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Regenerative Value Systems – Models illustrating flows and transformations of value within production systems

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Abstract:

This paper studies various foundational economic concepts, with the purpose to support the development of new systemic frameworks for *regenerative value systems*: those systems that we design, build, and work in, that help us provide for our physical needs of food, water, materials, products, structures, and energy et cetera – which also clearly influence and are influenced by our sense of being, culture, worth and abilities and so forth.

The term *regenerative*, underlines that these systems need not only to be sustainable – and to be resilient, but also be actively (and dynamically) engaged in their own *(re)production* and persistence. With a systemic view (verses a reductionist one) to be engaged in one's own reproduction, also implies that the surrounding system in which one persists (and thrives), also needs to reproduce itself (regenerate) – and one affects and is affected by the other.

Keywords: Value Chains, Circular Economy, Institutional Economics, Production, Value, Values, Natural Systems, Ecology, Modelling, Systemic Design.

1. Introduction

This is about systems, that not only produce goods and services, but also create jobs, and generate wealth and incomes, and so, this is foremost an economic study. With a look at some different aspects and contrasting economic views (or schools of economic thought). Within the frame of economics, the topic of 'value' will be looked at, as well as the use of metaphor, some of the various different forms of 'problem framing,' and the circularity or linearity of concepts for instance.

As this is about regeneration and production, this is also in part, an ecological study. Ecological systems (life, nature...) are, by the very 'nature' *regenerative*, (reproductive and self-replicating). The ecological part of this study is illustrated within two images within the conclusion, which also includes a tentative regenerative value systems framework, which compliments the ecological frameworks.

This is seen as a foundational work for further development.

2. Some Differences in Economic Thought

2.1. Physics or Biology (& Experience)

According to Reinert (2008), in very broad terms, two main types of economic theory can be characterised: those based on *metaphors* from physics, and those based on a combination of experience and metaphors from biology. Both have developed concurrently (and influenced each other) over time, however, according to Reinert, it is the economic schools of thought built on the metaphors of (Newtonian) physics that have dominated - and continue to be.

Metaphors from physics are generally inspired by Newton's work (circa. 1680's) – such as 'the invisible hand' – inspired by the invisible theory of gravity that keeps the Earth orbiting around the Sun, and 'equilibrium' for instance. Physics-based economics often attempts to distil concepts down to the most simplified uniform form, often using maths, is *quantitative*, and is often linear.

Experience-based economics, according to Reinert, is based on practical policies, which are put in place and tried-and-tested, prior to being 'distilled' into theory. His example is the understanding by medieval sailors, that eating oranges or lemons at sea prevented scurvy, prior to science finding and isolating the active agent, Vitamin C in 1929. And he continues:

“It is perfectly possible to cure illnesses, economic or other, simply by lesson-drawing without having a complete understanding of the mechanisms at work.” (p 27 Reinert 2008).

For this, 'less abstract' 'other cannon,' Reinert states that metaphors of biology are often used, helping to provide an often holistic and *qualitative* understanding of synergies, change, interdependence, trade-offs, stocks and flows, creativity, and spirituality for instance - often inspired by the human body. Here Reinert (2008) uses the example of Thomas Hobbes's '*Leviathan*,'^[1] where he shows the state as literally formed from its citizens.

Neither can be said to be 'better' than the other (Reinert, 2008) - particularly as more recent theories such as electromagnetism, relativity theory, and quantum theory have 'shattered' much of the Newtonian (and Cartesian) world view (Capra et al., 2014), perhaps modern physics will continue to help develop different forms of economic metaphor models in the future.

¹ Hobbes, Thomas (1981 [1651]) '*Leviathan*.' (or '*The Matter, Forme and Power of a Common-Wealth Ecclesiasticall and Civil*.' UK: Penguin Classics.

2.2. Cyclical or Linear

The '*economic problem*' – sometimes called the basic or central economic problem, has various definitions and has changed over time. Economics, as a field, made a substantial change in what was defined as the '*economic problem*,' during the so-called '*marginalist revolution*' (commonly cited 1871-1874) (Roncaglia, 2005; Mazzucato, 2018). Classical economics (the predominant school of economics prior to the marginalist schools) defined (political) economy as the study of the:

“[...] functioning of an economic system based on the division of labour, and hence analysis of production, distribution, accumulation and circulation of the product” (p279 Roncaglia, 2005).

Classical economics considered an objective (fact-based, measurable, observable...) view of economic value based on the difficulties and costs of production (principally labour), and prices attained the role of indicator for the relative difficulties in production. These concepts of circulation were developed with an objective to understand how the economy '*reproduces*' itself – continues to make itself anew (p45Mazucato).

The economic problem from the marginalist approach, can be said to be:

“...the optimal utilisation of scarce available resources to satisfy the needs and desires of economic agents.” (p279, Roncaglia 2005)

In marginalist economics, the '*marginal*' utility and scarcity defines the price and the magnitude of the market (p65 Mazzucato, 2018). The supply and demand of scarce resources adjusts value, which is conveyed in monetary terms. In the market, this becomes '*prices*,' which become the indicators for relative scarcity and consumer preferences. Prices are kept in check through competition, and simultaneously indicate the level of demand, and the required quantities for supply - greater demand raises prices, which raises (willingness to generate more) supply; and a fall in demand visa-versa (p56 Heilbroner, 1999).

