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## **CIRCULAR ECONOMY, SYSTEMIC DESIGN AND SOCIAL DEVELOPMENT GUIDELINES FOR EMERGING ECONOMIES**

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### **ABSTRACT**

This paper synthesises the main ideas presented as a keynote speech for the First World Distributed Conference 2019: Designing Sustainability for All. The objective is to contextualize Product-Service Systems and Distributed Economies in the Brazilian and Latin American context from the perspective of sustainability. First, some initial reflections and ideas about the perception we have regarding sustainability in today's context are presented. We discuss why our present production and consumption system remains unsustainable and why the paradigm of circular economy still is challenging today. Then, the LeNSin Brazil Project is presented. To illustrate the project, case studies were systematically collected and classified. As a conclusion, we point out that the development of s.PSS for the context of DE is relatively recent field for design in Latin America and "classic" or "traditional" design methods do not fit all the new variables involved in this type of projects. Also, the lack of appropriate methods and tools opens a new field of research for the creation of methodological models to support the design of S. PSS in specific contexts. Finally, there is a (re)definition of the design process and designers need to improve their skills in order to better understand how users' needs can be met through intensive use of services and experiences.

Key Words: Sustainable PSS, Distributed Economies, Latin American PSS.

## 1. WHAT IS WRONG WITH THE ECONOMIES OF SCALE?

Perhaps one of the reasons that bring people together to an event such as the First World Distributed Conference is that, in a way or another, their activities are closely related to sustainability.

In this regard, I'd like to begin this presentation with a particular definition of sustainability from professor Ezio Manzini in which "Sustainability is a way of being and doing thank to which people can live better, consume less and help to regenerate their contexts of life"

When we evaluate where our society is today in terms of sustainability, probably we might have mixed fillings about it. Optimistic and pessimistic scenarios might come to our minds. For instance, when looking at how products are made today, we realised that globalisation continues to give support to linear production systems, where huge amounts of raw materials are shipped away, traveling long distances in order to be transformed into products thanks to the use of enormous amounts of energy (Figure 1). Those products are then shipped back and commercialised worldwide to be used and consumed and, probably, at the end of their not so long lasting life cycle, what remains from those products will end up in a land fill or by the sea. This is why the idea of a circular economy remains challenging, even today.



[Figure 1] Representation of the current production system. (Source: the Author)

We could say that the economic laws that have so successfully governed industrial systems in the last 70 years do not provide the right signs for sustainable development for all.

It seems that something is wrong with the economies of scale and society is taking action in order to bring to the table the discussion of our future. For instance, at the time I'm writing (April 2019), thousands of young students across the globe are taking the streets of main cities across the globe calling for action against climate change. They refuse to attend school to protest adults' lack of concern for their future (Figure 2).

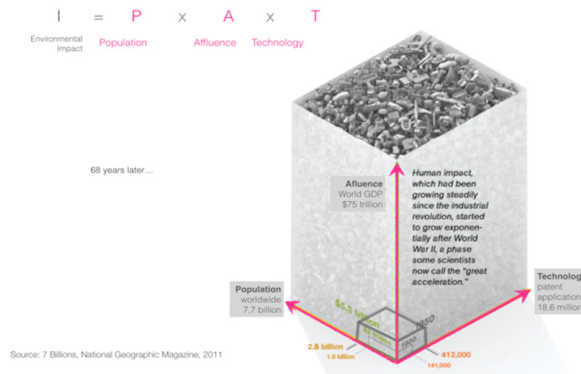
On the other hand, In France, the yellow vests have paralysed the country in recent days. They went to the streets demanding better conditions of work, of life, of health, of security, and sustainability as well. Among their claims, they demand that instead of financing the electric car industry, the French government should make more investments in alternative, clean fuels, such as hydrogen (Figure 2).



[Figure 2] Student (left) and Yellow Vest (right) calling for society action, February 2019.

