among other characteristics, are web page addresses. The value of these sites is aggregating a network of human agents and the potential “open” creative knowledge they provide.

New technological capabilities, which are emerging increasingly, quickly and continuously, play a fundamental role in this announced transformative paradigm of Industry 4.0. The ease of communication and digital connectivity and the integration of advanced electronic devices to detect more and more things point to the scenario of Cyber-Physical Systems where the control of the entire product lifecycle, from preparation, through execution, until the evaluation of the final results, is a continuous cycle of learning and realignment that adapts to the uncertainties of the context (Putnik et al., 2019).

Open X based only on information systems can be easily replicated without requiring any capital investment, such as the idealization of software through individual contributions, as long as it only depends on the computer that the programmer already has. In other areas, it is still difficult to introduce Open X, due to

several factors such as difficulty in dividing large projects into small, manageable and independent modules; lack of experts available to collaborate; clumsy user interfaces; The legal costs of designing, testing and seeking regulatory approval are enormous (e.g. drugs) (Lerner & Tirole, 2002).

Table 3. Some acquisitions of Open X by "longhorn cattle" organizations.

Open design network	Website	"Long horn cattle" organization	Year	Price	Note
Github	https://github.com/	Microsoft	2018	$7.5 billion	1
RepRap Project and Thingiverse	https://www.thingiverse.com/	Stratasys (An industry leader in professional-grade 3D printers)	2013	$430 million + $3.3 billion	2
Instructables	https://www.instructables.com/	Autodesk	2011	$30 million	3
1) https://news.microsoft.com/announcement/microsoft-acquires-github/ 2) https://www.extremetech.com/extreme/159218-3d-printing-pioneer-stratasys-looks-to-the-future-and-buys-makerbot-thingiverse 3) https://www.wired.com/2012/09/ff-autodesk-and-the-big-make/					

Societies are more independent when free from marketing barriers or corporate agreements, i.e., when these are open. Evolution does not generate a permanent winner but diversity, revealing a rich structure often recognized as edge of chaos, or complexity. It can also justify modelling what is complex, such as human languages because they model reality (O'Reilly, 1999). To that extent, Open X could be a dissipative structure where new contributors find more complex self-organization, as exemplified by the development of the social public resource digital sharing system (SPRDSS) in China (Li & Jiang, 2022). The sustainability of Open X depends on the availability of participation and collaboration of network agents. Without a renewal of ideas through new members, the network becomes extinct.

7. OPEN X APPLICATION EXAMPLES

Considering business model innovation as a set of "designed, novel, and nontrivial changes to the key elements of a firm's business model and/or the architecture linking these elements" (Foss & Saebi, 2017), it seems imperative to rethink the traditional corporate designs. Open can also be part of a "business" model.

The automotive industry has stood out in using Open Technologies. In part, technological progress stems from the development of electric propulsion in vehicles.

The findings suggest that open source has positively affected the evolution of the electric vehicle industry in the United States (Yihan, 2020). Investment cost decreases after open source, encouraging electric vehicle manufacturers to invest more frequently, which results in higher-quality production. The cost of entry also becomes lower after open source, allowing more models to enter the industry and inducing economies of scale to reduce manufacturing costs (Yihan, 2020).

As Figure 4 shows, China, in addition to producing, is the largest market for electric cars.

In 2022, China accounted for nearly 60% of all new electric car registrations worldwide. The sales-weighted average price of small electric vehicles in China was below US$10,000, significantly lower than in Europe and the United States, where the sales-weighted average costs of these types of cars exceeded US$30,000 in the same year (International Energy Agency, 2023). Therefore, as shown in Figure 5, it is not strange that a car sold in China below US$40,000, in Europe and the United States costs above US$70,000, representing an enormous margin that other Western manufacturers should overcome to compete in China. It is not about fees and taxes but about manufacturing capacity.

The technological development and increasing complexity of the manufacturing systems in China, creating products adapted to its enormous domestic market, will inevitably influence the global market. Figure 5 shows how electric vehicle production in China competes with Western manufacturing. The plethora of products with different qualities demand a Neo-industrialization that respects multiple expectations.