“Sraffa [...] sums up the contrast with two images: the classical approach consists in the '*picture of the system of production and consumption as a circular process*,' while the marginalist approach aligns the perspective along '*a one-way avenue that leads from “Factors of production” to “Consumption goods”*’.” (p279 Roncaglia 2005)

As Piero Sraffa (1898-1983) alludes, economics shifted from a view of the economy as being '*circular*' - by looking at relations between entities, and attempting to calculate how the '*system*' reproduced and maintained itself for future production (including concepts of (re)distribution) (p45 Mazzucato); to one which is more '*linear*' (one-way), that begins with (industrial) inputs and ends with consumers – with markets in-between.

2.3. Values or Value

The word ‘value’ is derived from the Latin *valere*, which means ‘to be strong or worthy.’ Since this origin, ‘value’ has developed different connotations; the most popular are listed below - the order in the Oxford dictionary indicates the given importance/or level of common usage:

- [Value] “The regard that something is held to deserve; the importance, worth, or usefulness of something.
 - The material or monetary worth of something.
 - The worth of something compared to the price paid or asked for it.
- (Values) Principles of standards of behaviour; one’s judgement of what is important in life.” [2]

Roncaglia (2005), proposes that the discipline of political economy (therefore, economics) grew around these two different meanings of value: the *moral* issues – the rules of conduct (thus related to values), and the *economic scientific* issues – how to organise a society, based on the division-of-labour, to keep the process going (thus related to value).

The emphasis, in economics, on moral values (hence forth, ‘values’) and economic scientific value (hence forth, ‘value’), has evolved from an initial focus mainly on values in early societies, as social interactions dominated, to a greater focus on value in modern societies, as economic interactions have come to dominate (p19 Heilbroner et al., 2012). According to Heilbroner (1985 p107-118), the ancient canons of virtue and justice, which were founded on a scrutiny of *motives* and an ‘external’ assessment of ‘*social outcomes*,’ were slowly replaced, in the early nineteenth century with the rise of utilitarian philosophy, which made these canons null and void. Utilitarianism, asserted that:

“...whatever served the individual served society. By logical analogy, whatever created a profit (and thereby served the individual capitalist) also served society, so that a blanket moral exemption was, so to speak, extended over the entire range of activity that passed the profit-and-loss test of the marketplace.” (Heilbroner, 1985)

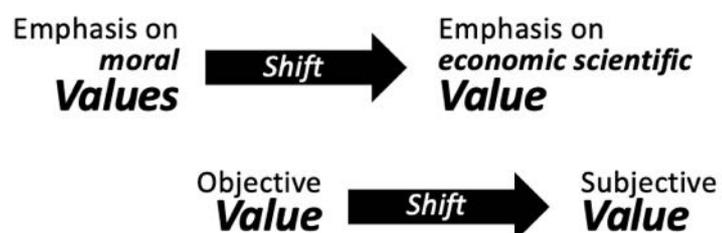


Figure 1. Shifting Emphasis of Values and Value (Author)

² Oxford Dictionary

What value actually *is*, and where it can be ‘found,’ or measured, or produced, particularly within production and distribution ^[3] systems, has been of great deliberation during the development in the field of economics (p7 Mazzucato, 2018).

As briefly mentioned in the previous section - up until the mid-nineteenth century, economists believed that a clear **objective theory of value** (also known as intrinsic theory of value) was a prerequisite to having a clear appreciation of the prices of services and goods in the economy. Objective value means that an object’s value can be estimated using *objective measures*, such as the conditions of production, the amount and quality of the labour required to produce goods or services, the technological and organisational form, or the relationships between capital and labour for instance (p7 Mazzucato, 2018).

However, after the mid-nineteenth century, the understanding of what economic value was shifted towards one of ‘**subjectivity**,’ where the price which is paid by the consumer (who is said to have subjective ‘preferences’) in the ‘market,’ determines the value of the goods or service, which are now regularly conceptualised as being ‘scarce’ ^[4] (p7 Mazzucato, 2018).

Modern economics has, according to Mazzucato (p8, 2018), all but left the study of value behind (in all its forms). What resides, are theories of ‘*share-holder value*,’ ‘*adding value*,’ and ‘*value chains*’ (Porter, 1998), which are often found in greater presence in modern business schools, than in the study of economics.

