Commoning and common information systems for social equity and ecological sustainability

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Abstract

Ecological sustainability and social equity are among the United Nations' Millennium Development Goals - but, unfortunately, as the years pass, they are still far from being reached. But concern about these issues has made its way to industry and the IS community. IS play a central role in companies as they are cross-functional and have a strategic role in our current information society.

We argue that it is our responsibility, as IS scholars, to dedicate some of our research efforts toward environmental sustainability and to social equity, and that our teaching, our journals and our associations should also address these two objectives. This article proposes Commoning and Common Information Systems as a possible tentative to facilitate the inclusion of both ecological sustainability and social equity concerns within the IS discipline. We advance this new concept of Common Information Systems, which are IS where (1) the surrounding society is considered a human community, (2) the material and energy input into the IS are seen as common goods, and the material and energy leaving the IS are viewed as common bads, (3) commoning (i.e. sharing) information output is preferred.

Keywords: Social Equity, Ecological Sustainability, Common IS, Commoning.

1 A human challenge

Ecological sustainability and social equity are among the Millennium Development Goals officially established by the United Nations (UN) in 2000. Unfortunately several years have passed, but the goals originally set for 2015 are far from being reached. The UN Development Program affirms that environmental sustainability and social equity "*are critical to expanding human freedoms for people today and in generations to come. The point of departure is that the remarkable progress in human development over recent decades […] cannot continue without bold global steps to reduce environmental risks and inequality*" (UN Development Program 2012) - a conclusion that is supported by many indicators of our unsustainable ecology and social inequity, like the fact that Ecological Debt Day falls earlier every year, the annual increases in atmospheric CO^2, the depletion of our fossil fuel reserves, the growth in the numbers of both hungry and overweight people, and of revenue inequality.

Ecological Debt Day (the notional day in the year on which the total resources consumed by mankind exceed the Earth's capacity to generate those resources in that year) fell on November 1st in the year 2000, but had moved to August 22nd by 2012 (Global Footprint Network 2012). The annual growth rate of atmospheric CO^2 had increased to 2.36 ppm by 2010, raising the atmospheric CO^2 concentration from around 370 ppm in 2000 to 389.6 ppm in 2010 (Global Carbon Project 2011) and reflecting the rate of fossil fuel depletion, with conventional crude oil production peaking in 2006 (International Energy Agency 2011). The number of hungry people in the world was 868 millions in 2010-2012 (having been 919 millions in 1999-2000), but even more people were overweight (UN Food and Agriculture Organization 2012). In terms of comparative income levels, the number of 'high net worth' individuals increased from 7.2 million in 2000 to 11 million in 2011 (Capgemini and RBC Wealth Management 2012) - but at the same time, 50% of the world's population survives - somehow - on less than \$2.50 a day and 80% manage on less than \$10 a day (UN Development Program 2012).

These concerns have trickled through to industry, e.g. with increasing numbers of commercial organizations signing the UN Global Compact that requires them to embrace the UN's universal principles and run their businesses in globally enlightened ways. At the same time, Information System (IS) people have also become more concerned: some have responded to the issue of ecological sustainability via 'Green IT' initiatives (Watson, Boudreau, and Chen 2010)[1] - although we argue that the contribution IS makes to ecological sustainability could go much further than Green IT (Pernici et al. 2012) - while others have responded to the social equity issue via 'Free Software' (Williams 2010), although other IS initiatives exist in this area too (Srivastava and Teo 2007).

IS play central roles in companies, as they are cross-functional and have very high strategic value in contemporary human society - which has been called the *"information society"* (Webster 2006) - and so are in a favorable position to help transform both business and society at large to make them more compatible with the aims of ecological sustainability and of social equity. The academic IS community has already received a call of duty to address ecological sustainability issues (Watson, Boudreau, and Chen 2010), but cannot afford to be only thus engaged: we argue that IS scholars should also enhance their sensitivity about social inequity and act in consequence. This article proposes the launch of an initiative for the IS community to engage in *both* ecological sustainability *and* social equity.

If *"it is our responsibility, as IS scholars, to dedicate some of our research efforts to better understand the role of IS in tackling environmental sustainability"* (Watson, Boudreau, and Chen 2010), the recognition that ecological sustainability cannot be separated from social equity - enshrined in the UN Development Program - extends our responsibility to dedicate at least an equivalent research effort for social equity. Such efforts should also be supplemented by teaching the potential of

[1] We wish to explicitly thank Rick Watson, Marie-Claude Boudreau and Adela J. Chen for their inspiring article 'IS and environmental sustainable development' (2010) on which we develop this article.

IS in both social equity and ecological sustainability, and IS journal editors and IS association leaders should get involved, too, in leading the radical change required to achieve these two ambitious objectives.

Our article consider the potential role of commoning for social equity and ecological sustainability and we advance the role that Common IS could play in tackling these two issues.

