

Autopoiesis and self-sustainability in economic systems

Milan Zeleny

Graduate School of Business Administration,
Fordham University at Lincoln Center, New York,
New York 10023, USA
E-mail: zeleny@mary.fordham.edu

A newly emerging *organizational mode* shifts our thinking from the traditional vertical hierarchy of command to horizontal patterns of market-oriented networks of autonomous agents. This organizational mode is characterized by *self-management*, *autonomy* and *self-sustainability*, the trio of prerequisites for a successful and self-sustainable enterprise.

Self-sustainable systems must be *autopoietic*, i.e., self-producing. They must be capable of producing themselves, not only of producing something else. Employees, managers and community stakeholders are striving to create a *self-sustaining* organizational milieu by pursuing decisional autonomy, self-management and shared participatory ownership. Like biological "amoebas", they should adapt to the ever changing circumstances in terms of size, shape, function and interaction.

Keywords: Sustainability, self-sustainability, autopoiesis, self-production, self-management, self-service

A nation behaves well if the natural resources and assets which one generation turns over to the next are increased and not impaired in value.

Teddy Roosevelt

1. Introduction

Constructing and enhancing the renewal and persistence of *self-sustainable social orders* at all levels – economies, regions, cities, businesses and corporations – has become a demanding political, cultural and social imperative.

In the simplest terms, a system is sustainable if, through its operations, it expands or maintains the set of options and choices it has itself started with. A farmer has a sustainable corn production if he can



Milan Zeleny is currently Professor of Management Systems at Fordham University in New York City. He also served on the faculties of the University of South Carolina, Copenhagen School of Economics, European Institute for Advanced Studies in Management (Brussels), and for ten years at Columbia University School of Business. He holds Dipl.Ing. from the Prague School of Economics, and an M.S. and Ph.D. from the University of Rochester. He is listed in *Who's Who* (Marquis editions) in Science and Engineering, in America, in the East, and in the World. He has served on editorial boards of *International Journal of Operations and Quantitative Management*; *Journal of the International Strategic Management*; *Operations Research*; *Computers and Operations Research*; *Future Generations Computer Systems*; *Fuzzy Sets and Systems*; *General Systems Yearbook* and is the Editor-in-Chief of *Human Systems Management*. Also OR/MIS Editor and contributor of five entries in the *International Encyclopedia of Business and Management*. Among Zeleny's books are *Multiple Criteria Decision Making* (McGraw-Hill), *Linear Multiobjective Programming* (Springer-Verlag), *Autopoiesis, Dissipative Structures and Spontaneous Social Orders* (Westview Press), *MCDM-Past Decades and Future Trends* (JAI Press), *Autopoiesis: A Theory of Living Organization* (Elsevier North-Holland), and *Uncertain Prospects Ranking and Portfolio Analysis* (Verlag Anton Hain). Zeleny published over 300 papers and articles, ranging from operations research, cybernetics and general systems, to economics, history of science, total quality management, and simulation of autopoiesis and artificial life (AL).

put aside a sufficient part of his current production as cornseed for the next season planting and thus assure the same or expanded production in the next cycle.

The reproducible part of a system's production which can become a viable input for the next production cycle is *capital*. The accumulation or at least the maintenance of capital levels is necessary for reproducing the same or a better set of options for future production, consumption and investment decisions.

It is important to realize that *capital is a multi-dimensional concept*, a vector of different, complementary and mutually self-enhancing "capitals". This capital portfolio consists of at least four components:

1. natural resources matrix,
2. man-produced assets,

3. human knowledge and
4. social organization.

Observe that it is unnecessary to single out or emphasize money separately. Money is a consensual measuring stick of value and exchange tradeoffs. Money becomes capital only to the extent it represents *real* amounts and qualities of any of the four capital forms; in itself money is not capital, but has a potential to be transformed into one under the proper circumstances.¹

At the core of the continued wealth creation, income production, economic growth and sustainable development, lies a properly balanced, optimally structured "profile" of *capital portfolio* (CP). Sustainable institutions pursue *all* CP components in parallel, although with differential priorities at different developmental stages. Although total, aggregate levels of capital are important (savings, investments), it is the CP *structure* which is crucial for sustainability.

It is the substantial preponderance of human and social capital components, not the natural and man-produced resources, that explains most of the currently sustainable wealth of nations. In other words, wealthier nations have accumulated most of their capital in human and social resources and infrastructures, while poorer nations still maintain most of their capital in natural resources and man-made assets. Simply stated: the poor and unsustainable economies dig for coal and build dams while the rich and sustainable ones educate people and build institutions and communities.

The countries with high GDP percentage of raw materials and primary products exports are the poorest, characterized by the lowest rates of growth. For example, only a 10% increase in raw materials exports is correlated with more than 56% decline in the growth rate. Only three raw materials exporters have achieved at least 3% growth during the last twenty years: Malaysia, Mauritius and Botswana.

Example. It is now useful to ponder a simple example. A cook, in order to succeed in the market, has to pull together all four types of capital:

1. energy and raw materials (meat, fish and vegetables);
2. equipment and technologies (pots and pans);
3. information, knowledge and skills (ability to coordinate action);
4. social context and organization (restaurant, clientele, setting, culture).