We cannot say that our lack of action towards sustainability is due to our lack of information about it. I remember when I was a young researcher, 20 years ago, there were just a couple of films about sustainability. Inspiring films such as *Koyaanisqatsi*, *Baraka*, *Home* were precious jewels hidden in the last shelf of video rental shops. By contrast, today people have access to hundreds of films that, in one way or another, openly discuss diverse topics directly related to sustainability. A simple search on the internet for audiovisual material related to the economic, social and environmental pillars of sustainability brings a list with hundreds of recommendations of films and documentaries to watch. The reason I mention documentaries and films and not books or papers is because those documentaries have the power of reaching wider audiences across the globe, informing people about what's going on with the environment and society today, and inspiring and encouraging them to take immediate action.

Looking from another angle, environmental impact could be defined as the multiplicative contribution of three main factors: population, affluence and technology. It is called IPAT, and it measures the world's population, the affluence of society in terms of Gross Domestic Product (GDP) and technology, which measures how technology impacts, among other things, the processes that are used to obtain resources and transform them into useful goods.

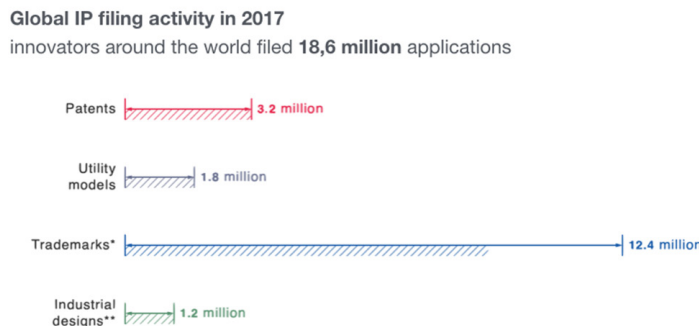


[Figure 3] Representation of Environmental Impact: (Source: 7 Billions, National Geographic Magazine, 2011)

In terms of Population, today we are 7.7 billion people. That number has steadily increased 1.2% a year since the 1950s and it will continue to do so for the next 20 years. Only by 2040, when we reach 9.3 billion people, according to predictions, it is when our population will begin to decrease and stabilise. Also, another important fact to mention is that back in the 1950s the population living in urban areas was approximately 30%. Today that number almost doubled. 57% of the population lives in urban centres.

The next component in the IPAT equation is Affluence, which can be measured according to GDP figures, in 2018 it was 87,5 trillion US dollars (almost 10% increase from the previous year) The truth is that since 1970s humanity has been in ecological overshoot, with annual demand on resources and energy that exceed what Earth can regenerate each year. Our ecological foot print is 1,7 planets. This means that it takes the Earth one year and six months to regenerate what we use in a year. Imagine our future scenario putting together the demands of an increasing population + increasing Affluence.

Finally the last component of the IPAT equation is technology. In the equation, patent registration is a way to measure how technology impacts, among other things, the processes that are used to obtain resources and transform them into useful goods. in 2017, innovators around the world filed 18,6 million applications (Figure 4).



[Figure 4] Global IP filing activity in 2017. (Source: WIPO Statistics Database, March 2019)

At this point, some sectors of society could advocate in favor of technology as our hope towards the future. It could be true, but not for sustainability. At the present moment, two revolutions are quietly taking place. One the one hand the Information and Communication Technology (ITC) revolution and on the other the Biotechnology revolution. They are transforming humanity and the planet in ways we cannot yet comprehend. However So far, none of the advancements in these two directions have made solid sustainable claims. What are the benefits, in terms of sustainability, of the increasing use of autonomous systems, such as cars, robots, or digital assistants into our daily life? Or what are the possible sustainable gains of hacking our DNA? If, in the not so distant future, humans can extend their lives more than 100 years, what the implications would be for sustainability?

When we imagine a sustainable system innovation, we know that we need to radically reduce the consumption of environmental resources. What signs of less resource consumption do we have from ITC or Biotech experiments if they are produced with the same mindset of the industrial systems?