2 Commoning and Common Information Systems

Commoning "*is about the (re)production of/through commons... [] There are no commons without incessant activities of commoning, of (re)producing in common. But it is through (re)production in common that communities of producers decide for themselves the norms, values and measures of things*" (De Angelis 2007). Commoning has been recognized as a successful way through which humans interact with ecosystems to maintain long-term sustainable resource yields and many societies have developed diverse institutional arrangements for managing nature and avoiding ecosystem collapse, without government regulation or privatization (Ostrom 1990). A general framework for analysing sustainability of social-ecological systems has been developed and it includes: definition of boundaries and rules, collective-choices, monitoring, scale graduated sanctions, mechanisms of conflict resolution, self-determination of the community, effective communication, internal trust and reciprocity and nature of the resource system as a whole (Ostrom 2009). Finally, a polycentric approach is put forward and key management decisions should be made as close to the scene of events and as close to the actors involved as possible.

So a common good is a good that is - broadly speaking - shared by and benefits all members of a community (Helfrich 2009) rather than a resource to be appropriated and exploited (Hardin 1968). So questions about how to preserve it become unavoidable: adopting the 'communal' perspective promotes reflection about the ecological sustainability of human practicesand of their social equity within the human community (Helfrich 2009).

Given this theoretical foundation on commoning, we can define here and detail hereafter a Common Information System (Common IS) as one where:

- the Society with which the organization interacts is considered a human community,
- the Lower Entropy (LE) material and energy input is considered a common good and the Higher Entropy (HE) material and energy output is considered a common bad,
- commoning the input and output of the IS is the preferred behavior.

2.1 Human community

A society is an ensemble of people who share the same natural environment and enjoy patterns of inter-relationships, and who can benefit from living together in ways that would not otherwise be possible on an individual basis. If society is the ensemble of the people sharing the same natural environment, members of this 'human community' are also likely to share common values and display unity of will (Tönnies 1957), as well as to have a propensity to give each other mutual aid (Kropotkin 2006). This perspective includes all human communities, and is not - as so often in IS literature - limited to virtual participation in virtual communities. Even if taking this community perspective does by itself not solve the individual and social conflicts that stem from divergent individual and group interests, it should - ideally - serve to facilitate social equity within the human community, as it opens the perspective for IS people to common - to share with other members of human society: in short to act as what Helfrich (2009) labels 'commoners'.

2.2 Common good and common bad

In physical terms, the IS requires the input of a particular combination of material (such as hardware) and energy (e.g., electricity) in order to process data and so produce information. Beyond information, the IS also outputs some material, such as printed paper, and energy, such as heat. The processes that take place in an IS reduce the system's initial state of order, making the material and energy available in the system less effective or useful. The hardware input can breaks down, the electricity input is converted in heat, the white paper is covered with ink. Even if the paper, or other outputs, is recycled, the recycling system cannot be 100% physically efficient. Moreover, anyway these recycling processes will require more input, for example energy. This new input, to bring back the IS to its initial state of order, raises the issue of the availability of the energy and material outside the IS, thus simply pushing the boundaries of the reference system out.

Entropy is the metrics measuring the level of system's state of order, ie its usefulness or effectiveness (Georgescu-Roegen 1999). A system's entropy increases as its levels of order - and thus the availability, usefulness and effectiveness of its material and energy - decrease, and entropy decreases as they increase. The processes taking place in a system will increase or decrease its Entropy - but processes that take place in isolated systems can only reduce the initial system's state of order, i.e. raise its entropy level. The slower the processes will reduce the initial system's state of order, the longer the system will function over time. We talk about Lower Entropy (LE) when we refer to a system's initial state of order, and Higher Entropy (HE) when referring its later or final state of order.

The concept of entropy comes originally from thermodynamics, where is used to explain why some processes - like ice melting in a glass of water - occur spontaneously while others - such as the electrolysis of water - do not. By extension, it explains why processes in isolated systems are not reversible: ice and water do not naturally separate again without new energy input. The entropy in such systems can only remain constant (if nothing happens) or increases, if a process takes place. Although first used to describe energy issues (Clausius 2009), the entropy concept has since been applied to the physical world (Boulding 1966), to information theory (Gray 2011) and also to economic processes (Georgescu-Roegen 1999).

Given this wide possible applicability, we decided to employ the entropy concept to the physical level of an IS, so that its material and energy inputs carry Lower Entropy (LE) than its material and energy outputs, which hence carry Higher Entropy (HE). The material and energy transformations of physical input into physical output that change (i.e., raise) the entropy level of the information system as a whole. Entropy levels relate to specific systems (here, ISs), but the material and energy outputs of one IS can be the material and energy inputs for another - so the HE outputs of one IS can also be LE inputs into another.

LE material and energy are the physical means employed to process data into information. Among the material, we will certainly find Information and Communication Technology hardware, and, typically, the energy will be electricity. Higher Entropy (HE) material (e.g. obsolete hardware) and energy (e.g. heat generated by a central processing unit) are the physical outputs of an IS, and their entropy levels are higher than those of its material and energy IS inputs.

When IS people see themselves more as members of the whole human community than just as the IS people of a given specific organization, they invest the community with a moral authority and social legitimacy on which to base shared decisions and agreements about the IS's material and informational inputs and outputs. So LE material and energy input can be considered to be a common good (Helfrich 2009), as it is synonymous with order in the system, and with making that material and energy input available for effective use. So it is more readily considered something to be held in common and shared.