We can equip two cooks with identical capitals of the first two kinds: the same raw materials, the same pots and pans, even the same cookbooks. Yet, they could conceivably prepare two entirely different products: one a masterpiece, valued and rewarded by the market, the other a totally forgettable tribute to mediocrity. The difference lies in the knowledge (as ability to coordinate cook's action) and in the social infrastructure capable of appreciating the product. The last two capital components are decisive, the first two are not even necessary: a great chef can do "miracles" with even mediocre inputs, an ignoramus would be lost even in the best of kitchens and waste even the very best of ingredients.

Both market and investment money will tend to flow and concentrate where the last two capital forms prevail.

Both theory and practice confirm that knowledge and its social and organizational embedding are crucial for the wealth of nations, companies and institutions, and the natural and man-made capitals, although important under given circumstances, play only a secondary role in general.

2. Sustainability and self-sustainability

It appears that a useful operational definition of "sustainability" remains elusive. Our understanding of the meaning of what is or is not sustainable is rather intuitive and experiential, often marred with notions like higher consciousness, transcendentalism or heightened awareness.

We are continually convincing each other that a sustainable system is better than a non-sustainable one: a self-evident proposition at best.

The questions of sustainability of systems are often limited to public institutions, goods and resources. Yet, it is the private systems, families, businesses and corporations that often manifest not only sustainability, but the more essential *self-sustainability* in their requisite milieu. The question is not How can *we* sustain a given system, but How can a system sustain *itself* in its given milieu?

¹Only when money itself becomes a commodity and a sole purpose of transactions, like in most speculative, lending and gambling activities, part of money made becomes the "cornseed" for the next money-making cycle of speculation, i.e., capital.

It is important to realize that sustainability (and self-sustainability) is directly related to system organization and its self-production (autopoiesis). How are systems organized is more important than how its individual member-agents think, how high is their “level of consciousness” or what individual values they uphold. Properly organized self-sustainable systems must survive and flourish even if their individual constitutive agents do not know, care or say anything about sustainability.

Self-sustainable systems are autopoietic and must therefore be organized for *autopoiesis*. Sustainable systems are *heteropoietic*, i.e., their sustainability does not come from within (from their own organization) but from without, from planned, system-sustaining activities of external agents. Non-sustainable systems are *allopoietic*, i.e., they are organized to produce things other than themselves. Allopoietic systems necessarily deplete their environment.

Heteropoietic systems can remain sustainable as long as the external agents sustain their system-sustaining efforts. Only autopoietic systems replenish their own environment and thus can become self-sustaining.

Self-sustainable systems must therefore maintain and extend their ability to coordinate their action. Purposeful coordination of action – or *knowledge* – has to be continually produced and maintained: self-sustaining systems must be also knowledge-producing, not only labor- or capital-consuming entities.

In summary, the proposed view of sustainability can be characterized as follows: *both sustainability and self-sustainability are time- and context-dependent system properties emerging from system organization. System organization must be continually produced or renewed through competition and collaboration of agents via continued coordination of action, i.e., continued production of knowledge.*

Self-sustaining systems are capable of continually producing their own organization and its requisite knowledge in an evolving milieu.

Traditional hierarchical enterprises can often be sustained – and are therefore sustainable – but they are not *self-sustaining*. Most systems can be sustained over long periods of time through an external supporting agent, disbursing effort, money or resources. Once this external agent withdraws this support, system sustainability can be directly affected. *Externally sustainable systems do not have to be internally self-sustainable.*

A concentration camp can be externally sustainable even though it lacks any indigenous attributes of self-sustainability. Any resource-depleting system can be sustainable as long as the external agent maintains the ability to “support” the system through inputs and imports of resources, efforts, funds and values. A resource-depleting system can be sustained through rationalization, savings and self-restraint of external agents, but does not become any more self-sustainable.

The free-market system is essentially self-sustainable because the value of resources, goods and services can be assessed via transactions between suppliers and purchasers. Non-market systems can only be more or less sustainable, through external-agent (such as State) supportive intervention.

Any relationship (External agent → Sustainable system) can be transformed into a *self-sustainable metasystem* (External agent ↔ System). While an external agent can in principle make any system sustainable, only a meta agent-system can become self-sustainable: through making the external agent an internal part of the system.

An infant is sustainable through his mother’s care, but it is not self-sustainable as a separate, autonomous system. A mother-infant metasystem is not only sustainable by others, but becomes also self-sustainable in its social or even physical milieu.

3. Autopoiesis

Autopoiesis or self-production can take place when there are distinct and autonomous individuals or agents interacting and communicating in a specific environment and according to specific behavioral *rules of conduct and interaction*.

Autopoietic organization can be defined as a network of interactions and processes, involving at least:

- 1) *Production (poiesis)*: the rules and regulations governing the entry of new components, such as emergence, input, birth, membership, acceptance.
- 2) *Bonding (linkage)*: the rules governing associations, arrangements, manufactures, functions and positions of components during their tenure within the organization.
- 3) *Degradation (replenishment)*: the rules and processes associated with the termination of membership, like death, separation, consumption, output and expulsion.