³ The term ‘*distribution*’ in economics, should not be confused with the retail and logistics of goods; in economics, distribution theory “...is concerned with the basic question of *for whom* economic goods are to be produced. In examining how the different factors of production—land, labor, and capital—get priced in the market, distribution theory considers how supplies and demands for these factors are linked and how they determine all kinds of wages, rents, interest rates, and profits.” (p244 Samuelson et al., 2010)

⁴ Formal (orthodox) economics “...is the study of how societies use scarce resources to produce valuable goods and services and distribute them among different individuals.” (p4 Samuelson et al., 2010)

2.4. Chrematistiké or Œconomia

One of the most famous visual models of how the 'macroeconomy' is supposed to work was developed by Paul Samuelson in 1948 (p 63 Raworth, 2017). Entitled the 'Circular Flow Diagram,' it illustrates how households supply their labour and capital to firms, in exchange for profits and wages. It also shows an interdependence between production by businesses and consumption and the flow of income to households. The model also illustrates that this is allowed to continue thanks to (the right amount of) 'leakages' and 'injections' from trade, governments and banks (Raworth, 2017).

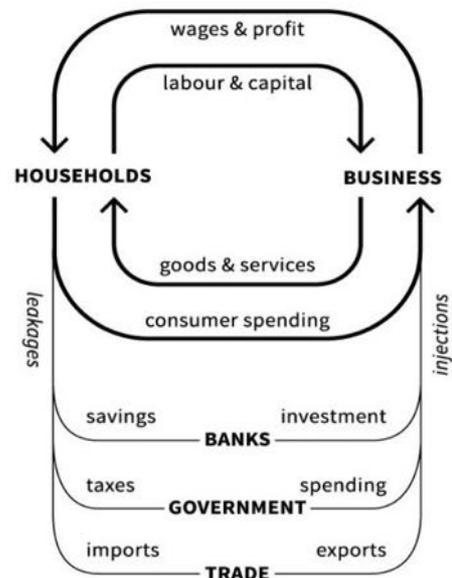


Figure 2. 'The Circular Flow.' Diagram by Marcia Mihotich. Copyright © 2017 Kate Raworth. Based on the 'Circular Flow Diagram' by Samuelson (1948)

According to Harvey (2017) illustrated a circular model of what he believes Karl Marx was describing (in his collections of finished and unfinished – and 'finished' by Engels - work). As a comment, in Harvey's book '*Marx, Capital and the Madness of Economic Reason*,' Harvey uses the physical metaphor of the water cycle to introduce the concepts further described in his book.

In essential terms, according to Harvey, there are four rudimentary processes within the overall circulation process of capital. The 'first' stage is called '*valorisation*,' whereby capital is produced in a firm in a form called '*surplus value*.'

This stage is then followed by '*realisation*,' where the commodities produced during production (which are either luxuries, 'wage goods' or means of production - the machines that are used to make the machines) and are exchanged for (or 'transformed' into) money. The next stage, '*distribution*,' is where the value and surplus value is distributed to certain economic entities. The 'final' stage shows how a portion of the profit is cycled back into the appropriation of the commodities (Labour Power and the Means of Production) required to continue the valorisation process.

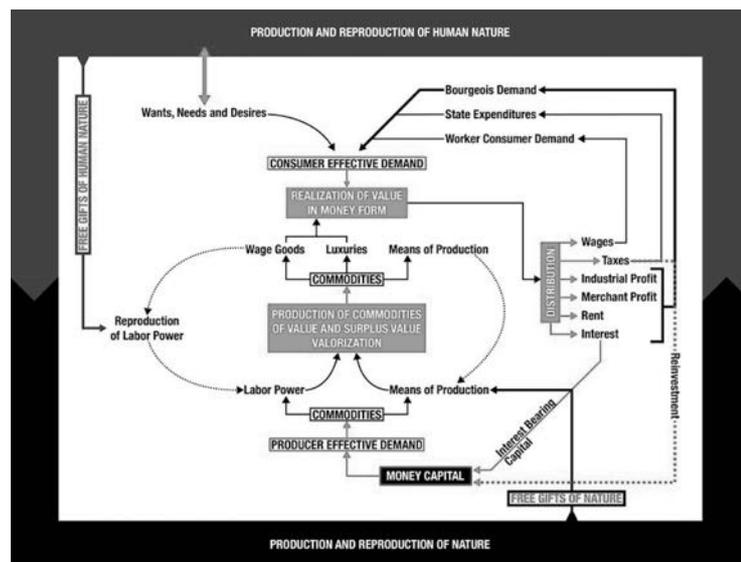


Figure 3. 'The paths of value in motion as derived from the study of Marx's writings on political economy.' Copyright © 2017 David Harvey

There is however, another potential starting point – another view on what is *within* the ‘economic problem.’

According to Gerber (2016), it was Aristotle that first distinguished between two forms of economics. Initially, Aristotle defines two forms of value: the value in use, and the value in exchange. With this distinction, he proposed a moral peculiarity between them both, by stating that it was ‘proper’ – or ‘natural’ - to use goods (*consumption*), but it is was ‘improper’ - ‘unnatural’ - to exchange them (*commerce*) (Heilbroner et al., 2012).

Aristotle also used his moral concept of ‘natural’ or ‘unnatural,’ not only to the goods, but also to the way in which wealth was created. For example, pasturage, agriculture, hunting, and fishing were said to be ‘natural’,

whilst usury (the lending of money for a rent profit – interest), and all forms of commerce (profits from the selling of goods in exchange for money) were considered ‘unnatural.’