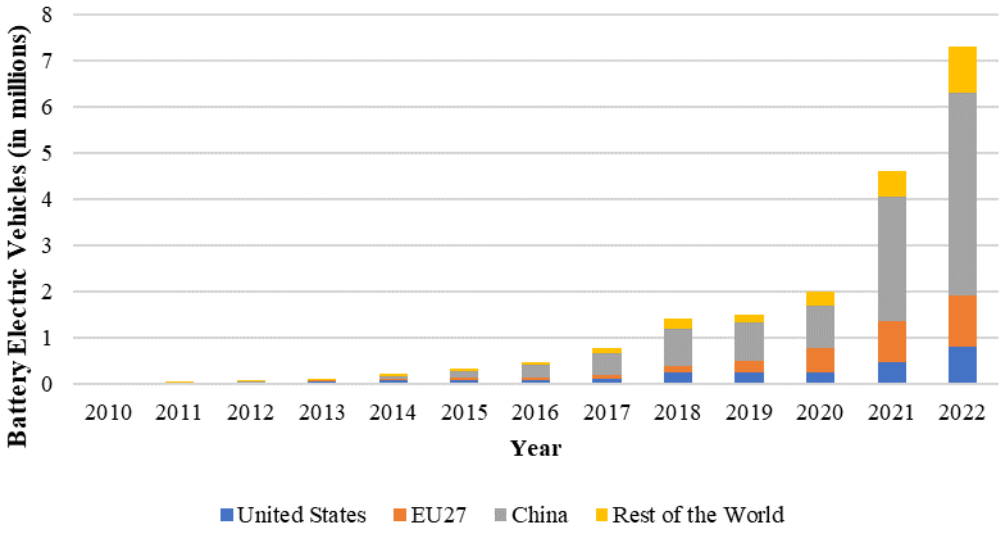

Figure 4. Electric car sales (International Energy Agency, 2023)

The BYD (Build Your Dreams) Han EV model costs less than US$40k in China and over US$70k in Europe.

The TESLA Model S now starts at US$89k (down from $96k)

The WulingHongguang Mini EV is a battery electric city car manufactured by SAIC-GM-Wuling since 2020. In February 2023, global sales since the beginning exceeded 1,1 million units, with the Mini EV, priced at around US$5k, being the best-selling and cheapest electric car in China.

Figure 5. Average consumer prices for electric car models in May 2023

One of the possible fears about Open X is that the economic value of its adoption to its members may be negligible. Although the data presented are circumstantial, they suggest that the probability of achieving higher value at a lower price is greater with Open X than with closed governance. The benefit is not only for the community that participates in Open X but goes beyond its boundaries.

This would then lead to a reduction in the quality and quantity of the very content that Google and other information technologies are using to power their semantic technologies and are surfacing directly with users. If substantiated, this trend would represent a new and concerning interaction between peer production communities and information technologies that likely would generalize beyond the relationship between Wikipedia and Google. Moreover, if it exists, this interaction will likely only grow soon, especially as Siri, Amazon Echo, Cortana, and other information technologies follow Google's lead and address more information needs directly rather than pointing people to webpages (often using Wikipedia content to do so).

One of the major donors to the Wikimedia Foundation, which owns the Wikipedia Trademark and Wikidata, is Google. Despite the concerns raised by (McMahon et al., 2017), the relationship between the two organizations remains mutually beneficial, showing that the value of considering peer production communities

like Wikipedia in the information technology ecosystem is broader than their existence. For example, the collaborative, free and open knowledge structured database Wikidata underpins Google Search©, Alexa©, Siri©, and Cortana© (Cafarella et al., 2022). The financial results presented in Figure 6 reflect the growth of the Wikidata database made available by the owner of Wikipedia.

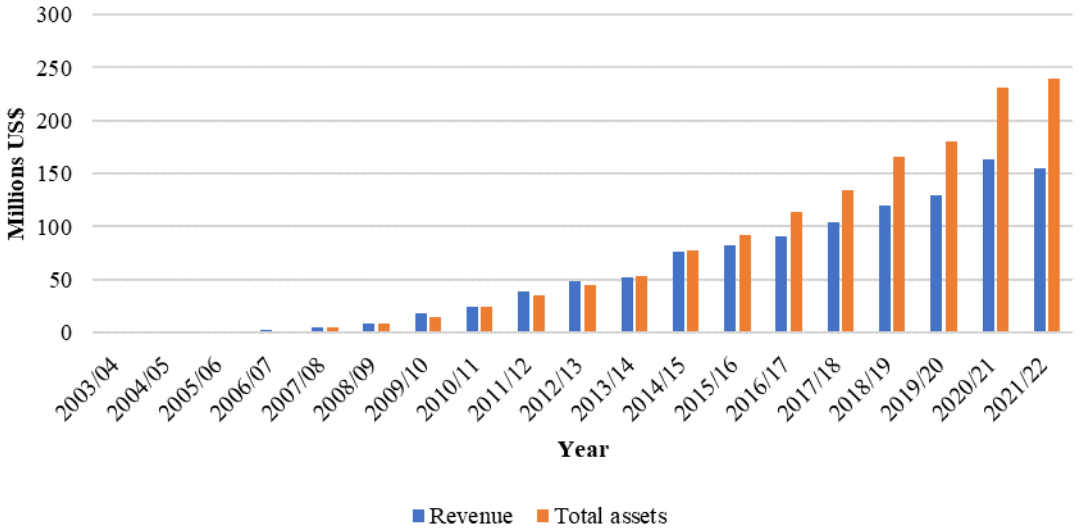

Figure 6. Economic results of the Wikimedia Foundation (Wikimedia Foundation, 2023)