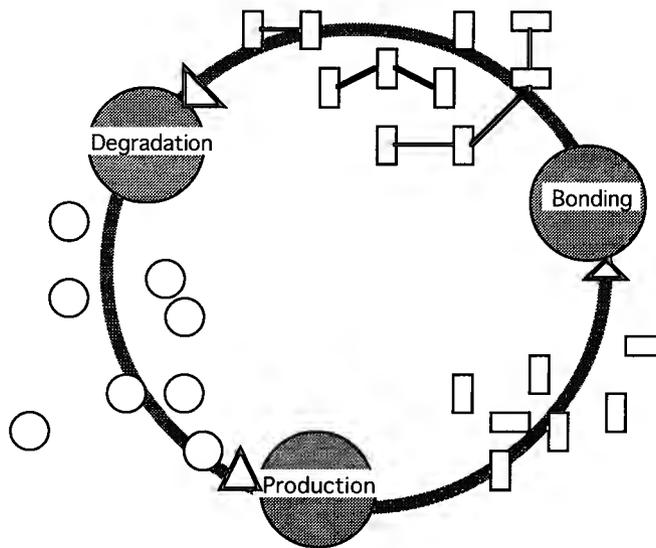


Fig. 1. Circular organization of interdependent processes and their "productions".

In Fig. 1, the above three poietic processes are connected into a *cycle of self-production*. Observe that all such circularly concatenated processes represent productions of components necessary for the subsequent processes, not only the one labeled as "production". Although in reality hundreds of processes could be so interconnected, the above three-process model represents the minimum conditions necessary for any autopoiesis to emerge.

An autopoietic system can thus be defined as a system that is generated through a closed (circular) organization of production processes such that the same organization of processes is regenerated through the interactions of its own products (components), and its boundary or distinction emerges as a result of the same constitutive processes.

Autopoietic *organization* is an autonomous unity of a network of productions of components, which participate recursively in the same network of productions of components, which produced these components, and which realize such a network of productions as a unity in the space in which the components exist.

Such organization of components and component-producing processes remains temporarily invariant through the interaction and turnover of components. What changes is the system structure (its particular manifestation in a given environment) and its parts. The nature of the components and their spatio-temporal relations are only secondary to their organization and thus refer only to the *structure* of the system.

An organization becomes autopoietic if *all three* types of constitutive processes are *balanced* or *in harmony*. If one of the three types is either missing or if one or two types predominate (out-of-balance system), then the organization can only be heteropoietic or allopoietic, i.e., capable of producing only "the other" but not itself.

For example, production and bonding without degradation quickly depletes the environmental substrate and comes to a halt, like crystals and crystallization. Production and degradation without bonding leads to ephemeral oscillatory systems, and so on.

Any self-sustaining system will have production, bonding and degradation concatenated in a balanced and harmonious way, so that production rate does not exceed the replenishment rate and vice versa. *Self-sustaining systems will be autopoietic in an environment of shared or common resources.*

In autopoietic social systems, dynamic networks of productions are being continually renewed without changing their organization, while their components are being replaced; perishing or exiting individuals are substituted by the birth or entry of new members. Individual experiences are also renewed; ideas, concepts and their labels evolve, and these, in turn, serve as the most important organizing factor in human societies.

4. Coordination of action

Autopoietic social systems, in spite of all their rich metaphoric and anthropomorphic meanings and in-

tutions, are networks characterized by *inner coordination (or harmony) of individual action achieved through communication among temporary member-agents*. The key words are coordination, communication, and limited individual lifespan.

Coordinated behavior includes *both cooperation and competition*, in all their shadings and degrees. Actions of predation, altruism, and self-interest are simple examples of different and interdependent modes of coordination. Communication could be physically, chemically, visually, linguistically, or symbolically induced deformation (or in-formation) of the environment and consequently of individual action taking place in that same environment.

So I, as an individual, can coordinate my own action in the environment only if I coordinate it with the action of other participants in the network. In order to achieve this, I have to in-form (change) the environment so that the action of others is suitably modified; *I have to communicate*. As all other individuals are attempting to do the same, a *social network of coordination* emerges, and, if successful, it is being “selected” and persists. Such a network improves my ability to coordinate my own action effectively. Cooperation, competition, altruism, and self-interest are therefore inseparable.

Any self-sustainable system must secure, enhance and preserve communication among its components or agents as well as their coordination and self-coordination capabilities.

Systems with limited or curtailed communication can be sustained and coordinated through external commands, but they are not self-sustaining. Hierarchies of command are sustainable but not self-sustaining.

Consensual (unforced) and purposeful (goal-directed) coordination of action is nothing less than knowledge. Knowledge, in contrast to data and information, cannot be separated from action and its coordination. Production of knowledge is production of the capability to coordinate action. Self-sustaining systems must be organized so as to continually “produce themselves”: their own capability of their own action coordination.

5. Self-sustainable enterprise

F.A. Hayek, in his book *The Fatal Conceit* [1], was among the first to recognize the non-sustainability of traditional hierarchies of command and the inevitabil-

ity of agent empowerment, self-management and self-coordination.

The self-sustaining organization has recently found its organizational embodiment in the “amoeba system” of Kyocera Corporation [6]. This system is quite reminiscent of the famous Bata-system of management in the 1920s and 1930s in Moravia [7].

The “amoebas” are independent, profit-sharing and self-responsible units of three to fifty employees. Each amoeba carries out its own statistical control, profit system, cost accounting and personnel management. They compete, subcontract, and cooperate among themselves on the basis of the intracompany market of market-derived transfer prices.