Instead of redefining economy into production and distribution terms, Aristotle looked at economics through the lens of *use* (*oekonomia*) and *gain* (*chrematistiké*) (p20 Heilbroner et al., 2012). This famous distinction is arguably the first distinction of a ‘substantive view’ of the economy (*oekonomia*), alongside a formal view of the market economy (closer to *chrematistiké*) (p187 Gerber, et al., 2018).

Therefore, substantive (in *substance* and in the *concrete*:) economics:

“...centers on how human beings organize and allocate the pursuit of the things needed to sustain human life.” (p 29 Block et al., 2014)

In this view, Karl W. Kapp (1910-1976), asserted that economics should begin with actual human needs, and then going outward to his dependence upon, and his interaction, with his social and natural environment (Kapp, 1975). As well as Kapp, Karl Polanyi (1886-1964) with whom Kapp exchanged ideas and corresponded with (Gerber, 2016), also developed a substantive approach to economics. One of his many contributions with this approach was in developing the idea of ‘*embeddedness*’ – a term he used to describe politics, social relations, and institutions (p10 Block et al., 2014) – which he said framed and organised (different types of) markets.

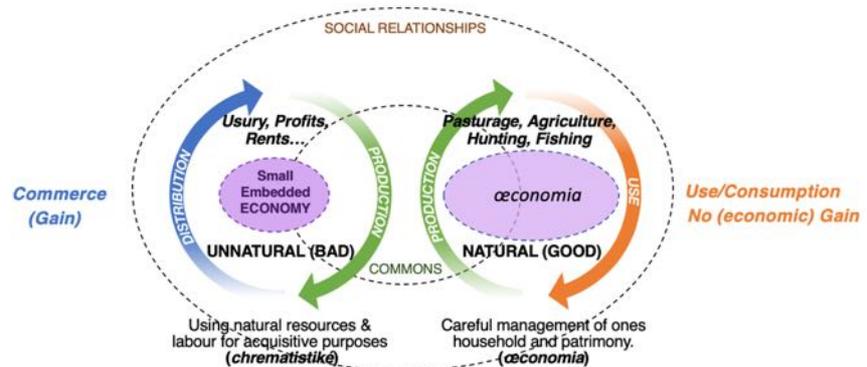


Figure 4. The View of the Economy According to Aristotle (Author)

3. Value Models

3.1. Competitive Linear Value-Chains

Arguably, one of the most famous studies and visual models of a ‘business view’ of value, was developed by Michael E. Porter, which he presents in his book ‘*Competitive Advantage*.’

Porter (1998) describes a model, that has two main levels of abstraction – the largest, ‘macro view,’ is called ‘*The Value System*’ (Figure 5). This value system includes upstream ‘*Supplier(s)*’ – *upstream*, implying their preceding position in the models’ linear sequence – followed by the industrial ‘*Firm*’ (which is the central ‘protagonist’ of the concept), followed by the downstream ‘*Channel(s)*’ – the often, but not always present, intermediate distribution firm(s), which is finally followed by the ‘*Buyer(s)*.’ The Value System represents the organisation of these entities from the point-of-view of a ‘*Single-Industry Firm*’ or a ‘*Diversified Firm*.’

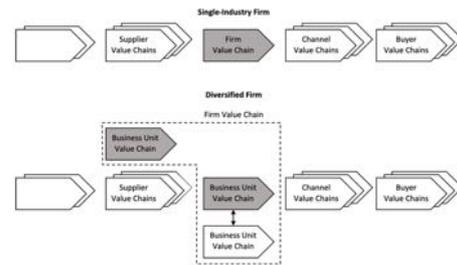


Figure 5. The Value System by Michael E. Porter (1998)

‘*The Value System*’ is then reduced to a second level of abstraction, either as the ‘*Firm Value Chain*,’ for a single-industry firm, or as a ‘*Business Unit Value Chain*’ for a diversified business firm. These two variants are analysed using one model (and treated in a similar way), which Porter (1998) calls ‘*The Generic Value Chain*’ (Figure 6) – which models a generic sequence of ‘individual value activities,’ that he asserts take place within all industrial firms (and hence, not in the market directly). Porter (1998) states that, it is here, at the level of the ‘*Generic Value Chain*,’ that the most effective form of analysis can be made:

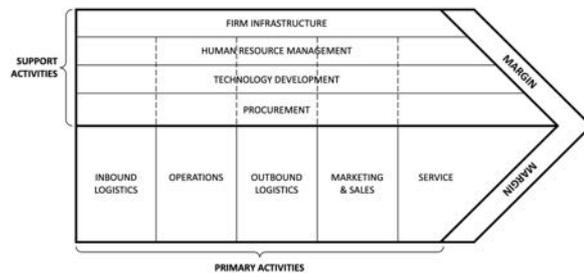


Figure 6. The Generic Value Chain by Michael E. Porter (1998)

“The relevant level for constructing a value chain is a firm’s activities in a particular industry (the business unit). An industry- or sector- wide value chain is too broad, because it may obscure important sources of competitive advantage.” (Porter, 1998 p36)