To expand and accelerate a rapidly evolving technology platform with other companies that make electric cars, in 2014, "Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology" (Musk, 2014). The willingness to share doesn't end or begin with Elon Musk. "Since 2003, for instance, major auto firms, including GM, Toyota, and BMW, and their suppliers have collaborated in an organization called AUTOSAR to develop an open-source flexible software layer standard for the electronic control of a vehicle's hardware" (Teece, 2019). And like Tesla, BYD, since 2021, has opened a platform with all its competitors (Battery Industry, 2021). These examples show that "Technology leadership is not defined by patents, which history has repeatedly shown to be small protection indeed against a determined competitor, but rather by the ability of a company to attract and motivate the world's most talented engineers" (Musk, 2014).

As mentioned, the Open concept can have multiple interpretations, from sharing to collaboration. Nevertheless, Open does not define, *per se*, success in a social organization where capital dominates. For example, we point out "despite the attractive label and the entrepreneurial successes, Uber, Airbnb, and Facebook are not based on "sharing"; rather, they monetize human effort and consumer assets." (Kenney & Zysman, 2016). The data obtained by these organizations primarily benefit themselves.

Trade openness is not always positive and meaningful, so political decisions must first address enabling factors to significant positive outcomes from Open X adoption, e.g. alignment of their trade and industrial policies with trade facilitation, financial development, industrialization, technological improvement and infrastructure development (Malefane, 2020).

8. CONCLUSIONS

It is essential to distinguish between what we get/have (value) and what we spend/pay to get it (price). The data presented in this paper warn that Western organizations must change behaviours, not to compete with China, but to be more independent. And amid the struggle of the titans, the small countries must have a different, industrialized and autonomous political strategy, although they should consider coalitions.

This paper shows that Open X is dependent on conscience. It relies on dialogue, learning, sharing and collaboration. The essence of Open X is concrescence and becoming, while closed institutions aim to maintain the *status quo* (always condemned by the action of entropy). A new reality requires new behaviours. We suggest a Neo-industrialization 2.0 based on Open X.

We may be subverting the concept of Open X if there is no fair return on participation in open networks. The danger arises from economic and political regulations. Regarding the first, the owners of the network platforms have a brand, sign or reference to which a dynamic community converges, creating a complex dissipative structure, i.e., a new attractor. This platform, fed collectively, usually has an individual property where a will based on traditional powers can subsist. The mainstream economic model, without the intellectual property of patents, distinguishes itself in brand/platform ownership. Perhaps we are amid a reorganization of our economy in which platform

owners are developing power that may be even more formidable than the factory owners at the start of the industrial revolution (Kenney & Zysman, 2016). This possibility points to a political inability (or anti-politics) that, supported by law, distorts the objectives of open networks. Using old legal frameworks may hinder the development of the Neo-industrialization 2.0 needed to face the challenges of a new world order.

Elite law schools whose students are usually in powerful legal and political positions advocate the depoliticization and naturalization of market-mediated inequalities by discouraging thinking systematically about the interrelationships between political and economic power, reinforcing the success of the 20th-century synthesis that created a neoliberal political economy based on concepts of efficiency, neutrality and anti-politics (Britton-Purdy et al., 2019). Open X tends, through dialogue, to raise awareness. Therefore, we have a dichotomy between the organized powers and the (pseudo) anarchist models of Open X.

Proprietary and open platforms, over time, tend towards hybrid governance models characterized by central control over the platform's technology (Eisenmann et al., 2009). It can mean that when a proprietary design becomes unprofitable, it becomes open to the prospect of redesign, and if it becomes valuable, it entices other large organizations to participate and use it. There is a dominance of someone over others. The more unclosed the organization, the more undefined this domain is. However, it, the non-closed/open organization, exists due to the self-organization that guarantees the coherence of the network structure.

Open X requires the creation of a reality that renounces normative or prescriptive approaches to the classic management of organizations (Putnik et al., 2021). We cannot have a sustainable Open X, without Open Education, without Open Culture, without Open Society, that is, without Open Context. An Open Organization within a closed society is doomed to failure. To think globally is to think openly; to discover beyond boundaries.

Considering that X (from Open X) is a set of multiple variables (Design, Education, Society, Culture), it is pertinent to investigate the effects of multidisciplinarity in Open Manufacturing, part of Neoindustrialization 2.0. This proposal for future work intends, among others, to investigate the hypothesis that the multiple variables (Xs) are open subsets that intersect and influence each other. Given that these sets have a dynamic topology, any analysis of the sustainability of these sets is quite reductive because they frame recursive structures where small fluctuations can cause disruptive effects.

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