Depending on the demand and amount of work, amoebas can divide into smaller units, move their members from one section of the factory to another, or integrate with other amoebas or departments. All amoebas are continually on the lookout for a better buyer for their intermediate products. Many amoebas even produce the same or similar products. They are authorized, as in the Bata-system, to trade intermediate products with outside companies; if the internal supplier is unreasonable, the buyer amoeba will search for a satisfactory supplier outside the company.

A most remarkable feature in the autonomy is the member trading. Heads of amoebas lend and borrow members and so eliminate losses caused by surplus labor. Kyocera’s amoebas multiply, disband, and form new units according to the autopoiesis (self-production) of the enterprise. Amoeba division and breakup are everyday occurrences and are decided upon the criteria of output and a worker’s added value per hour.

This concept of ultimate flexibility is best summed up by Kyocera’s President Inamori: “Development is the continued repetition of construction and destruction” [6], as if coming directly from the systems theories of autopoietic self-organization.

Neither age nor training are essential to become the head of an amoeba – only the faculty for the job under the immediate circumstances. If unsuitable, amoeba heads are being replaced immediately.

This system represents quite a revolutionary step beyond the traditional Toyota “just-in-time” system. At Kyocera, orders received by the sales department are passed directly to the amoeba of the final process. The rest of the amoebas in the preceding processes are then given free rein in entering into mutual contracts: the intracompany market takes over. Kyocera Corporation is one of the most profitable companies in Japan.

6. Self-sustainable networks

Australian TCG (Technical Computer Graphics) provides a good example of a self-producing network in a business-firm environment. There are no coordinating divisions, "leading firms", or management superstructures guiding TCG's 24 companies; the coherence, growth and maintenance of the network is produced, according to J. Mathews [3], by a set of network-producing rules:

1. Mutual independence, binding firms through bilateral commercial contracts. This excludes the formation of an internal hierarchy.
2. Mutual preference to member firms in the tendering and letting of contracts.
3. Mutual non-competition among members, to establish self-denial and trust.
4. Mutual non-exploitation among members, based on "cost-plus" contracting, not profit maximization.
5. Flexibility and business autonomy; no need for group approval of any transactions, if no rules are broken.
6. Network democracy without a holding company, "central committee", owner, controller or formal governance structure.
7. Non-observance of rules leads to expulsion.
8. All members have equal access to the open market.
9. Entry: new members welcome, but financed by debt, not through drawing on group resources.
10. Exit: no impediments to departing firms.

The above ten rules constitute the autopoietic organization of a network TCG. They insure that the network continually produces itself and maintains its coherence over time. There has never been a bankruptcy within the TCG network.

In a changing environment, TCG network grows outwards and adapts to a global market place through a "triangulation process" of collaborative alliances and through spinning-off new companies. A triangle is a strategic alliance of (TCG + external company + customer) and their bonding and concatenation expands the network.

7. Evolution and adaptation

Self-sustaining systems persist. They can persist as ecosystems of agents only if the individual mem-

bers are born, communicate, and die in harmony with themselves and their environment. Because of the turnover of components, self-sustaining networks not only persist and are renewed, but they also *evolve*.

The unit of evolution (at any level) must be a network capable of a variety of self-organizing configurations. These evolving networks are interwoven and co-evolving with their environment; they do not only adapt to the environment, but also adapt the environment to themselves, through a reciprocal *structural coupling*.

For example, a bird must undoubtedly adapt to a mountain. However, a society (network) of birds can make the mountain adapt to them. By overconsuming particular berries, the new bush growth is arrested, the mountain's erosion enhanced, and the production of both berries and birds reduced until a temporary balance or harmony is restored.

The environment is therefore not a structure imposed on living beings from the outside but is, in many ways, a creation of those beings. The environment is not an autonomous process, but a reflection of the biology of the species. Just as there is no organism without an environment, so there is no environment without an organism.

Especially in social domains, the environment is created, maintained and degraded by networks of human beings. Self-sustaining networks, economic, social and cultural, are structurally coupled with their environment and co-evolve with it.

8. Customer integration

Traditionally, customers (or consumers) have been viewed as being distinct and separate from the production process, non-participating in its sustainability.

In the era of mass customization, the product in the hands of the customer is *still* a part of the production process. In other words, the product remains essentially incomplete or unfinished until the customer completes it or issues instructions for completing it. This system is referred to as *Integrated Process Management* (IPM) [10].

Traditionally, we have perceived production process as simply a transformation of inputs into outputs. Such linear and one-directional scheme, where customer remains an object, separated "out there" in the environment, is now replaced by the circular inte-