‘The Generic Value Chain,’ therefore, becomes a form of minimal unit or cell, where internal production processes can be disaggregated into a sequence of discrete tasks, where they can then be analysed for improvements. Porter also describes his concept of value and margin:

“The value chain displays total value, and consists of value activities and margin. Value activities are the physically and technologically distinct activities a firm performs. These are the building blocks by which a firm creates a product valuable to its buyers. Margin is the difference between total value and the collective cost of performing the value activities.” (p38 Porter, 1998)

3.2. Circular Models

“Looking beyond the current take-make-dispose extractive industrial model, a circular economy aims to redefine growth, focusing on positive society-wide benefits. It entails gradually decoupling economic activity from the consumption of finite resources, and designing waste out of the system.”
(Ellen MacArthur Foundation, 2018a)

Due to planetary wide issues such as climate change, and the destruction and pollution of eco-systems [5] [6], there has been an amplified demand for industrial firms to evolve how they do business. As stated by the Ellen MacArthur Foundation (EMF) above, it is proposed that firms need to transition towards ‘circular systems’ – which include a larger (macro view) of the firm and it’s interaction with it’s environment.

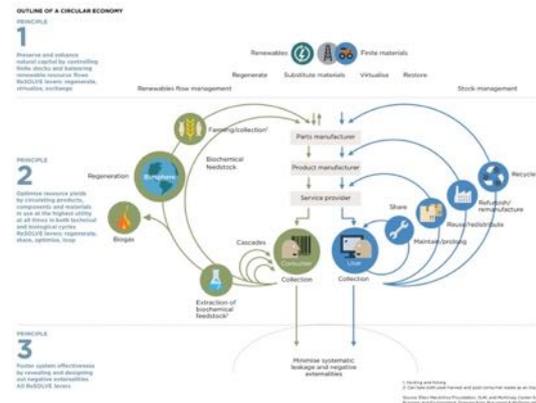


Figure 7. The Circular Economy (CE) System Diagram by the Ellen MacArthur Foundation

Possibly the most internationally recognised ‘circular model’ in the field, is the ‘circular economy system diagram’ (Figure 7), developed by the EMF. [7] In many ways, the central column maintains much of the ‘The Generic Value Chain’ concept developed by Porter (1989) - although turned 90° clockwise. Nevertheless, the model goes much further, by integrating it within a more expansive system of ‘biological’ and ‘technical’ - two ‘metabolisms’ (Braungart et al., 2002).



Figure 8. Cradle-to-Cradle Model by Walter Stahel

The circular economy system diagram was built upon and inspired by the previous work of many people and schools of thought. [8]

Prior to the CE diagram, there has been other ‘circular’ models, such as the ‘Cradle to Cradle’ model by Walter Stahel (Figure 8) [9], or the more sophisticated ‘Comet Circle™’, developed by Ricoh., Ltd (Figure 9). [10]

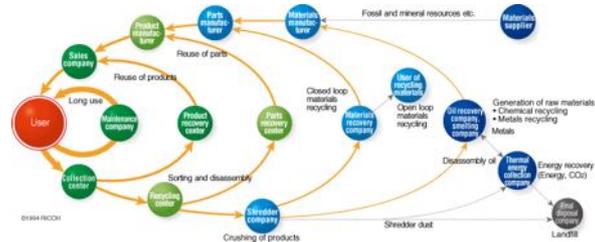


Figure 9. Concept of a Sustainable Society: The Comet circle TNM
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⁵ United Nations (2015) ‘The 17 UN Sustainability Development Goals (SDGs).’ Retrieved October 18, 2018, from <https://www.un.org/sustainabledevelopment/sustainable-development-goals>

⁶ IPCC (2018) ‘Special Report: Global Warming of 1.5°C.’ Retrieved October 18, 2018, from <https://www.ipcc.ch/sr15/>

⁷ Ellen MacArthur Foundation, ‘Circular Economy System Diagram.’ Retrieved October 18, 2018, from www.ellenmacarthurfoundation.org/circular-economy/infographic

⁸ See this link for more information: <https://www.ellenmacarthurfoundation.org/circular-economy/concept>

⁹ Stahel, Walter (1981) ‘Jobs for Tomorrow, the Potential for Substituting Manpower for Energy.’ Vantage Press; 1st edition 1981, U.S. Image: ‘Cradle to Cradle’ model. Retrieved October 18, 2018, from www.product-life.org/en/cradle-to-cradle.

¹⁰ RICOH Company Ltd, ‘The Comet Circle™’ model. Retrieved October 18, 2018, from www.ricoh.com/environment/management/concept.html

3.3. Embedded Models

The models shown thus far, focus on material flows and transformations, however, there are also models within this theme that are based around ‘*embedded systems*’ (see section 2.4). This includes work by the Forum for the Future, such as ‘*The Five Capitals*’ framework (Figure 10)^[11], and the work by Ricoh Ltd with their ‘*Vision - Pursuing the Ideal Society (Three Ps Balance™)*’ – Image 5 of 5, shown in Figure 11^[12] – which also integrates resource flows.