Just as LE material and energy input can be seen as common good, HE material and energy output can be identified as their opposite: common 'bad', as being synonymous with greater disorder in the system and thus with the less effective use of material and energy, bringing the issue of stopping - or at least slowing down - the increase of entropy to the fore. Taking this perspective, HE material and energy output invests IS people with the moral authority and social legitimacy to share decisions and create agreements about this common bad that is the material and energy output of the IS.

2.3 Commoning Information Systems

The human community perspective as a way of organizing the relationships between the IS, the organization, the society and nature, invites IS people, as well as those with whom they interact, to become ‘commoners’ and so to share legitimacy and authority - as well as data and information, energy and material - with them. As far as they agree on seeing material and energy inputs as common goods and outputs as common bads, an acceptable way to balance and make the transformation of LE material and energy into HE material and energy would be to share the benefits of the IS, and also to share decision making about IS between IS people, the organization and the wider human community. This sharing of benefits and decisions will help to define what are the right things to do (effectiveness) and how to do things right (efficiency) (Drucker 2006; Blohm et al. 2011) in their communal society, which will then be observable in the concrete behaviors of IS people, organizations, and society at large.

Data are the informational input of an IS, and are characterized by a being at a level of abstraction that is lower than that of the output (i.e., information) - although the level of abstraction is relative to a specific IS, so the information output of one IS can be the data input for another. Information is the informational output of the IS, and it is characterized by being at a higher level of abstraction than that of the input data. The notion of ‘commoning’ can concern both data input and information output - when they are shared openly, they become available to everyone to freely reuse, revise, remix and redistribute. Following the example of private individuals sharing information freely (Yahoo 2012; Wikimedia 2012), several administrations (e.g., the U.S. and U.K. governments) have begun to publish the data-sets they generate on their web sites, (United States Government 2012; HM Government 2012): some corporations, like Enel (see Enel 2012), act in the same way, which is also recommended by key IS actors like the audit company Deloitte (Branch and Lewis 2011) and the scientist Tim Berners-Lee (2009). In parallel, specific licenses have been created and employed to legitimize the sharing and use of published data and information, such as the Open Government, Creative Commons and Open Data Commons licenses.

Commoning is not necessarily limited to data inputs or information outputs. As LE material and energy input is common ‘good’, and organizations, human society and nature suffer from common HE material and energy output ‘bad’, both the benefits and the decisions - about both internal processes and other IS inputs and outputs - can be open and shared by commoners. In practice this may concern hardware, software and processes. In terms of hardware, some IS people are already sharing the design of infrastructures - e.g., Facebook (Facebook 2012) - and of hardware, as does Arduino (Arduino 2012) and even the hardware itself, in situations of under exploitation or of higher social priorities (University of California 2012). Software can also be made accessible, perhaps limited to access at no cost but with restricted usage rights, like PySolFC (PySolFC 2012); source code can be made accessible (i.e., open source), again with restrictions on its use, as was the case with Sugar CRM (Tienmann 2012); or software can be given away free, and access granting to its source code, without restrictions on its use (Stallman 2010). Finally, processes not formalized in software code, such as governance matters, can be made accessible to and agreed by the people affected by the IS (Schlagwein, Schoder, and Fischbach 2011; Blohm et al. 2011); thus the Wikimedia Foundation publishes its procedures on its web site and they are open to discussion online. Software development processes and governance matters can be commoned in the same way (Raymond 2010; Lindman and Rajala 2012).

3 Research Questions

Having presented the framework and described the concept of Common IS, we propose the IS community should develop a new research IS sub-field to tackle the subject. We examine below some possible research questions that we believe are valid for IS scholars and deserve research effort.

The first set of research questions concern efficiency and effectiveness of Common IS: the aim is to show that Common IS can move us closer to ecological sustainability and social equity more easily and more rapidly than 'State' or 'Market' systems. It would also be interesting to measure how and how far this movement to ecological sustainability and social equity proceeds:

- Does the commoning of an IS increase ecological sustainability and/or social equity?
- Under what conditions and to what extent does the commoning of an IS increase ecological sustainability and/or social equity?

Similar questions can be detailed for each Common IS component: physical and informational input and output and IS processes.

A second set of research questions could concentrate on the antecedents of common IS. It is evident that Common IS currently represent only a minority of IS - nevertheless, they do exist:

- What are the antecedents of common IS and how have these antecedents influenced the development of common IS?

Such antecedents can relate to nature, society, the organization and the IS itself, and could concern : physical and informational input and output and IS processes.

4 Concluding Thoughts

The UN has called everyone to contribute to fulfilling the Millennium Development Goals, and to recognize that social equity is inextricable interwoven with ecological sustainability. While social equality is still not a reality, some people have more power than others to help reach these objectives. Through their research, teaching, political influence and media exposure, scholars can play a key role in this ecological and social revolution, by including both environmental sustainability and social equity directly in our research, in our teaching, in our publication outlets and in our academic associations. Maybe the best way to do this is by commoning - opening up and sharing our processes, our IS, our information, and our ideas.

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