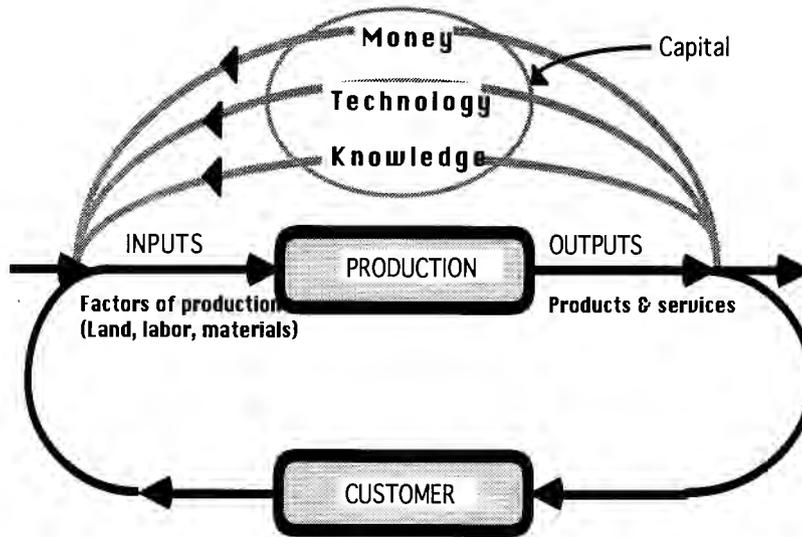


Fig. 2. Customer integration into the production process.

grated process, as portrayed in Fig. 2. The customer is both the purpose and the driving force of an enterprise.

Observe also the “capital loop”, the continuous self-renewal of the portfolio of *money, technology and knowledge* which “produces”, over and over again, the enterprise itself.

It is increasingly realized that a modern enterprise is engaged in *two types of production*:

1. *heteropoiesis*, producing “the other” than itself (i.e., goods and services) and
2. *autopoiesis*, producing itself, i.e., its own production *process*, its own ability to produce.

Self-sustainability of systems is crucially dependent on the reliability of the second type of production, autopoiesis. Only a system that could continually “produce itself” under changing environmental conditions can be deemed self-sustainable.

9. Capital portfolio

Modern learning, knowledge-based corporations have realized for some time that human knowledge has become the primary form of capital in the global competitive space. Knowledge, defined as the ability to coordinate one’s actions, alone and with others, effectively and purposefully, is embedded within and activated by human social and cultural institutions.

Learning to coordinate one’s actions, i.e., producing, maintaining and sustaining human capital, can

only take place within requisite social infrastructure: cultural and educational institutions, family-based kinship systems and shared experiences of history, habits, values, beliefs and aspirations.

Functioning democracy is based on respect and free-market behavior is based on trust. This is why democracy and markets are to a large extent *learned behaviors*, brought forth by strong cultures and social infrastructures. Without the learned and deeply habituated respect and trust, both democracy and markets become merely gaudy and often cruel caricatures of themselves. Russia and Eastern Europe are the prime examples of today.

Only socially and culturally strong nations, rich in human capital, family values, respect and trust, can ever become prosperous – regardless of their natural, physical or financial endowments. Only the learning nations, evolving their human and social capital continually and reliably, can ever taste truly sustainable prosperity.

A wealthy nation, like a wealthy farmer, must be able to continue increasing its stock of capital. Such accumulation of the capital stock enlarges the set of alternatives and opportunities for subsequent generations, thus making current wealth sustainable.

Increased wealth also helps to generate higher income, although higher income can also be temporarily created through decreasing one’s wealth and reducing the capital.

Only the poor countries, like the poor individuals, live mostly from their income while only maintaining or even dipping into its capital stock. Income

based on the depletion of capital is not sustainable and should not be accepted as income [1], but only as a consumption of capital. Only the poorest of the poor consume their own substance: they eat up their own capital endowments.

It is therefore the charge and challenge of the current generations to leave the future generations with more capital per capita.

As stated earlier, there are *at least* four basic forms of capital:

1. Man-made, produced physical assets of infrastructures, technologies, buildings and means of transportation. This is the manufactured “hardware” of nations. This *national hardware* must be continually maintained, renewed and modernized to assure its continued productivity, efficiency and effectiveness.

2. Natural capital, i.e., nature-produced, renewed and reproduced “inputs” of land, water, air, raw materials, biomass and organisms. Natural capital is subject to both renewable and non-renewable depletion, degradation, cultivation, recycling and reuse.

3. Human capital (or human resources) refers to the continued investment in people’s skills, knowledge, education, health and nutrition, abilities, motivation and effort. This is the “software” and “brainware” of a nation, perhaps the most important form of capital for rapidly developing nations.

4. Social capital is the enabling infrastructure of institutions, civic communities, cultural and national cohesion, collective and family values, trust, traditions, respect and the sense of belonging. This is the voluntary, spontaneous “social order” which cannot be engineered, but its self-production (autopoiesis) can be nurtured, supported and cultivated.

All of the above capitals must be developed in balanced, harmonious ways. The last two forms are currently most significant and effective in wealth and prosperity creation. The vector or portfolio of capitals, its structure and profile, is more significant than its overall aggregate sum. A country that has all or most of its wealth in natural resources might become an international supplier but it will not progress itself. Although the trade-offs among the capitals are often necessary, and sometimes wise and strategically desirable, they are rarely sustainable. The optimal *capital portfolio* could be negatively affected by irreversible or too frequent trade-offs and substitutions.

In the long run, it appears to be the social capital which provides the necessary supportive infrastructure for the human capital to manifest itself ef-

fectively. Through renewing primarily both itself and human capital, and consequently also the man-made and natural capitals, the set of opportunities is being widened for future generations.

Social capital is clearly critical [4], although still one of the most neglected and ignored. This is a spontaneous social order, uncoerced and unforced civil society and culture which defines people’s ability to work towards common goals and objectives in groups and organizations, form new associations and cooperative networks, dismantle and slough off the old institutions without conflict or violence. It is the *enabling environment* for human capital to become effective.