In summary, when comparing our environmental impact today with our IPAT in the 1950s we can see an exponential increase of everything. Almost everything we produce at some point is transformed into energy or ends up in landfills or the ocean. From bicycles that not so long ago were part of a bike sharing PSS, to fight airplanes being buried after some years of use. It seems that we were unable to reuse or recycle them. Also, thousands of polymers forming huge patches of plastic garbage in the middle of the oceans are clear signs that something is wrong with our system. Just imagine how many schools or hospitals could have been built with those resources and money that now rest on river basins, oceans and landfills.

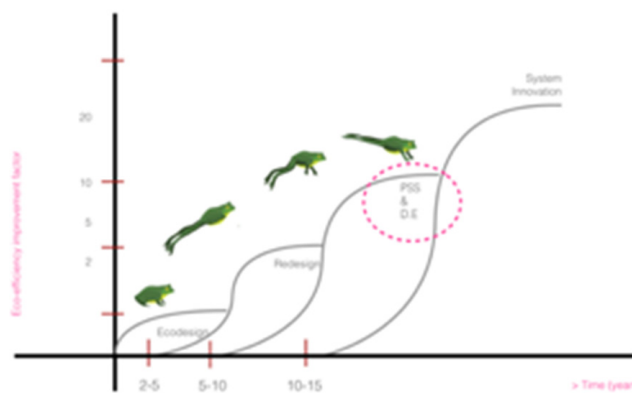


[Figure 5] Example of waste disposal in land fills: (Source: The Atlantic 2018 <http://bit.ly/2JLZ4Ph>)

Summarising, we could say that one of the objectives of the industrial system is to remain attractive and profitable for investors over the long run, and the key to remain as such is the prevalence of mass production and centralised industrial cores.

## 2. THE QUEST FOR ALTERNATIVE SUSTAINABLE SOLUTIONS

Over the past 30 years we have increasingly been looking for alternatives. For instance, in the design community, researchers envisioned future scenarios that might favor the transition towards a sustainable society. Back in the 1990s, one of the early stages in that transition was eco-design, where designers were committed to improve the environmental impact of artifacts.



[Figure 5] Degrees of environmental benefit and of innovation required. (Source: Source: A Promising Approach to Sustainable Production and Consumption, Brezet, 1997)

Soon, we realised that eco-design was not enough in terms of sustainability. So a more radical approach was envisioned. An approach that introduced sustainability criteria since the beginning of design process. We commonly called this approach Design For Sustainability.

Soon after, we focused on the idea of dematerialisation of the economy. It meant satisfying users's needs with services and PSS. At the same time attention to a new types of organisations such as DE, emerged. Perhaps, our next step will be to envision possibilities for system innovation. A system where hopefully we will be able to consume 90% less resources.

### SUSTAINABLE PSS & DISTRIBUTED ECONOMIES: THE LENSIN PROJECT

Over the past 3 years, designers and researchers from all over the world joined the Learning Network of Networks on Sustainability International (LENSIN) to research two promising models of development within the sustainability perspective. The models are Sustainable Product Service Systems (S.PSS) and Distributed Economies (D.E). The project has been the result of a social interactive learning process involving 14 universities from around the world, more than 100 professors and researchers and 500 or more students, to discuss, develop and share knowledge regarding S.PSS and D.E at the local and global context (Figure 6).



[Figure 6] Typologies of Distributed Economies within the Lensin Project. (Source: The Lensin Project 2016)

Along the Lensin Project, it was possible to identify new forms of organisations, movements and initiatives that have a completely different approach to production and consumption of goods for the satisfaction of needs. From grass root movements to social innovation, crowd design e local production systems, cooperatives etc.

We identify those models as examples of Distributed Economies, since they promote the development of small-scale, decentralised, flexible production units, synergistically connected with each other and that make use of local resources, offering the advantage of being much more flexible and resilient to respond to change.