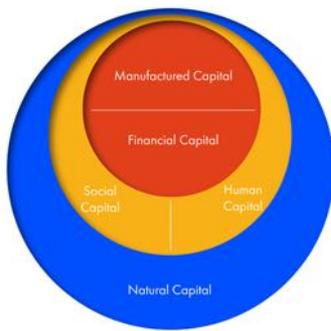


Figure 10: The Five Capitals by Forum for the Future



Figure 11. Vision - Pursuing the Ideal Society (Three Ps Balance™) Image 5 of 5 © 2002 Ricoh

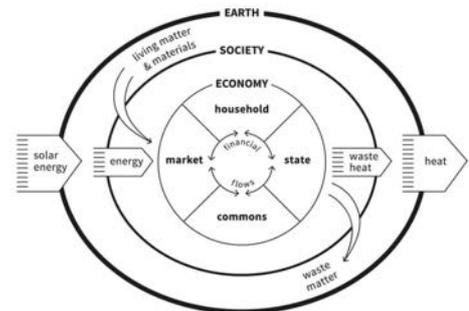


Figure 12. Embedded Economy. Diagram by Marcia Mihotich © Kate Raworth (2017)

The more recent work by Kate Raworth, and her ‘*Embedded Economy*’ diagram (Figure 12), also includes different ways communities organise themselves to provide for their needs - the so called ‘*provisioning systems*’ (household, state, commons, and market) (Raworth, 2017), which is *embedded* within the larger social and planetary system.

3.4. Input-Output Webs

These are less circular, but more ‘networked’ or ‘webbed’ (like food-webs) - *input-output diagrams*. Developed and promoted by the Zero Emissions Research & Initiatives^[13] (and others, including the Systemic Approach Foundation, who also worked with ZERI^[14]). ‘Input-output’ models are both models describing a concept, and are also dynamic tools that can be used to design new material flows through integrated production systems. Also, as in nature, there is no distinction between ‘agriculture’ or ‘industry’ – just transformative ‘nodes’ linked together with material flows.

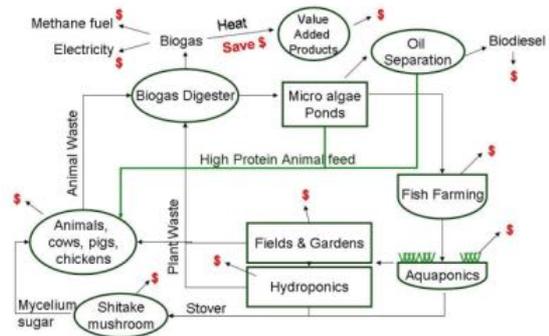


Figure 13. Simple Zero-Waste Agriculture System promoted by ZERI^[13]

¹¹ Forum for the Future, ‘The Five Capitals,’ Retrieved October 18, 2018, from www.forumforthefuture.org/the-five-capitals.

¹² RICOH Company Ltd, ‘Three Ps Balance™.’ Image retrieved October 18, 2018, from www.ricoh.com/environment/management/earth.html

¹³ Zeri Emissions Research & Initiatives, ‘Simple Zero-Waste Agriculture System.’ Retrieved October 18, 2018, from https://en.wikipedia.org/wiki/Zero_waste_agriculture;

¹⁴ The Systemic Approach Foundation <http://www.systemicfoundation.org>

3.5. Values Models

As well as Aristotle’s concepts of *oeconomia* and *chrematistiké*, he also developed concepts around how to develop values. One of his concepts was ‘Virtue,’ which includes a breadth of philosophical thought around:

“cultivating the attitudes and dispositions, qualities of character, on which a good society depends” and by “[...] giving people what they morally deserve – allocating goods to reward and promote virtue.” (Sandel, 2010).

Unlike other moral (economic linked) concepts, such as, welfare and freedom, virtue is perceived to be more *judgemental* – as it ascertains to hold a preconceived position on what virtues are worthy of honour and reward and what are not. In economics, virtue can focus on the concept that goods differ in qualitatively in higher and lower ways (Sandel, 2010).

Another of Aristotle’s concepts of value was based around the concept of ‘*Telos*,’ which attempts to:

“...identify the norms appropriate to social practices by trying to grasp the characteristic end, or purpose, of those practices.” (p98 Sandel, 2010)

And so *Telos* (from the Greek τέλος for "end", "purpose", or "goal") is the concept that things should and do have purpose. In this way, one can ask, what is the purpose of economics – or a business?

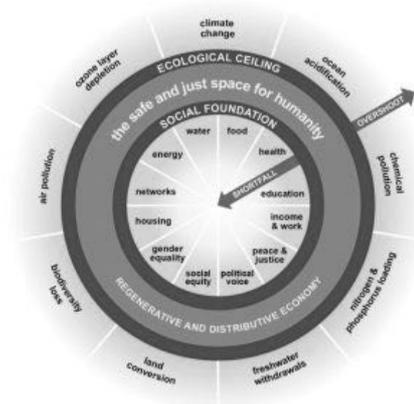


Figure 14. The essence of the Doughnut. Diagram by Christian Guthier ©2017 Kate Raworth

The models in Section 3.3, Figure’s 10, 11 and 12, illustrate human and social systems as related to economic activities therefore, this implicitly shifts the potential debate towards values. However, Raworth (2019) has taken this further, with a model that both explicitly states ‘*social foundations*’ (forms of virtues?), whilst also developing a *Telos* (a form of purpose) of where *not* to go – not into ‘overshoot’ or ‘shortfall – and stay within the safe space for humanity.