Social capital includes not only business, but also voluntary and not-for-profit associations, educational institutions, clubs, unions, media, charities and churches. Strong civic community is characterized by a preponderance of horizontal organizations, self-reliance, self-organization and self-management, while autocratic, centralized and hierarchically vertical organizations of command are found in societies of lesser trust, low spontaneous sociability and thus lower economic performance. The State then has to compensate for the lack of reciprocity, moral obligation, duty toward community, and trust, a role for which the State is the least equipped and the least reliable institution to undertake.

Strong cultures, strong spontaneous social orders, strong levels of civic trust tend to produce higher economic performance and generate wealth, not the other way around. Strong economic performance and wealth creation are not precursors or prerequisites to strong civil societies.

Nations with weak cultural and civic traditions will be generally poorer, saddled with “strong” governments, relying crucially on their natural resources and man-made capital, neglecting the social and human spheres of existence. Wealthier and high-performing economies will be typically engendered by nations characterized by strong, dense and horizontally structured culture of trust, cooperation and voluntary associations.

One would therefore expect the wealthiest nations to have most of their wealth embodied in social and human capital, only a lesser part in man-made or natural capital. For example, the wealthiest and the high income countries have, on average, only 16% of their total wealth in produced assets and 17% in natural capital, but some 67% in human resources.

The poorest countries are raw material exporters, having 20% of their wealth in produced assets, but

44% in natural capital and a meager 36% in human resources.

If we look at the US dollar wealth per capita and the percentages lodged in *human, produced and natural* capital respectively [5], we find, for example, the following “wealthy” portfolio profiles:

Italy	(\$373,000; 82, 15, 3)
Belgium	(\$384,000; 83, 16, 2)
Netherlands	(\$379,000; 80, 18, 2)
Japan	(\$565,000; 81, 18, 2)
Switzerland	(\$647,000; 78, 19, 3)
Luxembourg	(\$658,000; 83, 12, 4)

Japan has virtually no natural resources and its accumulated wealth is virtually all due to human and social capital investments. These can be compared with some selected portfolios of “poor” countries.

Ethiopia	(\$1,400; 40, 21, 39)
Sierra Leone	(\$2,900; 14, 18, 68)
Bhutan	(\$6,500; 8, 7, 85)
Zambia	(\$13,000; 9, 18, 73)

The above capital portfolios have so little investment in human and social capital that their future prospects are quite discouraging indeed. On the other hand, there are some poor and developing countries which do seem to have the right “mix” of capitals, indicating a possible economic takeoff in the future:

Viet Nam	(\$2,600; 74, 15, 11)
Slovakia	(\$33,000; 78, 17, 5)
Czech Republic	(\$50,000; 66, 15, 19)
Mexico	(\$74,000; 73, 11, 16)
Slovenia	(\$111,000; 67, 16, 17)

Richer countries are generally those which invest more in their human capital, education, nutrition, health care, etc., over longer periods of time.

Some poor countries have relatively high incomes because they do not invest enough into renewing their capital portfolio, but actually consume their capital (“eat up their next-year cornseed”). Especially the Sub-Saharan countries have recently registered very high levels of disinvestment, negative savings and capital depletion. Many countries in Eastern Europe are still artificially increasing their current incomes for political reasons, but at the cost of depleting their wealth. It is quite sad to see some of these countries rapidly disinvesting in their educational, health care, nutritional and cultural endowments, nurturing corruption and the anything-goes culture, being culturally blind to “dirty money” and self-assuredly myopic about their future.

This adds up to a very short-sighted and nation-damaging policy, destroying nations’ social capital and wealth, virtually irreversibly.

The recent World Bank studies [5] have confirmed the leading role of human capital in economic development. With the exception of some raw material exporters, human capital exceeds both natural capital and produced assets combined: sustainable development is best achieved by investing in people. Yet, it is on the less than a fifth of total wealth (man-made capital) that the bulk of current economic policies is focused.

The World Bank and other similar institutions have so far emphasized building the assorted “Aswan dams” rather than founding technology institutes and enterprise foundations, educating people and expanding their self-reliance and self-management opportunities and abilities. That is why most of the world still remains poor after some 50 years of such misplaced “efforts”.

Many of the misguided policies are supported by naive beliefs and neo-pagan market worshiping, especially in Russia and Eastern Europe. The free-market efficiency is only one of the many by-products of pre-existing moral communities.

Without such moral communities, the unfettered free market is neither conservative nor constructive but a radically disruptive force, relentlessly dissolving the loyalty of corporations to their communities, customers to their neighborhood merchants, athletes to their teams and nations, teams to their cities, and so on. Without the culturally preformed, spontaneous social orders of trust, loyalty and reciprocity, a nation cannot achieve and maintain sustainable wealth.

America’s human capital (Capital portfolio profile: \$421,000; 59, 16, 25) accounts for some 60% – compared to only 15% for the produced capital – of the productive capital stock. Developing America’s human capital is therefore by far the most important factor in maintaining its global competitiveness.

Lowering taxes for speculators in used cars, used goods, used stocks and used bonds cannot compare in importance with giving the tax incentives to teachers and educational institutions and thus encourage more and better people to educate nation’s children. The payoffs would be incommensurable.