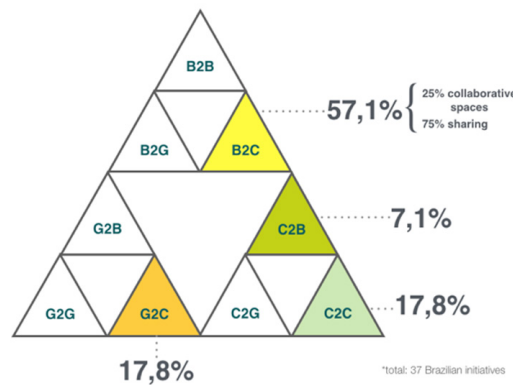
Distributed Economies have 3 main pillars: Structure, Scale and Sustainability Potencial. They represent a paradigm shift from centralised to distributed systems, from large scale to small scale of production and distribution. In terms of sustainability potential, D.E make use of renewable resources, they promote wealth creation, diversity and flexibility, as well as collaboration and empowerment among community members

In the Lensin Project, we classified DE into 5 categories renewable energy, hardware (artefacts), software, information and design. Everything in a distributed configuration.

What distinguishes DE from other kind arrangements is that in their essence they are decentralised organisations where information open to everybody. Every member is willing to contribute, sharing common values and ideologies. DE are benefitted with the so-called network effect, where every additional stakeholder makes the organisation stronger.

We began to search for initiatives with the characteristics of DE, in Brazil. From an initial list of 340 initiatives, we narrowed down to 37 that met the following criteria: Offering services to extend the product life cycle; Offering of enabling platforms; Complete services in DE system configuration; Stakeholder network optimisation; Proposals with alternative forms of payment.

Along the study, we classified the diverse initiatives according to who was the main proponent (Business, Government or Consumers) and whom was the PSS offered. According to this rationale we obtained 9 possible clusters of S.PSS offerings: Business offerings (B2B, B2C, B2G) such as collaborative spaces and sharing services, Consumer initiatives (C2B, C2C and C2G) like car pool and goods exchange among communities, and Government offerings (G2B G2C G2G) where we found proposals aimed at minimize urban environmental issues such as mobility and recycling solutions.

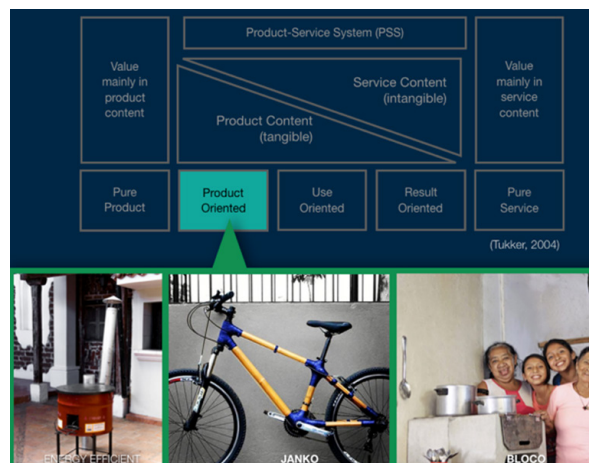


[Figure 7] Types of s.PSS within DE systems, Brazil. (Source: The Lensin Project 2016)

This initial study shows diffuse signs of the emerging of S.PSS offerings within a D.E. configuration. The study also shows opportunities for innovation with offerings in clusters such as B2G or G2G, where people could develop S.PSS offerings where the government is the main “user” or Governments offering S.PSS to other government agencies.

After our pilot experiment in Brazil, we decided to look for sPSS initiatives in the Latin American context, with the collaboration of our Lens partners from Argentina, Peru, Colombia and Mexico.

Taking as a reference the PSS typologies model from Tucker we found diverse Product Oriented PSS offerings. These case studies are a good sign of a shift towards sustainability thinking in our designers and entrepreneurs’ mindset.