Finally, there has also been a model developed by Alexandre Lemille, within his ‘*Circular Humans phere*’^[15] (Figure 14), that also integrates some concepts of ‘telos’ within the circular economy system diagram by the Ellen MacArthur Foundation.

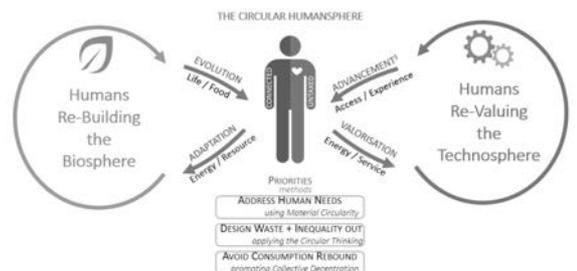


Figure 15. The Circular Humansphere by Alexander Lemille

¹⁵ Lemille, Alexandre. ‘The Circular Humansphere,’ Image retrieved October 18, 2018, from www.alexandrelemille.com/optimising-circular-value

3.6. Some Further Concepts of the ‘Economical Problem’

In their book *The Making of Economic Society*, Heilbroner and Milberg outline two key tasks of economic society which is to:

“...organise a system to assure the *production* of enough goods and services for its own survival,..” and to “...arrange the *distribution* of the fruits of its production so that more production can take place.”

Following this, they emphasise that society is also required to both *mobilise* (or motivate) and appropriately *allocate* human effort, in the making of *useful* things for the society.

In her book *The Value of Everything*, Mariana Mazzucato, defines the tasks of economic society through her description of value:

“Value can be defined in different ways, but at its heart it is production of new goods and services. How these outputs are produced (production), how they are shared across the economy (distribution) and what is done with the earnings that are created from their production (reinvestment) are key questions in defining economic value.” (Mariana Mazzucato 2018 p6)

Mazzucato, defines the term value as “...the ‘process’ by which wealth is created – it is a flow. This flow of course results in actual things, whether tangible (a loaf of bread) or intangible (new knowledge).” She adds that, that which is being created needs to be ‘*useful*,’ and that value can be discussed in terms of both ‘*value creation*’ (the ways in which different resources are established and organised to produce new services and goods) and ‘*value extraction*’ (the way in which different *existing* resources and outputs are moved around – with potentially disproportionate gains).

Both these definitions (and the works behind them) integrate many of the elements in substantive economics, with the additional element of ‘reinvestment,’ from Mazzucato, which brings in her important concepts of value creation and extraction – and a potential integration with the capital flow concepts of Marx (described by Harvey).

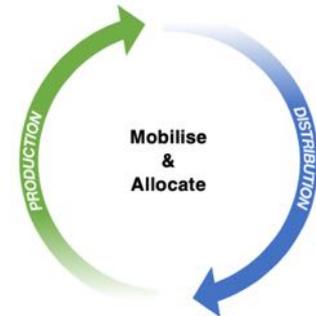


Figure 16. The Production & Distribution Cycle



Figure 17. The Production, Distribution, and Reinvestment

4. Some Conclusions

4.1. Some Concepts that Should be in the Model(s)

“If you look at that definition closely for a minute, you can see that a system must consist of three kinds of things: elements, interconnections, and a function or purpose.” (Meadows, 2008)

After this first review of some of the different economic perspectives, and models, here is a brief list of what could be included within a model for regenerative value systems:

- 1) A representation of at least three levels of abstraction: the *micro* – being the key stakeholders; the *meso* – the production activities; and the *macro* – the community, the infrastructure and institutions, and natural ecosystem of the region.
- 2) A representation of the *micro drivers* - framing, developing, and selecting goals, purpose, and motivations of the stakeholders – which can then be implicitly linked to KPI’s.
- 3) A representation of the *general flows* – the energy, material, components, goods, and residuals, within the meso and macro system.
- 4) A representation of the *general nodes* – the types of organizational and technical systems, and how they function, that are able to transform, move around, regenerate, or maintain the elements in flow. Again, at the meso and macro levels.
- 5) An explicit representation of the *embeddedness* of different *provisioning systems* (Commons, Households, States and Markets) – within the surrounding society and environment. This also implicitly brings in the important functions of the reproductive system.
- 6) A representation of how the different flows and nodes *interact* – the systemic dynamics such as potential symbiosis, competition, power dynamics. This needs to be represented at the meso level of the level of production, and at the macro level.
- 7) An explicit representation of the different forms of production (agricultural, material extraction and transformation, upcycling/cascading, and industrialization) all within a non-hierarchical scheme. ^[16]
- 8) A representation of the *flows of capital and money* - how and where it goes (how it is distributed) and how and where it is reinvested for instance.
- 9) An explicit visual, metaphor and objective relationship between the representation of regenerative production systems with an ecological system it works with and within.