Buying and selling used cars is no different from buying and selling used stocks for gain: no tax incentives are needed for speculation. Also, the wave of mechanical and politically motivated deficit-cutting efforts appears to be similarly short-sighted. Cutting

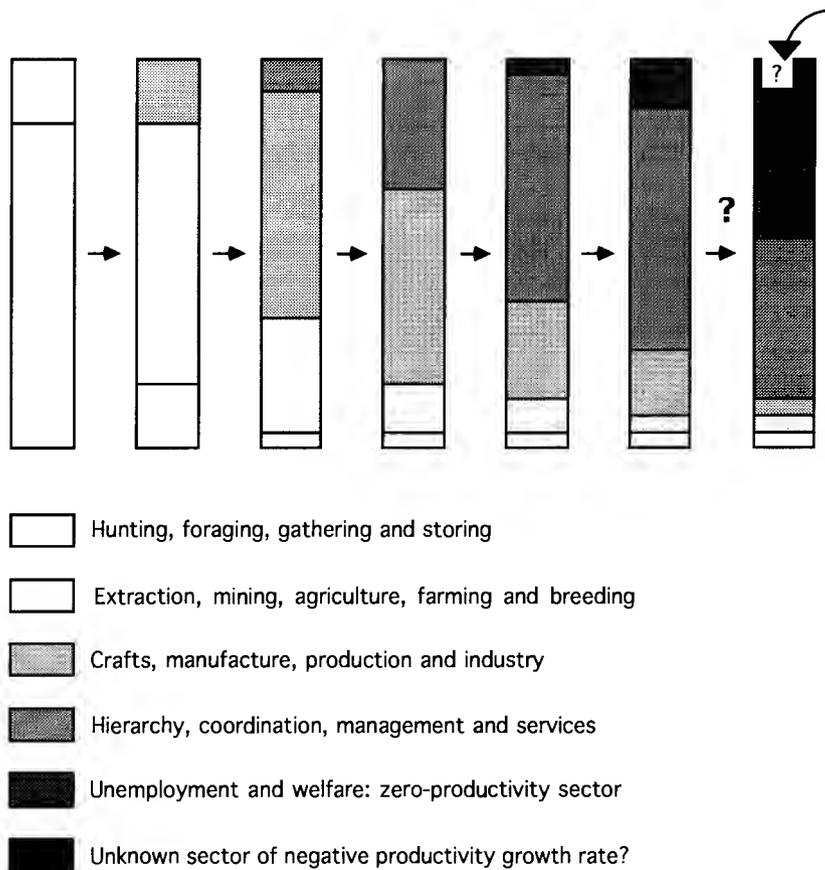


Fig. 3. Sectoral evolution and differentiation (in a rapidly maturing economy): Each sector, including services, emerges, persists and declines.

could turn into a useless political exercise if the creation of crucial social and human capitals is undermined and their accumulation stunted.

Contrary to this, creating a reasonable deficit by investing in the most productive, non-speculative forms of capital and assets could be a safer way towards prosperity. The United States national debt is now about 63% of the output, a relatively trivial phenomenon compared to Belgium's 138% or Italy's 122%.

Politicians often argue how they, as individuals, have to balance their budget. It is typical, especially in the United States, that individuals do take out home mortgages that are up to 300% of their incomes – and these are clearly the richer, not the poorer segments of the population. The poor have only very little or no debt.

In other words, it is not how much to invest or how far to go into debt, but where and how and to what productive, non-productive or speculative purposes is the debt (and investment) applied to. This holds true

for individuals, companies, economies, countries and nations.

10. Self-service and self-sustainability

Self-sustainability in socioeconomic systems is necessarily related to the levels of self-service and do-it-yourself activities of their independent economic agents. No central government, no matter how benevolent or competent, will be able to match the power and influence of modern, technology- and knowledge-based self-service activities. Self-service implies self-sustainability virtually by definition [2].

A self-service society has already started emerging in the USA, fueled by the decline in job-generating capacity of the so-called service sector.

Services are no different from any other economic sector, like agriculture or manufacturing, which went into their irreversible losses of employment capability some decades ago. The accelerating productivity