[Figure 8] Examples of Product Oriented S.PSS offerings. (Source: The Lensin Project, 2016)

Things got more exciting when we were looking for Tucker's Use Oriented PSS. We found lots of PSS initiatives in this category promoting SHARING as a main value proposition. From wardrobes, electric rental bikes, washing machines, toys and food delivery. Those initiatives are based on the network effect, and largely supported by social media interactions. Some representative case studies include the following:

A Roupateca (<http://aroupateca.com>) a shared wardrobe in São Paulo where the user can dress on a daily or weekly basis, if she wants, for a monthly fee. The only condition: to return the clothes cleaned.



[Figure 9] Roupateca, Shared Wardrobe. (Source: (<http://aroupateca.com>))

Econduce (<https://econduce.mx>) electric bike rental in Mexico City. The user pays for a minute of ride. \$1 Mexican pesos US\$0,05 us cents.

Washing Machine Rental ([https://www.youtube.com/watch?v=yc7\\_8Zuy7BU](https://www.youtube.com/watch?v=yc7_8Zuy7BU)) a PSS service for the suburbs of big cities in Colombia. Without access to public transport. Many of them use rain water and pay for hours of use. Tok Tok (<https://www.toktok.com.mx>) from Mexico, and Joanninha ([www.joanninha.com.br](http://www.joanninha.com.br)) from Brazil are good example of s.PSS toys rental where parents exchange toys for their kids once a month for a small fee.

Solar roasted organic coffee deliver (Source: <http://compadre.pe>) is a S.PSS where organic coffee is locally produced by cooperatives using solar energy.

Finally, in the Result Oriented PSS category, we found entire communities using and promoting alternatives ways of consumption and satisfaction of needs. In this kind of PSS, the core values are focused on the NETWORK effect and the EMPOWERMENT of stakeholders.

In lima, Peru where there is no rain fall the X-Runner Dry Toilet service (<http://compadre.pe>) attends low income communities with the rental of a dry toilet. The organic material is composted and commercialised for agro industry use.



[Figure 10] Dry Toilet Service. (Source: (<http://compadre.pe>))

Yolcan (<https://yolcan.com>) is an organic food deliver. More than a service is a platform connecting local farmers, consumers, academics and chefs. They promote the Chinampas, a type of agriculture that uses small areas of fertile, arable land to grow crops on the shallow lake beds in valley of Mexico.

LOuco Fab lab haker maker space dedicated to investigate possible solutions for the city, for instance by using sensors to monitor pollution levels, transit conditions in recife, Brazil and Hacedores (<https://hacedores.com>) fablab from México city are jus two examples of the fablab network in Latinoamérica. They are training young people under the idea of collaborative digital fabrication using shared tools and spaces.

Mercado Territorial ([mercadoterritorial.observatorioess.org.ar](http://mercadoterritorial.observatorioess.org.ar)) is a family agriculture network connecting farmers, the academy and consumers for a democratic distribution of agricultural products in Argentina. On the other hand, Mercado del Trueque (<http://data.sedema.cdmx.gob.mx/mercadodetrueque/index.html>) in Mexico, is an exchange market where people can exchange their recyclable waste for locally produced vegetables and food. No money is involved.

[Figure 11] Mercado Territorial, a familiar agricultural network (Source: <http://mercadoterritorial.observatorioess.org.ar>)



### 3. CONCLUSION

The development of s.PSS for the context of DE is relatively recent field for design in Latin America and “classic” or “traditional” design methods do not fit all the new the variables involved in this type of projects. The lack of appropriate methods and tools for conducting the design process opens a new field of research for the creation of methodological models to support the design of S. PSS development in specific contexts.

There is a (re)definition of the design process and designers need to improve their skills in order to better understand how users’ needs can be met through intensive use of services and experiences.

We also perceive a systemic change in the way artefacts are conceived in the contemporary world. An emerging scenario of customised and small scale local production, where users become part of the development process, assuming the designer’s role in a highly collaborative process, connected and networked.

We believe s.PSS and DE Models have advantages that can be levered as a new strategies to make industrial development less impactful to the environment, of decentralised, local scale, and consequently more sustainable.