¹⁶ This point was not discussed in the paper; however, this is framed within the dynamics between the different factors of production (land, capital, labour, and entrepreneurship), in terms of how much power they yield towards the other within the economy. For example, land (and rent from it) prior to the 19th Century in Europe, was where the power resided, as most of the GDP came from agriculture; as GDP in many countries transitioned to industrial activities, with this heightened focus and need for capital, capital became more important (and powerful) (Galbraith, 1985). This legacy has left agriculture (as well other collective factors, such as the different dynamics in terms of returns, and increasing divisions-of-labour e.g. added-value shifting off the farm) has continued to keep agriculture as the underdog to capital in the economy.

4.2. Some Initial Visual Models/Frameworks

Shown below are some first models that have been developed that attempt to answer some of those topics highlighted in previous section 5.1.

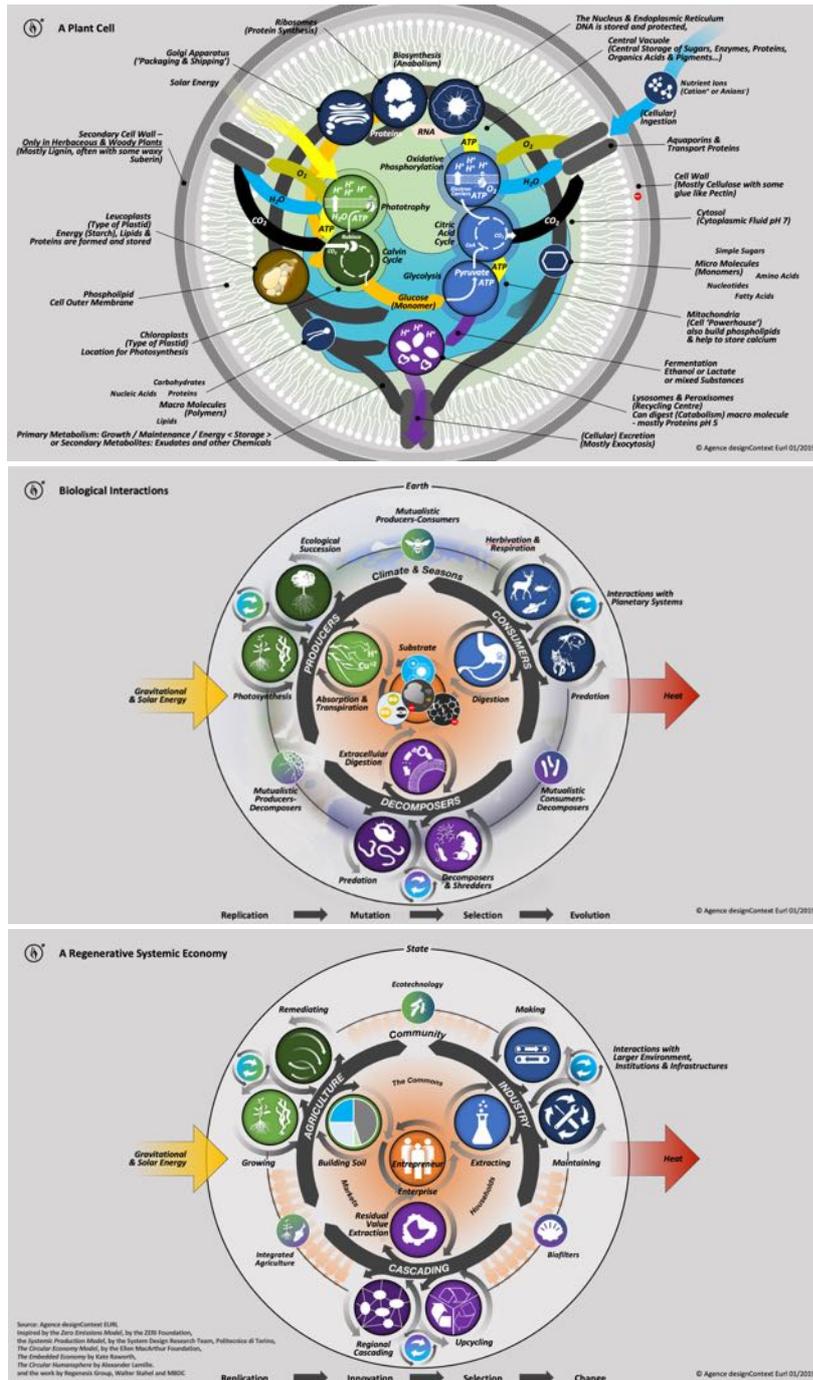


Figure 18. Three different Models: Top, 'A Plant Cell'. Middle, 'Biological Interactions,' Bottom, 'A Regenerative Systemic Economy.' Source: Tom Snow

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Since the first draft project proposal was written, followed by the first long abstract, followed by the presentation, followed by this final long abstract (with all the inputs listed above), the 'seed' of what actually wanted to be looked at, and wanted to be expressed has finally emerged. Thank you.

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