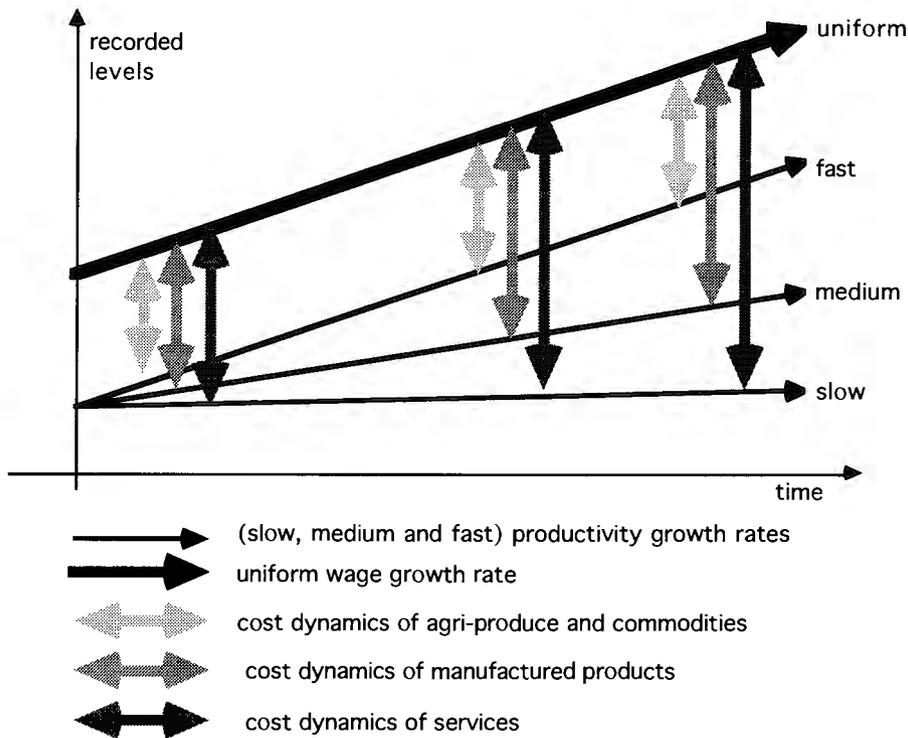


Fig. 4. *Price gap*: Differential sectoral productivity growth rates, combined with the uniform wage growth in the whole economy, causes the prices to grow faster in the “lagging” sectors.

growth rates in those sectors have caused the steady decline in their job-generating capacity. The service sector is simply following the same pattern: increasing automation, increasing productivity, global competitive pressures, high relative costs and overgrown hierarchies are annihilating its own employment opportunities.

In Fig. 3 is a sketch of the general sectoral dynamics from which there is no escape and which all economies, slowly or rapidly, sooner or later, are bound to follow. Each sector has to emerge, grow, persist, decline and dissipate in terms of its employment-generating capacity [11,12]. It has never happened otherwise and it never will.

The high-productivity growth sectors emerge and dissipate first, the low-productivity growth sectors (like services) are completing their cycle only in the nineties. No new sectors can emerge because we have already exhausted the potential of low-productivity growth sectors. Zero- or negative-productivity growth “sectors” (unemployment, welfare, etc.) cannot sustain any economy for too long. The last bar of Fig. 3 suggests that an *unsustainable* employment structure of the US economy could settle in about the year 2000.

The *differential* productivity growth rates in different sectors are accompanied by virtually *uniform* growth rates in wages and salaries across sectors (Fig. 4). This simple empirical fact, often ignored and rarely explained, implies that the costs and prices grow relatively faster in low-productivity sectors and relatively slower in high-productivity sectors. Therefore, in mature economies, the prices of food and manufactured goods are getting relatively cheaper and the prices of services are becoming relatively more expensive. In slow-developing economies of the Third World, it is still the other way around: food and manufactured goods are most expensive while services and human labor remain relatively the cheapest.

This fundamental systemic disharmony (between differential productivity growth rates and the uniform wage/salary growth rates across sectors) points to a self-organizing, spontaneous mode of resolving the conflict. Rational economic agents will exhibit and support the tendency towards substituting relatively cheaper capital-intensive manufactured goods for relatively dearer labor-intensive services.

Consumers will start using goods instead of services wherever economical and possible, while the producers will respond by supplying them with goods

instead of services, also wherever economical and possible. The economy of free markets searches out its own self-sustainable regime.

Consequently, self-service and do-it-yourself activities are replacing the traditional, other-person-delivered services at an increasingly accelerating rate, in spite of the uninformed legal, business and governmental/political counter-strategies. *Mature economies have entered the era of self-service and do-it-yourself societies.*

Self-service activities are very effective: they can be delivered when, where and at what quality the user desires, at lower costs and at a shorter time. They do require user-friendly support products with easy-to-use, reliable instructions and backup, as well as sufficient time and higher costs of alternative services. All these conditions are now present in mature economies. Do-it-yourself industries are the fastest growing parts of the US economy, virtually impervious to recession or depression.

The self-service society is self-sustainable: characterized by increasing autonomy of workers and consumers, accelerating growth in work-at-home, telecommuting, self-employment, community self-help, home office, part-time and seasonal work, telework, early retirement, barter and exchange networking, home shopping and banking, flexible work-hours, self-management, decline of supervisory "services", and fortified decentralized *self-reliance*.

11. Conclusion

Households are once again becoming primary investment/production units and producers and consumers are merging into "prosumers". Integration is replacing specialization and vertical hierarchies are being flattened into self-managing, horizontal hierarchies. Knowledge has become the most important form of capital. Democracy and autonomy are penetrating beyond the factory gates, into the companies and inside the enterprises.

Only the governments are failing: instead of creating the right milieu for self-sustainability, self-reliance and self-service, instead of acknowledging and amplifying these powerful spontaneous trends, many politicians are still selling the Big State. The new generation of politicians, businessmen and managers will

have to replace those who are obviously tired in their thinking, overwhelmed by these changes, elderly in their habits and too predictable in their conservative action.

The US, Japanese and European economic recessions are nothing less than fundamental structural realignments of the socioeconomic forces pulling away from specialization and division of labor and pushing towards reintegration of task, labor and knowledge, towards the autonomy of producers/consumers and towards the renewed self-service, self-help and self-reliance of their increasingly empowered citizenry.

Although many social systems can be temporarily *sustained* externally and from above, the same systems can become *self-sustainable* only internally and from below: through involving and empowering their most active components, the people and their knowledge.

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